**The Current Situation, Problems and Countermeasures of Technology Transaction Market in Jinan**

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**Abstract**

Technology transaction market is an important part of the market economy. The level of technology market transaction has increasingly become an important  indicator to measure the strength of science and technology among different regions. < “The 13th Five-Year” National Science and Technology Innovation Plan>requires that the country should enhance the level of the service of science comprehensive. As the global technology market becoming active continually, Jinan has put the goal of “Build regional science and technology innovation center,” in order to reach the technology and innovation new heights between Beijing and Shanghai, becoming the domestic first-class and the internationally renowned technology innovation center, and building up an innovative city firstly. This paper takes Jinan technology market as the research object, uses the method of qualitative analysis, quantitative analysis and comparative analysis, makes a statistical analysis for the current technology transformation situation and the existing problems in Jinan. The conclusion is that Jinan technology transaction market develops slowly and there is still a large space to improve. In the end, the research puts forward the corresponding countermeasures and suggestions.

**Key words:** Technology transaction market; Current situation problems; Countermeasures and suggestions

1. **Research background**

In recent years, technology transaction market has developed rapidly in China. The level of technology market transaction has increasingly become an important  indicator to measure the strength of science and technology among different regions.

The 18th National Congress of the Communist Party of China (CPC) points out: “To implement the innovation-driven development strategy, scientific and technological innovation is the strategic support for improving the social productive forces and comprehensive national strength, and it must be placed at the core of the country's overall development.” Technology transaction market is the main way to achieve the industrialization of S & T innovation, and it is an important way to transform the innovation product into social productive forces, which plays an important role in the rational allocation of technical resources. < “The 13th Five-Year” National Science and Technology innovation plan> requires “enhancing the level of development of science and technology service industry,” “focusing on the development of research exploitation, technology transfer, tests and certification, entrepreneurship incubation, intellectual property rights, technology consulting and other industries”; at the same time, the plan also requires perfecting the mechanism of scientific and technological achievements transaction. From here we see that governments have taken more and more care about technology transaction market, and then enterprises also have realized the huge economic benefits behind the science and technology.

As the capital city of Shandong Province, Jinan has many unique advantages in territory, policy, talents and so on. “The 13th Five-Year” is the critical period for Jinan to transform the mode of economic development rapidly. <Jinan Regional Science and Technology Innovation Center for the construction of three-year target system and 2016 goals and tasks> proposes the goal of Jinan “to build a regional scientific and technological innovation center,” to create the technology and innovation new heights between Beijing and Shanghai, to become the domestic first-class and the internationally renowned technology innovation center, to build up an innovative city firstly. However, in recent years, Jinan technology transaction market has developed stagnation, compared to other large cities in China there is still a big gap. So the paper analyzes the development of Jinan's technology transaction market, and points out the problems existing in Jinan's technology transaction market, and then puts forward corresponding countermeasures and suggestions.

1. **Literature review**

**2.1 Research on the regional technology transaction market**

With the development of technology market, more and more scholars are paying attention to the regional technology transaction market. The normally researches can be divided into two categories, the formative factors of the regional technology transaction market and the relationship among regional technology transaction markets. Chen Xiaodong (2003) says that technology property rights transaction market in China has been formed obvious regional characteristics, and has formed five models, "Wuhan - incubator model", "Shanghai model", "Zhongguancun mode", "Guangzhou - boutique mode" and “Shenzhen - entrepreneurship + listed company model ". About the crucial factors regional technical transaction pattern, Zhao Wendan (2012) thinks that the technology input has a significant impact on the pattern of technical transactions in the regional technology transaction market, while the technology output has a significant impact on technology produce. Zhao Zhijuan (2014) believes that no matter inputting or outputting of the technology market, both of them have positive influence on the local innovation capability. It’s merely that there is an greater impact on output. Zhang Chengwei (2013) researches the regional innovation of the Bohai economic circle which based on the applications and the authorizations of innovation patents, he points out that the factors of per capita GDP have been the dominant factor to promote regional technological innovation, the regional technological innovation of the Bohai economic circle shows a downward trend, and the factor of technical market turnover presents a negative regional technological innovation. Liu Liang (2014) talks about that the inter-regional technology transaction network has a positive influence on the regional innovation produce. And the ability of the absorption of knowledge can regulate the regional technology network and technology output. Ji Chunjiao (2016) believes that the two most important influence factors of regional transaction market activities are the research capacity factors and the policy factors.

In summary, existing researches analyze the spatial characteristics and the structure patterns of regional technology transaction market, and analyze the law of technology transfer in China’s typical area.

**2.2 Research on the current situation and current problems of technology transaction market**

These years technology transaction market in China develops rapidly recently, but there are also many problems. According to the problems of China’s technology transaction market at different times, many scholars do the research and come up with the solutions. Zheng Rong (2009) discusses on the factors that influence the development of technology market in China through two aspects which are environment and market. The research analyses three factors of technical requirements, enterprise management and R & D capabilities, market entry barriers, and R & D risk. It points out that the correct identification of influential factors for the analysis of technology market development status is essential. Jin weiming (2009) says that Chinese technology market is driven by "demand-driven" is not "technology-driven." Li Ting (2010) believes that information asymmetry in the technology transaction process can hinder the technology transaction market healthy development seriously. And in the process, the main reasons for asymmetric information are exogenous factors, cost factors, and knowledge differences. Zhang Shoumou (2016) particularly talks about that one of the important reasons for the low conversion rate of technology achievements in Shandong province is the lack of a multi-level capital market. Because the small and medium-sized high-tech enterprises are much more need technology transaction market to raise fund.

In a word, the researches on China’s technology transaction market at different times provided the theoretical support of the sustainable development of Chinese technology transaction market. In recent years, the research on Jinan’s technology transaction market situation is still a blank. Thus, this research takes Jinan technology transaction market as the object, analyzes the current situation and the problems then puts forward the corresponding countermeasures and suggestions

**3. Situation analysis of Jinan technology transaction market**

**3.1 Operational status analysis of Jinan technology transaction market**

Table 1 provided analyzes Jinan’s technology transaction market current situation in respect of the technology transaction turnover in nearly six years. Jinan technology transaction market turnover shows a general increase trend in recent six years. From a total of 1.77 billion yuan of technology transactions in 2010 to 3.099 billion yuan in 2015, the amplification climbed to 75%. It is worth mentioning that from 2010 to 2014 the total turnover of technology transactions grew steadily. From the speed perspective, the year of 2010, 2011 and 2014 had a relatively rapid growth, with the fastest growth reaching a peak of 40 percent. In the year of 2015, however, a negative growth appeared and the technology transaction turnover also declined. The reasons for the decline are complex. First, the government of Jinan didn’t place enough emphasis on it. Second, the scientific research project didn’t get enough help. Last but not least, the severe loss of population was one of the key reasons.

### Table 1 Jinan technology transaction turnover during 2010 to 2015

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| Turnover (Billion yuan) | 17.7 | 24.83 | 26.37 | 27.68 | 37.14 | 30.99 |
| Amplification | 27.89% | 40.3% | 6.24% | 4.69% | 34.19% | －16.56% |
| Jinan technology transaction turnover accounted for the proportion of the GDP in Jinan | 0.45% | 0.56% | 0.55% | 0.53% | 0.64% | 0.51% |
| Jinan technology transaction turnover accounted for the proportion of technology transaction turnover in Shandong province | 17.58% | 19.65% | 25.97% | 15.43% | 14.90% | 10.08% |

Data Sources：Jinan Science & Technology Bureau Torch High Technology Industry Development Center, Ministry of Science & Technology

Data Sources：Jinan Science & Technology Bureau Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 1 The amplification of Jinan technology during 2010 to 2015

The table 1 and figure 2 reveal a comparison of the proportion of Jinan technology market transaction turnover accounted for the whole technology market transaction turnover in Shandong province. From 17.58% in 2010 to 10.08% in 2015, the proportion experiences a process of accelerated rise successively and a process of sustained decline. During the period between 2010 and 2012, the proportion has increased, before a period of decrease in 2013. Thus, compared to other cities in Shandong, Jinan technology market is lack of the potential of continuous development and the energetic.

Table 1 and figure 2 figure the proportion of Jinan technology transaction turnover accounts for the proportion of Jinan GDP. In recent six years, the proportion remained very low, from 0.45% to 0.51%, the overall trends didn’t improve a lot. The contribution of technology transaction turnover to GDP is very low in Jinan, and there is still very large space to improve.

Data Sources：Jinan Science & Technology Bureau Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 2 Jinan technology transaction turnover during 2010 to 2015

Table 2 and figure 3 analyze the Jinan technology transaction market current situation technology transaction volume in the past six years. From a total of 2956 in 2010 to 3594 in 2015, the amplification sees a marginal increase in the whole. The amplification has a striking fluctuation in the year of 2011 and the year of 2014. In 2013, however, the amplification reaches a peak of 11.11%.

### Table 2 Jinan technology transaction volume during 2010 to 2015

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| Technology Transaction Volume | 2956 | 2947 | 3113 | 3459 | 3327 | 3594 |
| Amplification | 9.04% | －0.3% | 5.63% | 11.11% | －3.82% | 8.03% |
| Unit Technology Transaction Turnover in Jinan (Million yuan) | 59.88 | 83.41 | 84.70 | 80.02 | 116.63 | 86.23 |

Data Sources：Jinan Science & Technology Bureau Torch High Technology Industry Development Center, Ministry of Science & Technology

With the annual transaction turnover divided by the annual transaction volume, another important indicator can be reached, which measures the level of technology market, the average annual turnover of each contract technology.

Formula: =

Unit Technology Transaction Turnover ()=Technology Transaction Turnover()÷Technology Transaction Turnover (N)

Unit technology transaction turnover represents the average transaction turnover per contract in a year. It measures the average level of technology transaction market in a city. The much higher of the unit the technology transaction turnover represents the much more value of the unit technology transaction contract.

Data Sources：Jinan Science & Technology Bureau Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 3 Jinan technology transaction volume during 2012 to 2015

In the table 2 and figure 4, Jinan unit technology transaction turnover from a total of 59.88 million yuan in 2010 to 86.23 million yuan in 2015, the total amplification is 44%, and the peak volume up to 116.63 million yuan in 2014. Jinan unit technology transaction turnover shows a fluctuating upward trend.

Data Sources: Jinan Science & Technology Bureau Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 4 Jinan unit technology transaction turnover during 2012 to 2015

The technology transaction turnover in Jinan rises continuously, but the amplification of transaction volume in Jinan doesn’t change much. In this case, the unit technology transaction turnover rises obviously. The result shows that unit technology transaction achievement in the process of Jinan’s technology market is much more valuable. Jinan’s scientific and technological transaction becomes more reasonable, and the gold content of technology research also increased, this is indeed a welcome phenomenon.

In terms of technology transaction market turnover and volume, this paper selects the top five cities in China (Beijing, Shanghai, Xian, Wuhan and Shenzhen) and compares them with Jinan in turnover and volume, and then analyzes the present development situation of Jinan technology transaction market. At present, the most active areas in China's technology transaction market is the Beijing-Tianjin-Hebei region, the Yangtze River Delta region and the Pearl River Delta region, It’s is worth mentioning that Beijing, Shanghai, Guangzhou and Shenzhen play a significant radiation role in regional.

### Table 3 A horizontal comparison of the technology transaction turnover between Jinan and the top 5 cities in China

Unit (Billion yuan)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| Jinan | 17.7 | 24.83 | 26.37 | 27.68 | 37.14 | 30.99 |
| Beijing | 1579.5 | 1890.3 | 2458.5 | 2851.72 | 3137.19 | 3453.89 |
| Shanghai | 431.4 | 480.8 | 518.75 | 531.68 | 592.21 | 663.78 |
| Xian | 98.3 | 204.5 | 300.22 | 471.76 | 567.25 | 657.82 |
| Wuhan | 89.3 | 113.9 | 132.40 | 254.79 | 368.21 | 440.93 |
| Shenzhen | 83.0 | 91.6 | 153.05 | 285.98 | 144.07 | 372.16 |

Data Sources: Torch High Technology Industry Development Center, Ministry of Science & Technology

Data Sources: Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 5 A horizontal comparison of the technology transaction turnover between Jinan and the top 5 cities in China

In table 3 and figure 5, compared Jinan technology transaction turnover with the top 5 Cities’ technology transaction turnover in China, there is still a big gap. Jinan technology transaction turnover accounted for a part of 1.1% and 21.3% of Beijing’s and Shenzhen’s relatively in 2010. By 2015, however, technology transaction turnover of Jinan accounted for a part of 0.9% and 8.3% of Beijing’s and Shenzhen’s respectively.

The starting point of Jinan technology market is very low, and then the growth rate is also far less than the technology transaction market originally developed relatively mature cities such as Beijing and Shanghai.

Table 4 and Figure 6 compare the situation between Jinan and the top five cities in technology transaction volume. There is still a big gap. In 2010, the proportion of Jinan technology transaction volume accounted for 5.8% of Beijing’s technology transaction volume, for 11.4% of Shanghai’s, for 31.7% of Xian’s, for 46.3% of Wuhan’s, and for 57.4% of Shenzhen’s; however, the proportion declined in different extent in 2015, the technology transaction volume of Jinan accounted for 5%, 14.5%, 16.8%, 21.2% and 37.5% of five cities’ respectively.

### Table 4 A horizontal comparison of the technology transaction volume between Jinan and the top 5 cities in China

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| Jinan | 2956 | 2947 | 3113 | 3459 | 3327 | 3594 |
| Beijing | 50847 | 53550 | 59969 | 62755 | 67284 | 72306 |
| Shanghai | 25945 | 29005 | 27649 | 25952 | 22199 | 24859 |
| Xian | 9320 | 10783 | 16793 | 18463 | 25169 | 21395 |
| Wuhan | 6391 | 6822 | 10239 | 12278 | 15096 | 16953 |
| Shenzhen | 6894 | 9108 | 10077 | 10334 | 10290 | 9580 |

Data Sources: Torch High Technology Industry Development Center, Ministry of Science & Technology

Data Sources: Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 6 A horizontal comparison of the technology transaction volume between Jinan and the top 5 cities in China

From a perspective of whether technology transaction turnover or volume, it’s evident to view that Beijing owns the dominant statue in Chinese technology transaction market. In recent years, many people think that China has basically formed a Beijing-Shanghai the double centers structure. However, from the technical production capability aspect, Beijing still has more obvious advantages. Beijing has Chinese largest number of scientific research institutions, so with its own geography, personnel and policy advantages, the technology transaction market activities are also the most active. Hubei Province and Shaanxi Province are the centers of education, technology and culture in the central and western regions of China. In this process, Wuhan University, Huazhong University of Science and Technology, Xian Jiaotong University and other "985" "211" key universities and research institutions play a very important effect. Shenzhen is just rely on enterprises, “to seize the market of listed companies and venture capital market,” and to create a “venture capital - technology property rights trading - GEM or motherboard market” chain. The five cities all rely on their respective regional characteristics, and then explore the timely and appropriate development road of technology market actively. Jinan has put the goal of “Build regional science and technology innovation center”, so we must take more actively to explore and create the suitable economic development characteristics, the "Jinan model”.

**3.2 Analysis on the current situation of independent innovation of science and technology in Jinan**

### Table 5 Jinan invention patent statistics during 2012 to 2015

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 2012 | 2013 | 2014 | 2015 |
| Application | 23094 | 22527 | 23512 | 28944 |
| Year-on-year growth |  | －2.56% | 4.37% | 23.10% |
| Authorization | 14367 | 12403 | 11737 | 15537 |
| Year-on-year growth |  | －13.67% | －5.37% | 32.38% |

Data Sources: Shandong Statistical Yearbook 2015

Data Sources: Shandong Statistical Yearbook 2015

### Figure 7 Jinan invention patent statistics during 2012 to 2015

The reaction of invention patent is the intermediate output of technology innovation. Table 5 and Figure 7 show the present situation about Jinan independent innovation through the application and authorization of invention patent in Jinan, in recent four years.

For a long time, the number of application for invention patents in Jinan has been rising. From 23094 in 2012 to 28944 in 2015, the total amplification is more than 25%. On the contrary, the authorization volume had a fluctuant tend, from 14367 in 2012 to 15537 in 2015, but the negative growth came in 2013 and 2014. The number of applications of patents raised clearly, but the authorization did not have obvious changes. On the one hand, this phenomenon connects with the more standardized government audit, on the other hand, these also reflect that many innovations are immature and unstable, the level of technology output needs to be improved.

Table 6 and table 7 horizontal compare the invention patents output of Shandong 16 cities, in order to analyze the overall situation of scientific and technological innovation in Jinan. Through the table 6 and figure 8, the amplification of invention patent appears overall upward trend in the Shandong 16 cities. The top six cities are Qingdao, Jinan, Weifang, Yantai, Zibo, and Weihai. Qingdao, Jinan, Weifang, Linyi, the four cities’ overall momentum of development is well, and the speed of development is also much faster.

### Table 6 The statistics of invention patent application in Shandong 16 cities during 2012 to 2015

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 2012 | 2013 | 2014 | 2015 |
| Jinan | 23094 | 22527 | 23512 | 28944 |
| Qingdao | 27009 | 48607 | 55174 | 63691 |
| Zibo | 10120 | 8552 | 8347 | 9654 |
| Zaozhuang | 2759 | 3467 | 3036 | 3973 |
| Dongying | 3434 | 4254 | 4219 | 4828 |
| Yantai | 9571 | 9131 | 8734 | 9285 |
| Weifang | 11115 | 15582 | 13711 | 18571 |
| Jining | 6909 | 7610 | 7429 | 8699 |
| Taian | 8586 | 5780 | 5038 | 5619 |
| Weihai | 4982 | 5296 | 6241 | 9344 |
| Rizhao | 2157 | 2480 | 2098 | 2784 |
| Laiwu | 1980 | 2197 | 2552 | 2813 |
| Linyi | 3696 | 4774 | 4543 | 7658 |
| Dezhou | 3671 | 4196 | 3561 | 4120 |
| Liaocheng | 2303 | 2947 | 3154 | 4068 |
| Binzhou | 4971 | 4185 | 3434 | 4871 |
| Heze | 3157 | 3585 | 3836 | 4298 |

Data Sources: Shandong Statistical Yearbook 2015

Data Sources: Shandong Statistical Yearbook 2015

### Figure 8 The statistics of invention patent application of top six cities in Shandong during 2012 to 2015

The table 7 and Figure 9 show the situation of the authorization in Shandong province. There is not evident wave in the sixteen cities. But in 2014, except to several cities, there is different degree decline in whole province except to several cities. The main reason of the decline is the more standardized check procedures and the more strict check standards.

### Table 7 The statistics of invention patent authorization in Shandong 16 cities during 2012 to 2015

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 2012 | 2013 | 2014 | 2015 |
| Jinan | 14367 | 12403 | 11737 | 15537 |
| Qingdao | 12689 | 13856 | 14176 | 20168 |
| Zibo | 4401 | 5203 | 4711 | 6478 |
| Zaozhuang | 1864 | 1918 | 1665 | 2446 |
| Dongying | 2576 | 2971 | 3058 | 3189 |
| Yantai | 5801 | 4991 | 4466 | 6065 |
| Weifang | 7386 | 8186 | 8435 | 11055 |
| Jining | 5457 | 5453 | 4582 | 6349 |
| Taian | 2701 | 2768 | 2626 | 3191 |
| Weihai | 2990 | 3075 | 2832 | 3795 |
| Rizhao | 1638 | 1707 | 1514 | 1779 |
| Laiwu | 1913 | 1919 | 1712 | 2380 |
| Linyi | 2706 | 2838 | 2922 | 4211 |
| Dezhou | 2423 | 2807 | 2411 | 2975 |
| Liaocheng | 1409 | 1915 | 1731 | 2583 |
| Binzhou | 3280 | 2931 | 2399 | 3268 |
| Heze | 1912 | 2035 | 1841 | 2632 |

Data Sources: Shandong Statistical Yearbook 2015

Data Sources: Shandong Statistical Yearbook 2015

### Figure 9 The statistics of invention patent authorization of top six cities in Shandong during 2012 to 2015

Making a horizontal comparison among the sixteen cities in Shandong province, Qingdao and Jinan leads the province whether the application or authorization of innovation patent, and then Qingdao has more distinct advantages. In recent years, the development of Qingdao is especially rapid, the typical "rising star", but Jinan is slower significantly. So, in allusion to Jinan and Qingdao, this research makes a further detailed comparison of the various indexes.

### Table 8 Each index [comparison](http://fanyi.baidu.com/#auto/auto/comparison) between Jinan and Qingdao

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | The application of Invention patent | | The authorization of Invention patent | | The turnover of technology market (Billion) | | The volume of technology market | | The technology transaction turnover accounted for the proportion of technology transaction turnover in Shandong province | |
| Jinan | Qingdao | Jinan | Qingdao | Jinan | Qingdao | Jinan | Qingdao | Jinan | Qingdao |
| 2012 | 23094 | 27009 | 14367 | 12689 | 26.37 | 21.97 | 3113 | 3608 | 25.97% | 15.70% |
| 2013 | 22527 | 48607 | 12403 | 13856 | 27.68 | 31.47 | 3459 | 2673 | 15.43% | 17.54% |
| 2014 | 23512 | 55174 | 11737 | 14176 | 37.14 | 52.17 | 3327 | 3667 | 14.90% | 20.93% |
| 2015 | 28944 | 63691 | 15537 | 20168 | 30.99 | 74.87 | 3594 | 5054 | 10.08% | 24.34% |

Data Sources: Jinan Science & Technology Bureau, Qingdao Science & Technology Bureau, Shandong Statistical Yearbook 2015, Torch High Technology Industry Development Center, Ministry of Science & Technology

In table 8, from the aspect of the middle technology output- the application and the authorization of innovation patent, there is a large gap in application but a small gap in authorization between Jinan and Qingdao. Although there is a small gap in authorization, the final technology output – the turnover and the volume of technology transaction in Jinan is still very low. This phenomenon reflects a very serious problem in Jinan, the gold content of the unit technology output need to be further improved.

Table 8 makes a comparison of the Jinan and Qingdao technology transaction turnover accounts for the proportion of technology transaction turnover in Shandong province. Jinan technology transaction turnover accounted for 25.97% of the province, Qingdao accounted for 15.70% of the province, Jinan is the leader before 2012. However, Qingdao exceeded Jinan and ranked first since 2013.

Up to now, Jinan has activated 847 different kinds of enterprise research and development institutions, 39 of them are national level and 256 of them are provincial level. These institutions include 304 enterprise technology centers of city level and higher, 460 engineering the technology research centers, 71 engineering technology research centers, 12 enterprise key laboratories, 6 national science and technology parks , 6 international technology cooperation bases. Jinan totally has 22 high-teach business incubators of city level and higher, 7 of them are national level and 2 of them are provincial level.

Up to 2015, Qingdao has 52 colleges and scientific research institutions, 1827 relative exports, 92 technology transfer intermediaries, and more than 400 characteristic industrial bases which approved by the ministry of science and technology. Qingdao has established more than 70 various types of industrial bases and Industrial Parks, 4 of them are national torch characteristic industrial base. In the end, Qingdao technology transaction market has 105 relative laws.

Through the comparison, Jinan technology transaction market falls short in professional technical personnel and authoritative intermediaries, scale R & D bases and relative laws. Thus, Jinan municipal government can cut into these weakness points to stimulate the development of technology transaction market.

**3.3 Analysis on the turnover and volume of technology transaction market in Shandong province**

### Table 9 Shandong province technology transaction turnover during 2010 to 2015

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| Turnover(Billion in RMB) | 100.67 | 126.37 | 140.02 | 179.40 | 249.29 | 307.55 |
| Amplification | 39.90% | 25.20% | 10.79% | 28.12% | 38.96% | 23.37% |
| Shandong technology transaction turnover accounted for the proportion of GDP in Shandong | 0.26% | 0.28% | 0.28% | 0.32% | 0.42% | 0.49% |
| Shandong technology transaction turnover accounted for the proportion of turnover in China | 2.58% | 2.65% | 2.12% | 2.40% | 2.91% | 3.13% |
| Shandong technology turnover ranking in China | 7 | 7 | 9 | 9 | 8 | 8 |

Data Sources: Jinan Science & Technology Bureau, Torch High Technology Industry

Data Sources: Jinan Science & Technology Bureau, Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 10 Shandong province technology transaction turnover during 2010 to 2015

On the basis of the previous analysis, the further research on Shandong technology transaction turnover accounts for the proportion of turnover in China. So that study on the economic big environment of Jinan.

In table 9 and figure 10, the province’s technology transaction turnover from 200.67 billion yuan in 2010 to 307.55 billion yuan in 2015, the amplification climbed to 205%. It appears a high speed increase stat. Its development momentum is good.

The proportion of the technology transaction turnover accounts for the proportion of GDP in Shandong province is very low. The proportion from 0.45% in 2010 to 0.51%, in 2015, the overall trends didn’t improve a lot. There is still very large space to improvement.

The proportion of the technology transaction turnover in Shandong accounts for the proportion of the technology transaction turnover in China is very low, from 2.58% in 2010 to 3.13% in 2015. Shandong as a large economy province, this proportion is nowhere near enough. Anyway the rank is the top ten in national and the gap is also clearly. A Case Study of the central interior province of Hubei, in 2015, the total turnover of technology transaction exceeded 80 billion yuan, while Wuhan alone accounted for nearly 60% of the whole turnover. So the technology transaction market in Hubei province relies on the radiation effect of Wuhan.

### Table 10 Shandong province technology transaction volume during 2010 to 2015

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| Volume | 7865 | 9037 | 11114 | 14263 | 17331 | 20422 |
| Amplification | 2.52% | 14.9% | 22.98% | 28.33% | 21.51% | 17.84% |
| Unit Technology Transaction Turnover in Shandong (Million yuan) | 127.15 | 139.84 | 126.00 | 125.99 | 143.84 | 150.60 |

Data Sources: Jinan Science & Technology Bureau, Torch High Technology Industry Development Center, Ministry of Science & Technology

In table 10 and figure 11, the province’s technology transaction volume from 7865 in 2010 to 20422 in 2015, steadily increased year by year. And the unit technology transaction turnover keeps rising in Shandong. The structure of Shandong technology transaction market is becoming more and more scientific and reasonable; at the same time, the real scientific and technological content in unit output product continue rising, and the ability of connecting with market is improving.

Data Sources: Jinan Science & Technology Bureau, Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 11 Shandong province technology transaction volume during 2010 to 2015

Data Sources: Jinan Science & Technology Bureau, Torch High Technology Industry Development Center, Ministry of Science & Technology

### Figure 12 Shandong province technology transaction volume during 2010 to 2015

Jinan as the capital of Shandong province has the distinctive advantages in geography, personnel, and policy. In the regional, Jinan located in the center of the Bohai economic circle, the economic hinterland is vast, and the market potential is huge; on the other hand, there is lack of an economic transition zone between Beijing and Shanghai. In the policy, Jinan as the capital city enjoys a lot of convenience in policy. <Jinan Regional Science and Technology Innovation Center for the construction of three-year target system and 2016 goals and tasks> proposed the goal of Jinan “to build a regional scientific and technological innovation center,” the government begin to pay more attention to the development of technology transaction market. Thus, Jinan has to seize the s strategic opportunities, it will lead the Shandong Province even the entire North China to open the new look of the development of technological innovation.

**4. Existing problems in Jinan technology market**

**4.1 Jinan technology market legal environment needs to be improved**

Technology market is an intellectual property rights trading market. The protection of intellectual property rights is a prerequisite for the technology commercialization and the technology transaction market establishment, and it is an important "rules of the game" in technology transaction market. Once the intellectual property rights trading is lack of the strong legal protection, there will lead to confusion in the technology market, and hinder the technology market transactions.

The intermediate output of technology innovation of Jinan which is also called the application and the authorization of innovation patent shows a rising trend in recent years. However, technology innovation did not translate into technology output in the end, and in 2015 Jinan technology transaction turnover even appeared negative growth. The lack of Jinan technology market legal system construction is the key reason for this phenomenon. There are not particular intellectual property rights legal documents aimed to the technology market in Jinan until now.

The <Jinan technology market management approach> was announced by Jinan municipal government in 2001, but the “management approach” failed to rise to the “law,” and there is even no further amendment in recent years.

the <Jinan intellectual property strategy outline> was issued by the Jinan municipal government in April 2009 in Jinan, but the “Outline” only protect the property from the macro strategic consciousness, it cannot play a substantial protective effect, and the Jinan municipal government has not issued a similar document since 2009.

In addition to the lack of laws and regulations, supervision and management of the technology market is not perfect, and many management offices are also hollow, so all these results in infringement and fraud took place frequently in Jinan technology market. Just improving the laws and regulations, the law is only a mere scrap of paper with the weakness of the law enforcement department. The legal environment needs to be improved in Jinan technology market, and the law enforcement departments should have strong actions.

**4.2 The driving force of Jinan technology transaction policy weakness**

The government's policy has a strong power to guide a certain period of development plans, objectives and prioritizing development fields will be transformed into the direct driving force of the industry.

Jinan technology transaction turnover ranked the first in Shandong province before 2012. But the Jinan technology transactions turnover accounted for the proportion of the all transaction of the whole province has reduced greatly, while Qingdao has maintained a high growth rate, taking the place of Jinan and ranked the first since 2013. In this process, the guidance and the support of the Qingdao municipal government policy played a crucial role. In October 2013, Qingdao technology market put into operation officially which established by the Qingdao Science and Technology Bureau and the Qingdao national high tech Zone Management Committee. With the ratified reply of Ministry of Science and Technology of the People’s Republic of China, Qingdao established National Ocean Technology Transfer Center in 2014. With the government policy driving, Qingdao technology market maintains a rapid growth trend. On the contrary, Jinan does not have the relevant policy of developing technology transaction market preferentially in recent year. The government does not think highly of technology transaction market, there will not be able to form the strong power in the whole society. Obviously, the reason for the continue downturn in Jinan technology market turnover is the weakness of driving force of the technology transaction policy in Jinan. Therefore, the guidance of technology market and the preferential policies is crucial.

**4.3 The development of Jinan technology transaction intermediary lags, the service direction is not clear**

The service function of Jinan intermediary is not clear, the imperfect system is a big problem in Jinan technology market. In the analysis of the horizontal comparison between Jinan and the top five cities about the technology transaction market as I mentioned in an earlier post, the successful development model of five cities are all based on the perfect intermediary service. In the case of Wuhan, there has have 30 demonstrative technology transaction intermediaries, including 16 national technology transaction demonstration organization, 14 provincial, and 10 municipal, up to 2015. Jinan only has 7 Productivity Promotion Centers which are a little more authoritative so far.

Once the intermediary service missed, the development of technology transaction intermediary lags the technology output products, there will appear fault phenomenon, thereby affecting the growth of the market. On the one hand, Jinan is lack of the authoritative demonstration technology transaction intermediaries; on the other hand, the structure of existing intermediaries is unreasonable, the management and operation mechanism is confused. About the service, it cannot really play the intermediary role, neither clear service position nor in-depth market research.

**4.4 Jinan technology market is lack of professional talents**

The sources of the intermediary practitioners in Jinan technology market are difference. The abilities of workers are also different, their professional knowledge and the service quality are generally low. The whole industry is lack of the high level, professional, and versatile talents. Many workers are engaged in part-time technical intermediary activities. What is more, they use their position to earn extra profits.

At present, many colleges have opened the related major courses which located in Beijing, Shanghai and many other cities. This courses aim to technology market, and train interdisciplinary talents for intermediaries. These colleges provide high quality talents for the local technology market continuously. At the same time, many businesses open the regular trainings to improve the service quality and professional knowledge for their staff in some China’s big cities. Jinan has short coming of talent training. The colleges in Jinan do not have the plan of talent training about technology market. At the same time, the training of the agency staff is not enough, which impedes the development of Jinan’s technology transaction intermediary.

**5. Countermeasures to promote the development of Jinan technology transaction market**

**5.1 Improve laws and regulations, increase intellectual property rights protection**

Compared with the conventional commodity trading, the technology transaction commodities are more complex. In technology transaction process, it needs to let the technology transferee know the advanced and applicability of the technology; on the other hand, it also needs to prevent technology leak and fraud.

Therefore, it is very important to protect the intellectual property rights. Jinan municipal government should perfect the relevant laws, especially the patent protection, and the external environment of technology transaction. For example, Jinan municipal government can set the "patent dispute settlement rules" and the "patent dispute litigation process" and other similar laws.

**5.2 Enhance the strength of the regular of technology market**

The department concerned has to crystallize responsibility and enforce the law sternly in Jinan. A series of things against the law, such as false declaration, falsification, which should be stricken severely. So some precautions need to be done to prevent using national preferential policies loopholes to do something for themselves. Jinan municipal government has to disclose the rewards and punishments to the enterprise which involved in illegal things and companies related to them, optimize the system of information publicity, the expert evaluation system, to improve the quality of affirmation. Normalizing technology trading market and the intellectual property review mechanism and transaction behavior. Jinan municipal government has to consummate the settlement of transactions and the risk management to advance the development of daily statistical management of technology contract.

**5.3 Increase the thrust of science and technology in a multi-pronged way**

Jinan municipal government need to aim at the two different subjects supply and demand, giving different but effective guidance. Enterprises located in Jinan as the principal part of the technology demanders need to be supported in the tax finance aspect by Jinan municipal government. Government use Tax Lever Policy and investment allowance loan with discounted interest to build ad a diverse financing channel and promote venture investment to stimulate the enterprises’ demand for technology commodity. Jinan municipal government should increase the funding for research; on the other hand, it may use technical title assessment system to encourage researchers to create and develop scientific products which adapt the market environment.

**5.4 Develop the mediation of public service platform**

The function of technology transferring intermediary is to find demand and supply for technology and provide joint service. Jinan technology transaction market must be good at using the market mechanism to optimize the mediation system of trading platform, and then to improve intermediary efficiency of technology transfer, to use market to allocation the resources rationally; to give market decisive effort in technology transaction, consequently enhance the service level of Jinan technology market intermediaries. Jinan should focus on the development of authoritative intermediary institutions, driving regional market standardized step by step.

Jinan needs to pay more attention to use modernize management method to develop the public platform; and use data analysis methods such as Big Data to establish and perfect the technology market database, to improve the information network. Establish technical evaluation system that divided for different business it could facilitate both side of market demand and supply information exchange and price reference.

**5.5 Strengthen the construction of professional talent team**

In talents cultivation, Jinan is about to strengthen professional talent team construction, especially pays attention to college professional training. Technology transaction related to courses should be really added into the education plan to cultivate a batch of understanding law technology, market business and managements’ high quality versatile talent.

Jinan need stay focus on training of professional and technical personnel. The quality of staff will directly affect the level of technology transaction service. Establish enterprises as the main part and market as the guidance vertical cooperation system which combine produce and research. On the one hand, the management department in Jinan organizes large scale specialized systematic training to enhance the level of workers and the level of industry access standard gradually. On the other hand, intermediary should take internal evaluation which conducted for employees. According to the results of the evaluations, company can organize special training in batches.

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