Reconstruction of Seed Industry’s Value Chain in the Context of “Internet +”

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Abstract. The Internet+ action plan was first proposed in the 2015’s government work report by Premier Li Keqiang. Then the integration of Internet and traditional industries accelerated with the appearance of O2O, Internet finance and so on. As a strategic and basic industry, the healthy development of seed industry was vital to ensure the food security. The paper tried to analyse the influence of Internet+ on each links of the seed industry’s value chain including research, breeding, producing, marketing and service based on the analysis of the characteristics of Internet+. In the end, the paper put forward the re-constructing of the seed industry’s value chain including development, integration and optimization, which provided ideas for the healthy development of “Internet + seed industry”.

1. Introduction

Seed industry is of strategic and fundamental core industries which promotes long-term stable development of China’s agriculture and ensures national food security. It developed very slowly in the planned economy era because all the process including development, production and distribution was dominated by the state. However, in recent years it has been developing rapidly since the Seed Law unveiled with the emergence of various kinds of seed companies with technical strength. At present China has the second seed market in the world [1]. The increasing R&D achievements have laid the foundation for the construction of Chinese agricultural modernization. Even though the seed industry is developing fast, we should not ignore the existing problems such as the low concentration of the industry, lack of the large-scale company, serious homogenization competition, lack of core competitiveness and so on.

According to the smile curve theory, the front end and the back end of the industrial chain are relatively high value-added areas while the middle part of the chain known as the production process is relatively low value-added area. The rule is all the more so. Currently the “Internet+” action plan sweeps each industry and has been the national strategy. The integration of “Internet+” and traditional industry will promote the industrial upgrading and transformation in China. A variety of new industrial pattern is emerging in the “Internet+” age, which injects new endogenous power for China’s economic growth. So, the impact and influence on the seed industry brought by “Internet+” will be discussed. Meanwhile the strategy to seize the opportunity to promote the seed industry’s healthy and rapid development will also be researched.

2. Research summary of seed industry’s value chain

The concept of value chain is put forward by the Michael Porter in 1985. In the value chain theory the value creation activities can be divided into basic activities and supporting activities. The basic
activities include production, logistics, scales and after-sale service while the supporting activities include the R&D activity, human resource activity and finance. All these activities make up the whole value chain. In recent year more and more scholars adopt the value chain theory to study the seed industry and have got some achievements.

Kang Yu-fan[2] analysed the seed industry’s value chain in China and thought that the substantive activities of seed industry include R&D, production, marketing and service. Based on the analysis she put forward that the seed industry’s value chain can be expanded to virtual business, outsourcing and strategic alliance. Wang Wei-zhong[3] analysed the industrial integration theory and the development experience of seed industry in U.S. and then put forward the consolidation path for the seed industry. He thought that the horizontal integration along the value chain was appropriate in the current stage, which means that the merger and reorganization should be carried out by the large-scale companies upstream and downstream the value chain. Li Bo et al[4] gave a detailed analysis on the business model of China’s seed industry and summarized six basic models including substitute propagation model, propagation-sale model, breeding-propagation-sale model, substitute propagation-sale model, single operation model and other mixing model. More than 90 per cent of the companies in China adopt the substitute propagation model. Only one percent adopts the breeding-propagation-sale model. So, in China’s seed industry the problems such as small scale and weak competitiveness are very serious. Cao Hai-yan et al[5] analysed the value chain integration process of Chinese seed companies. They thought that the substitute propagation companies should integrate the research institutions by forward integration and integrate the sales enterprises by backward integration resulting in formation of the breeding-propagation-sale seed enterprise. Niu Jun-rang [6] studied the seed industry in Beijing from two dimensions as the industrial attractiveness and enterprises’ competitiveness with GE model. He drew the conclusions that the industrial chain is incomplete and the clustering degree is too low from the macro view while the industry and research integration is insufficient and the scale of seed enterprises are too small from the micro view. The countermeasures are also given in his study. Gao Jie[7] analysed the relationship between the seed industry’s development and intellectual property from the perspective of value chain. She discussed the emphases to be protected of the intellectual property in different stage of the value chain.

Through the literature review we can see that China’s seed industry shows the following characteristics: Firstly, seed companies at the both ends of the value chain are few and weak while that in the middle of the chain only operating the substitute propagation are in the majority. Secondly influenced by the planned economy era large-scale seed companies covering all the value chain including seed resource collecting, R&D, propagation, production, marketing and after-sale service occupy a small proportion. Thirdly the comprehensive competitiveness is too weak. So, it is necessary to reconstruct and integrate the seed industry’s value chain. Fortunately in the “Internet+” era the new generation of information technology represented by big data, cloud computing, mobile internet makes it possible to enhance the value level on both sides of the value chain including R&D and marketing links, which can promote the collaboration and integration of seed industry.

3. Reconstruction of the seed industry’s value chain in “Internet+” era

“Internet+ seed industry” is a new form of the seed industry with a comprehensive use of the internet of things, cloud computing, big data and mobile internet. It can integrate the new generation of information technology with each link of the value chain including resource collecting, R&D, propagation, production, marketing, logistics and after-sale service. The purpose is to promote the seed resources sharing, industrial cooperation and service-oriented transformation. With the realization of the new industrial pattern, each link of the value chain will benefit from the “internet+”. Not only the R&D activity in the front end and the propagation activity in the middle but also the marketing and after-sale service activities will become more open, sharing collaborative and innovative.
3.1. Analysis on the Characteristics of “Internet+”

The “internet+” strategy is firstly put forward by Ma Hua-teng. He holds the opinion that the “internet+” strategy is to combine the traditional industries with internet using all kinds of information and communication techniques and the internet platform to create new industrial patterns. Ma’s “internet+” strategy finally obtains the national accreditation with the “Internet+” action plan proposed by Li Keqiang. Recently a number of new industrial patterns have emerged with the convergence of internet with traditional fields of transportation, finance, telecommunication, e-commerce and manufacture. Through the analysis on the integration of “internet+” and traditional industries, the paper summarizes the main characteristics of “internet+” as follows:

Firstly, it has more comprehensive and real-time information perception.

By means of internet of things, various types of sensors, we can obtain the parameters of the human, physical and environmental objects comprehensively and timely. The big data resource provides the data basis for the integration of internet and traditional industries. For example, the GPS-based positioning technology is the basis for the “Internet+ Transportation” pattern and the multi-sensing technology based on types of sensors is the basis for intelligent manufacturing.

Secondly, it has faster and more reliable information transmission.

Development and maturity of the mobile internet technology make the interconnection and instant messaging in a wider range possible for all types of intelligent devices. Currently both the network speed and the stability have been improved greatly. With the implementation of 4G network, the information transmission costs will be further reduced. It is the development of the mobile internet that makes various APPs in intelligent devices perform their functions fully. According to the statistics, China’s mobile Internet users have reached over 800 million by the end of April 2014, which provide the massive user base for the implementation of the “internet+” strategy.

Thirdly, it has more intelligent and efficient information processing.

The development of data mining, business intelligence, big data and cloud computing makes it possible to efficiently process the massive, multi-dimensional and heterogeneous data. By exploring the implicit message behind the big data, the valuable knowledge such as the users’ behaviour characteristics, business rules, monitoring and control knowledge will be extracted, which provide assurance for the integration of internet and traditional industries. For example, intelligent monitoring and control in manufacturing areas, fraud monitoring in online finance, cross-selling and customer segmentation strategies for online store can be realized with the application of “internet+”.

Fourthly, it has more secure and intuitive information sharing.

To be open is a salient feature of “internet+”. The information sharing between people, enterprises and other types of social institutions will be realized with the constantly improving of the information security mechanisms. Meanwhile the development of virtual reality techniques and the visualization technology make the visual display possible. So, the information sharing and the visual display will finally make the information exchange more convenient.

Figure 1. Characteristics of “Internet+”.
3.2. Influence of “Internet+” on Seed Industry’s Value Chain

In order to analyse the role of “internet+” on China’s seed industry’s value chain, the paper firstly gives a summary of the seed industry on the basis of the previous studies. The previous studies generally analysed the basic activities and supporting activities that can bring value increment from the enterprises’ perspective. As different seed enterprise has different operation mode, so the basic and supporting activities are different from each other. In this paper we will analyse the value chain from the seed industry’s perspective. As known the seed industry is composed of seed enterprises with various operation modes. So, the superposition of different operation modes constitutes the entire seed industry’s value chain. Obviously there exists the cross part in the superposition process. According to the research achievement by Li Bo, the seed industry’s value chain includes the following aspects: seed resource collection, R&D, breeding, sales and after-sale service. Among all the activity, seed resource collection activity is in front of the R&D stage, which is the base and premise for the development of new seed variety. R&D activity is the substantial process to develop the new seed variety with high-quality, high yield and anti-pest. The R&D link is very risky with large investment in a long period. However, it is the key process to form the core competitiveness for seed industry. The breeding link is to produce the seed and the sale link is to sell the seed products to the farmers. The after-sale service link is to provide new variety demonstration, technical training, agricultural advisory and other related services.

1) Influence analysis of “internet+” on seed industry’s R&D

The influences of “internet+” on seed industry’s R&D activity are as follow.

Firstly, in terms of seed resource gathering, the big data and cloud computing techniques make it easy to collect, conserve and analyse the high-quality seed’s genetic information, which provide germplasm information assurance for seed innovation. Secondly, in terms of joint R&D, an individual seed enterprise has limited resources to undertake the long development cycle, large investment and high risk. Relying on the “internet+”, it is possible to build collaborative mechanisms between seed enterprises and research institutes with the sharing of R&D personnel, facilities and information.

Thirdly, in terms of collection of R&D requirements, it is possible to establish the exchange platform which can get farmers’ demand for crop variety. According to farmers’ demands, seed enterprises can determine the R&D directions and provide new seed varieties meeting farmers’ need. The R&D risks will be reduced.

2) Influence analysis of “internet+” on seed industry’s production and marketing

Seed enterprises can understand the true need of farmers fully under the “internet+” context. Different seed varieties suitable for different areas can be determined based on the comprehensive analysis on soil properties, climate and soil resources. Based on this the targeted seed marketing can be carried out which can lead to achieve marketing refinement. At the same time, it is possible to collect the quantity demanded accurately so that seed enterprises can carry out seed breeding in a right amount reducing the seed backlog.

3) Influence analysis of “internet+” on seed industry’s service

Seed enterprises can provide customers with more diversified services promoting the transformational development under the “internet+” circumstance. Firstly, in terms of new varieties demonstration, technical training and so on, the online virtual training can be realized with the application of mobile internet and virtual reality technology. The training can improve customers’ acceptance of new need species. Secondly, based on the “internet+” thinking, it is possible to create an online integrated service platform for farmers providing all kinds of agricultural materials involving seeds, pesticides fertilizers and agricultural machinery. Thirdly, seed enterprises can provide online financial services for farmers with the application of online finance. Considering the agricultural activities’ seasonal characteristics and farmers’ financial needs in different season, the online financial service can provide funding timely. Fourthly, seed enterprises can establish mutual communication platform for farmers. With the application of the platform, farmers can exchange planting experience with each other easily. The recognition of the seed brand can be improved.
According to the above analysis, the influence of Internet+ on the seed industry’s value chain is summarized as Table 1.

| Links   | Specific influencing point                                                                 |
|---------|------------------------------------------------------------------------------------------|
| R&D     | • Gathering seed resource utilizing the big data and cloud computing techniques.           |
|         | • Collecting of R&D requirements utilizing network techniques.                             |
|         | • Joint R&D by building collaborative mechanisms.                                          |
| Production | • Understanding the true need of farmers fully under the “internet+” context.             |
|         | • Determining seed varieties suitable for different areas based on the comprehensive     |
|         |   analysis of soil properties, climate and soil resources.                                 |
| Marketing | • Carrying out the targeted seed marketing.                                               |
|         | • Collecting the quantity demanded accurately reducing the seed backlog.                  |
| Service  | • Online virtual training with the application of mobile internet and virtual reality      |
|         |   technology.                                                                             |
|         | • Creating an online integrated service platform for farmers.                              |
|         | • Providing online financial services for farmers with the application of online finance. |
|         | • Establishing mutual communication platform for farmers.                                  |

3.3. Suggestions for development of “Internet plus seed industry”

Based on the above analysis, we believe that the “internet+” strategy provides a rare opportunity for the traditional seed industry. The “internet+” makes it possible to further improve the seed industry’s quality and efficiency and to narrow the gap with the advanced seed industry in the world. The traditional seed industry should seek a breakthrough in the following three aspects under the “internet+” background.

Firstly, achieve the transformation and expand the value chain of the seed industry relying on the “internet+”. The traditional product-centric concept should change to the service-centric concept. Seed enterprises should not only produce and sell seed but also provide other integrated agricultural service. Taking seed products as the core, the seed enterprises should provide anti-pest training, one-stop service, demonstration of new varieties, agricultural advisory, new agricultural financial services and so on to expand the value chain.

Secondly, establish the seed industry alliance to integrate the seed industry’s value chain relying on the “internet+”. As known seed companies scatter in different parts of the value chain and the substitute propagation companies are in the majority leading to the weak competitiveness of the whole industry. Meanwhile there exists certain risk to implement the traditional horizontal integration or vertical integration. So, the germplasm resources sharing platform should be constructed by the national seed industry administrators to enrich the germplasm resources. The value chain alliance involving seed R&D, breeding, marketing and after-sale service can be built by the cooperation of seed enterprises with different operation patterns.

Thirdly, construct the new seed industry pattern and optimize the value chain relying on the “internet+”. With the development of the logistics industry and growth of mobile internet users, the O2O pattern has become a possibility for the seed industry. So, we can try to establish the new seed industry’s ecology involving seed enterprises, logistic enterprises, farmers, and government supervision departments. In the new ecology farmers can select the seeds, comment and communicate online while the seed enterprises can face their customers directly.

4. Conclusions

With the implementation of the “internet+” strategy, the pace of transformation and upgrading of traditional industries are gradually accelerated. Taking the seed industry as the research object, the paper firstly analysed the key features of “internet+”. The features are summarized as the following four aspects: comprehensive and timely information perception, fast and reliable information transmission, intelligent and efficient information processing and intuitive and safe information sharing. Then it analysed the structure of the seed industry’s value chain and gave a detailed analysis
on the influence of “internet+” on each link of the value chain including germplasm collections, R&D, production and marketing, after-sale services. Finally, the suggestions are given for the development of “internet+ seed industry”. The suggestions are as follows: expanding the seed industry by transformation development, integrating the value chain by establishing the seed industry alliance and optimizing the value chain by cultivating the new seed industry ecology.

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