

R&D-Marketing Integration and Performance—Evidence Provided by Agricultural Science and Technology Enterprises

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ABSTRACT

R&D-marketing integration is an important factor of technological innovation success. This study explores the relationships among R&D-marketing integration, business performance, and social performance in the context of Chinese agricultural science and technology enterprises. The findings suggest that the integration of R&D-marketing has a positive effect both on business performance and social performance, and that business performance serves as a mediator in the relationship between the integration of R&D-marketing and social performance. This study provides empirical evidence for the research in the relationships between the integration of R&D and enterprise performance and contributes to the policy-making on the technological innovation.

KEYWORDS

R&D-Marketing Integration; Business Performance; Social Performance; Agricultural Science and Technology Enterprises; Mediator

1. Introduction

Enterprises are facing increasingly severe challenges in this world because the global market competition is gradually intensifying; product life cycle continues to shorten, and consumer demand is increasingly personalized. Technological innovation, as an important source of the competitiveness of enterprises, is crucial to survive and develop. Many enterprises have noted the importance of the development of new products, and increase investment in R&D, production and marketing departments. However, because of the complexity of the technological innovation activities, a department alone is difficult to separately complete new product development, and improve the performance. Even if every department possesses adequate resources, it does not guarantee their optimal use. Thus, technological innovation involves not only the R&D department to develop new products and marketing department to sale products, but also R&D-marketing integration to establish an effective

communication and cooperation [1,2].

The literature has demonstrated that R&D-marketing integration is an important factor contributing to technological innovation success [3]. Teece [4] empirically found that R&D and marketing are interdependent in the process of innovation. Clark and Fujimoto [5] put forward that the cooperation between R&D and marketing is the key to the success of new product development. If enterprises develop new products without studying the market demand, the products would not likely meet the consumer demand. If marketing does not fully understand the R&D process and product characteristics, it is difficult to work out the marketing mix. Functional specialization of different departments leads to the issue of coordination among the departments [6]. For R&D and marketing as two teams, experience, knowledge, energy and other resources of each department, are limited. It requires integration advantages of “1 + 1 > 2” [7] to make these resources play a greater role [8,9]. When there are serious management problems in R&D-mar-

keting interface, 68% of the R&D projects will completely fail and 21% partially fail [10]. Thus, R&D-marketing integration is a key factor in the success of new products.

Numerous scholars and practical managers focus on R&D-marketing integration and enterprise performance. The managers believe that R&D-marketing integration could result in sharing resources, improving the ability to integrate resources, sharing innovation risk, accessing to new technologies, entering new markets, and improving enterprise performance [11]. The extensive literature also discusses the relationship between the R&D-marketing integration and performance, but the conclusions are not consistent. Most scholars believe that the R&D-marketing integration has a significantly positive effect on new product development performance [12,13]. However, not all of enterprises can equally benefit from R&D-marketing integration [14]. Excessive functional integration may have a negative impact on product innovation performance [15]. Inconsistent conclusions may result from a different enterprise background, or some differences of measurement of the R&D-marketing integration and performance. This requires further study of R&D-marketing integration and performance.

In addition, scholars tend to care about business performance when studying the relationship between the R&D-marketing integration and performance. With the changes in the conditions of production, the relationships between enterprises and stakeholders, such as government, customers, the environment and other external factors, are getting closer and closer. The traditional evaluation of performance is increasingly unable to meet the practical needs. Then scholars study non-financial performance [16], called corporate social performance. Corporate social performance is an important factor for sustainable development. Therefore, this study, when investigating impact of the R&D-marketing integration on performance, divides performance into two aspects: business performance and social performance.

The main objectives of this study are to examine the detailed effects of the integration of R&D and marketing on the business performance and social performance. The rest of the article is organized as follows: the next section is the research hypotheses. Next, the research method is presented, followed by the analysis and discussion of the findings. The final section offers the main conclusions and implications.

2. Literature Review and Hypotheses

2.1. R&D-Marketing Integration

After the 1990s, many scholars and enterprises focused on the integration of the organizational structure [17-20].

Specialized departments should be integrated to complete overall target because specialization alone is not sufficient for high performance [21]. Internal organizational integration is that different departments support and cooperate with each other, and involve in new product project in order to achieve the success of the new product development. R&D-marketing integration is a part of the internal organization. Therefore, this study is to explore the R&D-marketing integration in the new product development process in order to achieve goals.

Scholars investigated R&D-marketing integration from different perspectives. Some scholars concerned “quantity” aspects of R&D-marketing integration, such as interaction frequency [8,22]. Appropriate interaction frequency is necessary for integration, but it does not mean that their communication is effective. Then, in order to better measure the constructive cooperation and the degree of inherent team cooperation, some scholars selected the “quality” aspects of R&D-marketing integration. Song *et al.* [18] proposed that R&D-marketing integration should focus on the degree of interdependence and information sharing. Kahn [23] argued that R&D-marketing integration was more extensive cooperation, including the behavior and attitude aspects. The behavior aspect meant that the two departments worked together to share progress and resources. The attitude aspect was that the two departments understand each other to achieve collective goals. His interpretation of the R&D-marketing integration was more comprehensive. Leenders and Wierenga [14] divided R&D-marketing integration into three parts, communication, collaboration, and good relationships. In fact, communication and collaboration can be seen as the behavioral aspect and good relationships as the attitudes aspect. Their views about R&D-marketing integration are essentially consistent. We define integration as the degree to which there is collaboration, communication, and good relationships between marketing and R&D [14].

R&D-marketing integration as a complex concept should be multidimensional in empirical research. Leenders and Wierenga [14] measured R&D-marketing integration with three dimensions of communication, collaboration and cooperative relationships. The scales are widely used by later research [12,24]. Communication means that the two departments share information accurately, credibly and timely. Collaboration refers to participation of different functional departments in the new product development process. Cooperative relationships refers to the degree of maintain an effective collaborative link between the R&D department and the marketing department.

2.2. Performance

Performance is the generalization of efficient achieve-

ment and effectiveness that managers operate the enterprise [25]. Different studies use different definitions and measurements of performance based on its own research purposes. Performance in this study includes business performance and social performance.

The measurement of business performance is complex and diverse, including two types: one is based on objective measurement of financial indicators, such as turnover, profits and other financial indicators; another is subjective evaluation. The latter asks senior management to subjectively evaluate sales, market share growth, and profitability indicators, compared with the expected subjective evaluation [26-28], or compared with industry competitors [29,30]. Objective data is more objective and accurate, but it is not easy to obtain [31]. Then many scholars chose the subjective evaluation. Dess and Robinson [32] confirmed that objective data and subjective data were strongly correlated. If the reliability and validity of subjective scales meet the requirements, then the results are credible. This study use the subjective evaluation measurement compared with the industry average.

With the development of performance evaluation, scholars have noted that the enterprises are getting closer and closer to government, consumers, environment and other external stakeholders. The enterprises are concerned about the improvement of business performance, as well as external interests, namely the impact of enterprises on the environment and other aspects. The measurement of corporate social performance does not reach a consensus, but mostly have chosen subjective indicators. For example, He and Wang [33] suggested that we should give more consideration to the social impact of the management, such as whether to raise the income and living standards of producers, whether to cause serious pollution, and whether to raise the industry overall technical level. They used four dimensions of social responsibility, social sensitivity, social justice and quality of life to subjectively measure corporate social performance.

2.3. R&D-Marketing Integration and Business Performance

In an increasingly competitive environment, individual departments can no longer independently accomplish the task of new product development and increase business performance. Integration of departments, especially the R&D-marketing integration plays an increasingly important role in the success of new product development. Internal R&D-marketing integration includes sharing market and technical information, as well as involving the R&D process and the marketing process. The success of new products requires technical support and products for market need. Marketing department provides customer and market information [8]. R&D department deploys

resources to research and develop new products which have a competitive advantage. Information sharing and a high degree of trust help enterprises make a better strategic decision [34]. Creative staff in R&D and marketing departments collaborates to develop new ideas and produce more effective and flexible ideas [35]. Joint decision-making between R&D department and marketing department has more advantages than a single sector in data collection, information processing, and evaluation of program results and new solutions. The high degree of integration will improve product quality and shorten the development cycle of new products [18], thus speeding up innovation.

R&D-marketing integration included communication, collaboration, and cooperative relationships [14]. In communication aspect, R&D-marketing integration is more conducive to the use of the information [36]. Marketing and R&D share updated market information. R&D department can understand the needs of the market in the new product development. Products that meet market demand will increase market share and reduce new product market risk. Communication can promote the implementation of the marketing plan through information sharing. At the same time, R&D department and marketing department share technical information. Marketing department can understand the latest technology information and help enterprises to seek new growth point. In collaboration aspect, R&D and marketing work together in the R&D process. It can help R&D department more rapidly improve product quality and shorten the development process. Without participation of marketing department, enterprises may produce products that do not meet the needs of the market. It will lead to a waste of resources and enterprises may lose the opportunity to capture the market. In marketing activities, R&D department can help marketing department to develop marketing programs more according to the characteristics of the new product. It can help to promote the success of marketing programs to bring better income. Krohmer *et al.* [37] confirmed that marketing activities in the case of the R&D department involved has a more obvious positive influence on the performance. As for cooperative relationships, communication between members is conducive to the establishment and maintenance of good relationships. If a harmonious relationship exists, R&D and marketing have a better understanding of each other's point of view and the rationale behind positions on different decisions [38]. It prevents the conflict of R&D-marketing, improve the efficiency of the new product development and complete the team task.

Many literatures have confirmed that effective R&D-marketing integration is the main factors of new product success [11,19,38]. Many companies cash flow

will increase in the future because of new product success. R&D-marketing integration will result in more competitive advantages and increase the success rate of innovation [39]. Therefore, R&D-marketing integration has a positive effect on business performance. Based on the above analysis, we introduced the following hypothesis:

H1: R&D-marketing integration has a positive influence on business performance.

2.4. R&D-Marketing Integration and Social Performance

In the study of R&D-marketing integration and firm performance, little literature has discussed the social performance. Wind [40] studied cross-functional integration and mentioned that in marketing activities with R&D-marketing integration, existing or new products and services, not only meet the needs of current customers or new customers, but also improve their related interests, e.g. the customers' quality of life. While meet consumer demands, enterprises expand the existing market share and increase production and sales of current products. It will improve existing technical level of the industry, destroy the equilibrium of the original market, and generate a new growth point [40]. This shows that R&D-marketing integration will help improve productivity level and technical level. Additionally, in the research and development of new products process, enterprises should consider reducing the damage to the environment, which is the common pursuit of the parties of the government and consumers. Marketing department conveys this demand to R&D department, and help R&D department to create a new green product. R&D-marketing integration will finally achieve the purpose of the protection and improvement of the ecological environment. Therefore, R&D-marketing integration will improve the income level of the stakeholders, the level of productivity, technology level, and the protection and improvement of the ecological environment. This means it has a positive role in promoting the performance. Based on the above analysis, we propose a hypothesis:

H2: R&D-marketing integration has a positive influence on social performance.

2.5. Business Performance and Social Performance

Literature has widely discussed the relationship between business performance and social performance. There are a variety of different views. Some literatures believe that they are negatively correlated [41] or not significantly related [42]. Most literatures had verified the positive relationship between them [8,43-46].

Enterprises with better business performance will have

sufficient resources to undertake social responsibility more actively [47]. Enterprises could properly handle the relationship with external stakeholders to meet external stakeholders' demand, increase employee income relatively, and protect the consumers' living standards and environment. Uadiale and Fagbemi [45] confirmed that the higher business performance, the more attention the enterprise will pay to the long-term development and environmental management. In reality, those attaching more importance to the social responsibility are just enterprises with better business performance. Therefore, in addition to the R&D-marketing integration has a direct impact on the social performance, R&D-marketing integration possible have indirect effects to the social performance through the business performance. We put forward the hypothesis:

H3: Business performance has a positive influence on social performance.

3. Methods

3.1. The Context of Agricultural Science and Technology Enterprises

There are several reasons for taking agricultural science and technology enterprises as the object of this study. Firstly, agricultural science and technology enterprises have important roles in improving the agricultural productivity, promoting the rural development and increasing the farmers' incomes. Agriculture in China has an important role that is the basis of the development of national economy. The issues concerning agriculture, countryside and farmers are always the hot topics. Due to the particularity and the important roles of China's agricultural science and technology enterprises, the process of technological innovation is different from other high-tech enterprises. Some scholars have explored the problem of technological innovation of agricultural science and technology enterprises [48,49].

Secondly, compared to other agricultural enterprises, agricultural science and technology enterprises have stronger capability of technological innovation, and the degree of integration of R&D-marketing may be higher and different [22]. Agricultural science and technology enterprises mainly engage in the agricultural technological innovation and the related activities of industrialization, e.g., the development and application of new technologies about agriculture. The main purposes are to develop the high-tech agricultural products and realize the large-scale production by relying on their own R&D or introducing the foreign advanced research achievements [50]. The integration of R&D-marketing of agricultural science and technology enterprises may have some different findings.

Finally, social performance is an important factor in the performance evaluation of the agricultural science and technology enterprises. Agricultural science and technology enterprises not only pay attention to the output growth and the increased market share, but also attach more importance to the stakeholders, the government, farmers and the environment [51]. Thus it's reasonable to choose agricultural science and technology enterprises.

3.2. Measurement

We used existing scales as much as possible, adapted some existing scales from the literature, and modified scales according to the characteristics of agricultural science and technology enterprises.

The scales of R&D-marketing integration adapted the scale of Leenders and Wierenga [14], including three dimensions of communication, collaboration and cooperative relationships. Since the original scale was in English, and its research object was the pharmaceutical industry, repeated correction was made. First of all, we translated the original scale into Chinese, and then translated it back into English to ensure the accuracy. The preliminary scale was formed through this process. Then, the scales included three dimensions of communication, cooperative relationships and collaboration with 11 items, such as "The two departments can communicate relevant information honestly", "In order to complete the task of marketing (sales), the two departments will share resources".

The performance is divided into two dimensions: business performance and social performance. The business performance is reflected by items, such as growth in sales revenue, market share growth, and gross profit margin. Social performance items include the improvement of farmers' income, the improvement of agricultural productivity and agricultural technology. In this study, the respondents need to make the subjective evaluation according to the average level of the industry. It can not only avoid the drawbacks that the data is hard to get, but also ensure the accuracy of data. We used 3 and 3 items to measure the business and social performance respectively.

The measures used are the 7-point Likert-type scales with the anchors 1 = strongly disagree to 7 = strongly agree. The questionnaire is divided into two parts. The first part is the scale of R&D-marketing integration, business performance and social performance. The second part is the basic information of enterprises, including the name of the firm, the types of innovation, firm age and size. The types of innovation include the independent innovation, cooperative innovation and imitative innovation. The firm size is measured by the

number of employees. Based on the previous literature and the characteristics of agricultural science and technology enterprises, the initial scales were formed. According to suggestions of marketing experts and the managers of agricultural science and technology enterprises, the initial scales were appropriate modified and the final scales were formed.

3.3. Data Collection

It took us four months to gather data. These samples are mainly distributed in Guangdong, Guangxi, Zhejiang, Jiangsu, Fujian, *et al.* We mainly selected the face-to-face interviews and e-mail methods. The respondents mainly are medium and senior managements in R&D department or marketing department that are familiar with the contents of the investigation.

In this study, we collected 317 valid questionnaires. In the 317 samples, 60% of all the enterprises are small and medium-sized enterprises that have less than 200 employees. 77.6% of the samples are private enterprises. Nearly 60% of enterprises choose independent innovation and 33.4% of the enterprises select the mode of cooperative innovation. The remaining enterprises choose the imitative innovation. 34.1% of enterprises invest the relatively more R&D expenses that are more than 3% of the total sales revenue.

4. Results

4.1. Reliability and Validity

The SPSS17.0 statistical software was used to measure the reliability of scales. To establish the internal consistency of the measures, we computed Cronbach's alpha coefficients. **Table 1** is the coefficients of Cronbach's α . All the coefficients are higher than 0.70 that are the evaluation criteria.

This study used two ways to ensure content validity of scale. Firstly, the scales of R&D-marketing integration and enterprise performance came from the published literature that many scholars have used. Secondly, all the

Table 1. Results of the reliability analysis.

	Number of items	Cronbach's α
R&D-marketing integration	11	0.959
Communication	3	0.912
Cooperative relationships	5	0.943
Collaboration	3	0.905
Business performance	3	0.834
Social performance	3	0.884

scales have been reviewed by marketing experts and the senior management of agricultural science and technology enterprises.

This study used the structural equation modeling (SEM) and AMOS 7.0 software to carry out the confirmatory factor analysis that can further verify the validity of scales. The measurement model provides a reasonable fit to the data ($\chi^2 = 273.250$, $df = 113$, $GFI = 0.909$, $CFI = 0.967$, $TLI = 0.960$, $RMSEA = 0.067$). GFI , CFI and TLI all exceed the recommended threshold level of 0.90. The $RMSEA$ is below 0.08 which is acceptable levels. The fit indexes are within the acceptable range. **Table 2** shows the results of the confirmatory factor analysis. Except the item of the improvement of agricultural technology, the factor loadings of all the items are more than 0.50. And the T values are more than 2 (see **Table 3**). The average extracted (AVE) is also more than 0.50. Based on the analysis above, the scales all had satisfactory reliability and validity.

4.2. Descriptive Statistics

Table 4 shows descriptive statistics on the three dimensions of the R&D-marketing integration, in which each dimension data was measured as the mean of the question items. The means of three dimensions are between 5 and 6, namely between “good and “relatively good” in the above the average level, which shows that R&D-marketing integration can be improved in the future. On the other hand, by comparing the data of three dimensions, the mean of communication is the lowest, and the variance is the highest, which indicated that the enterprise integration is relatively poor in communication, and data is much different.

4.3. The Results of SEM

The study uses structural equation modeling (SEM) to test the hypotheses. **Figure 1** shows the proposed struc-

tural model. The fit of the model is satisfactory ($\chi^2 = 273.250$, $df = 113$; $GFI = 0.909$; $RMSEA = 0.067$; $CFI = 0.967$; $TLI = 0.960$; $IFI = 0.967$). The test and the results of the model data is shown in **Table 2**. It also indicates that there is a significant relationship between R&D-marketing integration and performance in agricultural science and technology enterprises.

Estimated parameter $\beta_1 = 0.541$, $p < 0.01$ supports hypothesis H1, which proves the positive effect of R&D-marketing integration on business performance. It indicates that the higher the degree of R&D-marketing integration, the better business performance, which is consistent with the generally accepted view [18,38]. R&D-marketing integration is a key factor in the improvement of business performance. On one hand, market information can be transferred to the R&D department through R&D-marketing integration, which makes enterprises to quickly produce and supply products or services to meet consumer demand, thereby enhancing business performance. On the other hand, technical information can be conveyed to the marketing department through R&D-marketing integration, which makes enterprises to highlight the core technology in marketing programs to distinguish with the existed market products, and increase revenue. In addition, the marketing department can help R&D department look for new application method of technology, so as to shorten the development cycle, save development costs, and increase business performance relatively.

The results also provide evidence to support hypothesis H2. The estimated parameter $\beta_2 = 0.223$, $p < 0.01$ shows that R&D-marketing integration has a positive influence on social performance. It shows that the higher degree of R&D-marketing integration, the better social performance. The marketing department transfers not only the market demand to the R&D department, but also enterprise’s social responsibility requirements of outside. R&D and marketing department supervise each other,

Table 2. Results of the SEM.

Path	Hypothesis	Standardized parameter estimates		
		Parameter	Estimated value	t-value
Integration → Business performance	H ₁	β_1	0.541	8.751***
Integration → Social performance	H ₂	β_2	0.223	3.819***
Business → Social performance	H ₃	β_3	0.608	8.599***
Second-order				
Integration → Communication			0.890	--- ^a
Integration → Cooperative relationships			0.905	17.041***
Integrated → Collaboration			0.936	17.142***

*** Correlation is significant at the 0.001 level. ^aFixed parameter.

Table 3. Results of confirmatory factor analysis.

Constructs	Items	Code name	Factor loadings	T value	AVE
R&D-marketing integration					
Communication	The two departments can communicate information honestly	V1	0.952	--	0.789
	The two departments can honestly share their insights	V2	0.928	30.825 ^{***}	
	In order to complete the task, the two departments will share resources	V3	0.775	19.375 ^{***}	
Cooperative relationships	The relationship between the two departments is friendly	V4	0.875	--	0.769
	The relationship between the two departments is more like a team instead of competitors	V5	0.896	23.020 ^{***}	
	When two departments have some disagreement, they usually able to discuss for solutions	V6	0.894	22.898 ^{***}	
	Contentious issue between the two departments are constructive	V7	0.844	20.366 ^{***}	
	The two departments always trust each other and professional skills	V8	0.874	21.828 ^{***}	
Collaboration	The two departments will work to seek a mutually satisfactory solution	V9	0.864	--	0.765
	The two departments will help each other in order to complete the task more effectively	V10	0.934	23.343 ^{***}	
	The two departments will consult together to solve the problems faced by any department	V11	0.822	18.709 ^{***}	
Business performance	Growth in sales revenue	V12	0.840	--	0.631
	Market share growth	V13	0.830	15.692 ^{***}	
	Gross profit margin	V14	0.706	13.159 ^{***}	
Social performance	The improvement of farmers' income	V15	0.734	--	0.739
	The improvement of agricultural productivity	V16	0.930	16.421 ^{***}	
	The improvement of agricultural technology	V17	0.902	16.104 ^{***}	

Note: ^{***}the level of significance is less than 0.001 (P < 0.001).

Table 4. Results of descriptive statistics.

	N	minimum value	maximum value	mean	standard deviation	variance
Communication	317	1.67	7	5.41	1.19	1.43
Cooperative relationships	317	2.25	7	5.68	1.01	1.03
Collaboration	317	1.00	7	5.55	1.12	1.25

and work together to produce products which meet the market demand.

Estimated parameter $\beta_3 = 0.608$, $p < 0.01$ supports hypothesis H3, which shows that business performance has a positive impact on social performance. The business performance can be seen as a mediating variable between integration and social performance. This argument is consistent with most scholars that business performance and social performance has a positive correlation

[43-46,52]. This study also verifies a mediating role of business performance between R&D-marketing integration and social performance. And R&D-marketing integration affects social performance through business performance. Moreover, the indirect effect of R&D-marketing integration on social performance is greater than the direct effect, which indicates that R&D-marketing integration improve social performance mainly by improving business performance.

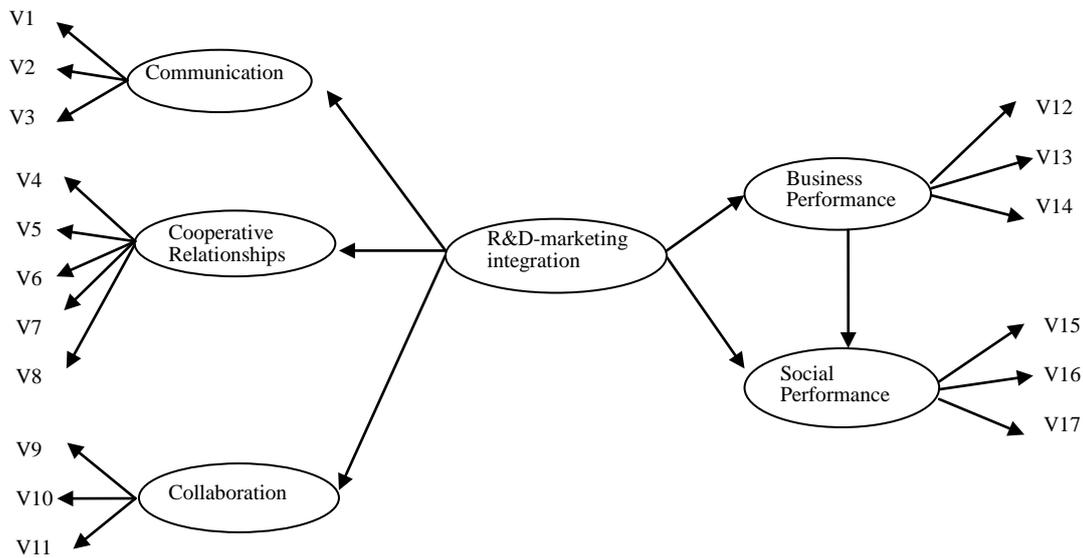


Figure 1. Structural equation model of R&D - marketing integration, business performance and social performance.

5. Discussions

5.1. Impact of R&D-Marketing Integration on Business Performance

Results show that R&D-marketing integration has a positive impact on business performance. We analyze the reasons for that from three aspects: communication, cooperative relationships and collaboration [14].

In communication aspect, R&D-marketing integration is more conducive to the use of the information [36]. Through integration, marketing and R&D department share updated market information. R&D department can take the needs of clients into consideration during development and produce the viable products, thus increasing market share and reduce the market risk of new product. What's more, communication can promote the implementation of the marketing plan through information sharing. R&D and marketing department share technical information as well. Marketing department can know the newly technology and help enterprises to seek new growth point. As for cooperative relationships, communication between members contributes to the establishment and maintenance of good relationships. With a harmonious relationship, R&D and marketing department can have a better understanding of each other and it is effective to reduce conflicts, improve efficiency and complete new product development smoothly. The managers believe that R&D-marketing integration can bring resources sharing and integration of resources, which can help the enterprise access new technologies, enter new markets, and improve performance. Collaboration means R&D and marketing department work together in the process of new products research and development. It

helps R&D department improve the products' quality and simplify the development process. Without participation of marketing department, enterprises may produce products that do not meet the needs of market, which leads to a waste of resources and a missed opportunity to capture the market. In marketing activities, R&D department can help marketing department to develop marketing plans according to the characteristics of the new product. It is important factor for successful implementation of marketing plans and profit improvement.

In general, for agricultural science and technology enterprises, R&D-marketing integration helps a lot informing competitive capability and improving business performance.

5.2. Impact of R&D-Marketing Integration on Social Performance

Our results show that R&D-marketing integration has a significant effect on social performance. The new products can bring about notable results in expanding the range of products and increasing the technical level of the industry. Therefore the marketing competition pattern will be changed. And enterprises can get new chances to develop well [40]. Additionally, what marketing department transfers to R&D department is not only market information, but also social responsibility requirements of enterprises. For instance, enterprises should decrease damage and pollution for the environment in the process of research and development, which has been drawing much attention from consumers and governments. R&D and marketing department supervise each other, and work together to produce green products. Through R&D-marketing integration, development of enterprises can be

better coordinative and united with the protection and improvement of ecological environment. Thus, for agricultural science and technology enterprises, R&D-marketing integration is beneficial for superior social performance.

5.3. Impact of Business Performance on Social Performance

The results also show that business performance has important influences on social performance. High business performance is the foundation of enhancing social performance. The agricultural science and technology enterprises, which play an important role in agricultural development, take on the great social responsibility. The development of agricultural science and technology enterprises helps solve the employment problem of China's rural areas, increase the income of farmers, improve agricultural productivity. Enterprises with superior economic strength are more likely to buy equipments for sewage treatment, pay more attention to environment protection and devote to the development of the surrounding rural areas. They may successfully handle the relationship with external stakeholders, relatively increase the income of employees, and enhance the consumers' living standards. So the premise of the development of social performance is the business performance. This study also verifies a mediating role of business performance between R&D-marketing integration and social performance. The effect of R&D-marketing integration on social performance was partially mediated by business performance.

6. Conclusions

This study explores the relationship of R&D-marketing integration, business performance and social performance. And it collected data of 317 agricultural science and technology enterprises to test the hypothesis. The empirical results show that: 1) R&D-marketing integration has the positive effects on business performance and social performance. 2) The business performance positively impacts the social performance.

Our results have several implications for managers in marketing strategy and development, and for the government who makes the policy for enterprise technological innovation. Suggestions are as following.

Firstly, the R&D-marketing integration should be further improved. This study finds that, most enterprises realize the importance of R&D-marketing integration, but they don't do it well. Enterprises should further encourage information sharing among departments, a harmonious and friendly relationship and collaboration to complete a common goal. For example, enterprises can build a good communication platform, asking the two

departments to share their own information with each other at times, and informing each other for the work progress and difficulties encountered in order to solve the problem faster and better.

Secondly, the government must exert the function to ensure social performance of agricultural science and technology enterprises by taking the social performance into evaluation system. Social performance should be considered when estimating the outcome of agricultural science and technology enterprises. At the same time, governments at all levels should enhance the propaganda to make the enterprise managers understand the importance of social performance, so that they can take the maximum overall profit as a target, but not their own maximum interest.

Thirdly, higher business performance is the important precondition for enterprises to undertake social responsibilities. Through this study, we proved that agricultural science and technology enterprises with good business performance will boost social performance. Government should also help enterprises to achieve higher business performance. If enterprises pay more attention to social performance, it is bound to generate more revenue in the long term, but in the short term it will lose some economic benefit. It is difficult to encourage majority of agricultural science and technology enterprises to give up some economic benefit to obtain social performance at present. Therefore, government may establish special fund to inspire them.

7. Limitations and Directions for Future Research

In the end, defects and shortcomings of this study are summarized on the basis of study conclusion, and moreover, we present a prospect on the study of this field for the future. The samples used were derived from an industry, so there are some limitations. The relationship between R&D-marketing integration and enterprise performance can be studied in different industries and with more samples.

At present, few academic researches on the effect of the R&D-marketing integration on social performance were made. The study preliminarily analyzes this issue. Further research is needed to investigate it deeply. Furthermore, researchers can explore whether there are some moderating variables, e.g. technological innovation mode, and study the relationship between R&D-marketing integration with performance under different levels of moderating variables.

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