Study on Evaluation Indicators of Agricultural Science and Technology Project Based on the Perspective of Innovation——Case in Basic Research Project

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Abstract Firstly, the related theories about agricultural science and technology innovation and project approval evaluation are combed and summarized. By combining application and finish books of science and technology support plan project in agricultural field of Ministry of Science and Technology with stronger innovation, case analysis and expert interview are conducted. Evaluation indexes of agricultural science and technology project based on innovation value are proposed initially, and there are 50 initial indexes. After that, via focus group talk, qualitative research is conducted to further adjust innovative evaluation indexes, and 50 initial indexes are deleted to 41. The importance of the 41 indexes is scored by the experts, and index screening and classification are conducted by verification factor analysis in structural equation model. It not only obtains index classification but also finds action mechanism among innovation demand, innovation mode, research thinking, treatment method of difficulty, and predicted risk. The research could straighten up ideas of project review experts in agricultural field and provide reference for applicant designing project.

Key words Innovation perspective, Application and development type of project, Evaluation index

1 Introduction

National science and technology plan project in agricultural field is one of basic organization forms of China's government implementing science and technology research in whole country, and is an important manner of realizing rational allocation of agricultural science and technology resources. It is worthy to follow how to promote larger breakthrough of agricultural science and technology innovation by depending on science and technology plan projects. Although science and technology projects at various grades and classes subsidized by government all emphasize innovation degree, namely innovation value, there are fewer researches about evaluation theory and method of innovation degree of the project, and an index system not only containing basic project approval requirements but also considering the evaluation of innovation degree is not formed. Therefore, in project approval evaluation process, it is especially necessary to improve science and justice of project approval by establishing objective, scientific, feasible and innovative evaluation indexes based on peer review system. In this paper, basic research project is taken as the case. This kind of project reveals general rule of nature development, and its value guide mainly shows at scientific value aspect, and original innovative result is generally taken as evaluation standard of the project, such as new finding, new concept, new theory and new method.

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2 Initial establishment of evaluation index on innovation of agricultural science and technology project

Research steps are as below. At the first stage, the factors which have been demonstrated in the related literatures and affect the innovation of science and technology project are summarized, thereby forming many initial influencing factors. At the second stage, 3 cases are studied to verify the science and rationality of indexes in basic scale table, and it also checks if there exists missing variables. Case research results show that major factors in typical project innovation process have been covered in initial indexes. At the third stage, focus group interview is conducted. On the one hand, the opinions of review expert and project leader for the supposed scale table are consulted. On the other hand, influencing factors of innovation are consulted according to the projects involved by review experts. At the fourth stage, test questionnaires are issued to review experts and project leaders which are interviewed in prior period, and initial test of scale table reliability is conducted. In this paper, the related theories about agricultural science and technology innovation and project approval evaluation are combed and summarized. By combining application and finish books of science and technology support plan project in agricultural field of Ministry of Science and Technology with stronger innovation, case analysis and expert interview are conducted, and evaluation indexes of agricultural science and technology project based on innovation are proposed initially. Case analysis process is designed as below: research design, preparation of data collection, data collection and data analysis, and 50 initial indexes are

obtained[1-7]. After that, via focus group discussion, qualitative research is conducted to further adjust innovative evaluation index factors, and 50 initial indexes are deleted to 41 (Table 1).

Table 1 Indexes of innovation degree of agricultural science and technology project (initial selection)

Factors	Corresponding category	Specific description
Innovation demand of the project	1 Social (industry) innovation demand of the project	Improving production efficiency of agricultural industry; having an important significance for social development
	2 Subject innovation demand of the project	Promoting the development of subject; if conducive to the development of cross subject
	3 National innovation demand of the project	Corresponding with national strategy target, and meeting national key demand
Innovation mode of the project	4 Original innovation of the project	Promoting new discoveries of frontiers of science and engineering related to knowledge innovation and social service
	5 Integrated innovation of the project	Using information, management and tool, *etc.* to select and integrate each innovation factor, thereby forming organic whole of advantage complementation
	6 Introduction, digestion, absorption and re-innovation in the project	Using various introduced technology resources to complete key innovation on the basis of digestion and absorption
Research idea design of the project	7 The comprehensiveness of theory	Sufficiently embodying comprehensive and in-depth grasping of the theory in the research field, especially the biological features of agricultural innovation objective
	8 Grasping of research frontiers at home and abroad	Overall grasp of applicant on theory and practice in the related field at home and abroad
	9 Scientific research form of the project	Corresponding with general rule, basic method and technical means of the research in related agricultural field, especially scientific attempt of nature and biological rules
	10 Design of research idea of the project	Science and rationality of research idea design in the project, containing the control of predicted risk
	11 Description of project innovation point	Identification of key problem, grasping of variable factor, proposing of scientific problem and breakthrough of key technology
Innovation feature in agricultural field	12 Treatment method of the project difficulty	Science and availability of treatment of control variables which may appear in agricultural field, such as climate, area and life cycle
	13 Multidisciplinary integration of project	Embodying the treatment of cross subject and professional integration in agricultural field and other related industries in the project
	14 Referring to research experience in other fields	Introducing innovation thinking, method and tool of other fields
Grasping of innovation method	15 Creating new scientific thinking in the project	The thinking and channel used in agricultural science research and development
	16 Creating new scientific method in the project	The manner and method used in agricultural science research and development
	17 Creating new scientific tool in the project	The facilities and devices used in agricultural science research and development
Project input	18 Personnel input of the project	The situations of personnel accepting TRIZ systemic training or obtaining significant innovation results
	19 Innovation resource input of the project	The situation of fund used for buying innovation device and tool in the project
	20 Establishing of project innovation group	Project group constitution embodying subject integration
	21 Time input of the project	Having sufficient time to engage in research and experiment of the project
Predicted output of the project	22 Knowledge output of the project	Quantitative output of the expected publications and papers issue of the project and learning and interaction among agricultural innovation subjects, to realize knowledge flow in the innovative system
	23 Technology output of the project	Expected patent application number of the project and new agricultural product and process, thereby inputting in the production
	24 Output of project technology standard	Establishing a kind of new agricultural production system, namely a kind of a new combination of realizing agricultural production factor and condition, and introducing the combination into specific agricultural production system of the project
	25 Talent culture of the project	Relying on the project to complete agricultural doctor and master's theses and cultivate innovative talent
	26 Expected output and risk of the project	Having scientific assessment on project risk, and taking effective methods to decline risk
Predicted production efficiency of the project	27 Promotion effect of the project on agricultural science research	The effect of promoting and pushing agricultural science research

(to be continued)

(continued)

Factors	Corresponding category	Specific description
	28 Demonstration promotion effect of the project	Pilot demonstration effect of the project in industry, for application basis and application development projects, except non-physical and chemical technology, the feasibility of other technology pilot, demonstration or technology integration and industrialization development
	29 Expected economic benefit of the project	The impacts of project application and promotion on improving production efficiency of industry and competitive strength of agricultural product and brought sustainable benefit
	30 Expected social benefit of the project	Project application and promotion improving farmer's production and living levels, increasing the quality of agricultural product, improving or protecting environment, and its sustainability
Innovation ability of applicant	31 Knowledge completion of applicant	Having systemic professional knowledge, and comprehensively using available knowledge, skills and methods
	32 Academic background of applicant	Applicant's profession is consistent with research direction
	33 Academic level of applicant	Obtained related landmark achievements recently
	34 Academic impact of applicant	The impacts of obtained results on theory and practice of the academic profession
	35 Innovation spirit of the applicant	It could be seen that applicant has courage and wisdom of innovation from project design
Innovation environment of the applicant agency	36 Innovation resource of applicant institution	If applicant's unit is national science and technology innovation group, national key laboratory and research center, *etc.*
	37 Device input of applicant institution	Fund input of applicant institution in new device and tool
	38 Industry university research cooperation of applicant institution	Cooperation among enterprise, farmer, cooperative, agricultural promotion department, scientific research institute and university
	39 Innovation excitation of applicant institution	Coupling degree between income and efficiency of scientific research personnel
Innovation environment of the region	40 Comprehensive competitive strength of applicant region	Agricultural (related industry) production, market and technology competitive strength
	41 Innovative resource of applicant region	Firstly should have resource endowment meeting project research, using regional resources

3 Screening of innovative indexes of agricultural science and technology project based on questionnaire investigation

In this paper, the used scoring manner of expert scoring scale table is seven-grade Likert scale, which uses 7 grades to score from index's importance by the experts, and they are not necessary, very not important, little important, generally important, important, very important and most important (1, 2, 3, 4, 5, 6 and 7 scores). The interviewed expert and questionnaire object cover rural center management personnel of Ministry of Science and Technology, rural center review expert of Ministry of Science and Technology, theory and practice experts in domestic agricultural field, senior project manager and leader of the enterprise involving agriculture. Firstly, investigation unit is determined, and then the contacting personnel of investigation unit are determined, and then questionnaire is issued in the form of electronic edition. Investigation units mainly include university involving agriculture, enterprise of scientific research institute, and promotion department directly under the government. There are 207 questionnaires in total, and 193 questionnaires are recovered, with recovery rate of 93.2%. In effective questionnaire, there are 88 persons from university, accounting for 45.5%; 48 persons from scientific research institution, accounting for 24.9%; 41 persons from enterprise (state owned business, private business and joint venture), accounting for 21.2%; 16 persons from promotion department directly under the government, accounting for 8.3%. The distribution basically corresponds with that of project review expert's unit property. Seen from age structure, there are 5 persons between 35 – 40 years old, accounting for 2.6%; 30 persons between 41 – 45 years old, accounting for 15.2%; 104 persons between 46 – 50 years old, accounting for 53.9%; 33 persons between 51 – 55 years old, accounting for 17.1%; 18 persons between 56 – 60 years old, accounting for 9.3%; 4 persons above 60 years old, accounting for 2.1%, and the distribution is rational. The situation of each evaluation index of basic research project in the questionnaire is shown as Table 2.

4 Index classification and screening based on structural equation model

On the basis of theory carding, case research and expert interview, evaluation indexes on innovation of agricultural science and technology project are proposed initially, which are verified via questionnaire. Verification factor analysis overcomes the drawbacks of exploration factor analysis that hypothesis condition constraint is strong, and result may not correspond with theory and practice[8]. In this paper, multi-adjustment of initial models of three kinds of projects is conducted, which aims to obtain ideal fitting index and rational index relationship. Model modification method could be tested by fitting degree of the improved model output by AMOS software, including fitting index χ^2, fitting goodness (GFI), comparative fitting (CFI) and estimated root mean square error (RMSEA). Under general condition, it needs referring to these fitting indexes to test if a model is rational. The values of GFI and CFI should be between 0 – 1, if the value is more than 0.85, it is thought that the model fitting is better. In addition, RMSEA is the most important reference index of verification factor analysis in

structural equation model, and is approximate root mean square error. When RMSEA is lower than 0.1, it shows that the model fitting is better. When RMSEA is lower than 0.05, it shows that the model fitting is very good[9]. The verification factor analysis of collected effective questionnaires is conducted, and model construction and adjustment situations are as below.

Table 2 Descriptive statistics of index importance questionnaire

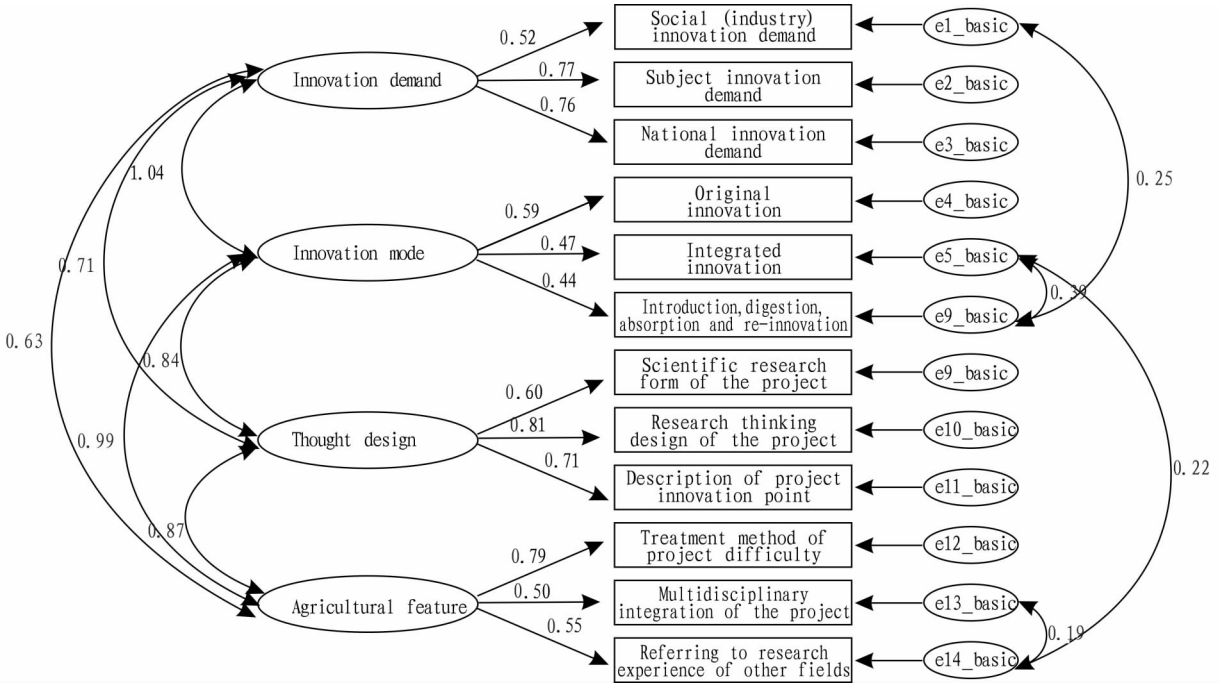
Application basic project	Sample number	Minimum	Maximum	Mean	Standard deviation
1 Social (industry) innovation demand of the project	192	1	7	5.38	1.20
2 Subject innovation demand of the project	192	2	7	5.70	1.16
3 National innovation demand of the project	191	1	7	5.72	1.31
4 Original innovation of the project	191	3	7	5.88	1.10
5 Integrated innovation of the project	185	1	7	4.94	1.27
6 Introduction, digestion, absorption and re-innovation in the project	173	1	7	4.97	1.39
7 The comprehensiveness of theory	191	1	7	5.70	1.17
8 Grasping of research frontier at home and abroad	191	2	7	5.80	1.07
9 Scientific research form of the project	192	1	7	5.63	1.19
10 Design of research idea of the project	187	2	7	5.93	1.13
11 Description of project innovation point	193	1	7	5.51	1.06
12 Treatment method of the project difficulty	185	1	7	5.38	1.19
13 Multidisciplinary integration of project	186	2	7	5.26	1.05
14 Referring to research experience in other fields	193	2	7	5.25	0.96
15 Creating new scientific thinking in the project	191	2	7	5.75	1.09
16 Creating new scientific method in the project	191	1	7	5.57	1.15
17 Creating new scientific tool in the project	193	1	7	5.25	1.21
18 Personnel input of the project	183	1	7	5.14	1.25
19 Innovation resource input of the project	183	2	7	5.22	1.16
20 Establishing of project innovation group	186	2	7	5.71	0.96
21 Time input of the project	186	3	7	5.75	0.95
22 Knowledge output of the project	187	2	7	5.64	1.17
23 Technology output of the project	187	1	7	5.13	1.41
24 Technology standard output of the project	193	1	7	4.80	1.42
25 Talent culture of the project	187	1	7	5.41	1.19
26 Expected output and risk of the project	190	1	7	4.90	1.28
27 Promotion effect of the project on agricultural science research	192	3	7	5.60	0.97
28 Demonstration promotion effect of the project	166	1	7	4.75	1.33
29 Expected economic benefit of the project	184	1	7	4.56	1.40
30 Expected social benefit of the project	179	1	7	4.88	1.21
31 Knowledge completion of applicant	190	2	7	5.78	0.93
32 Academic background of applicant	189	1	7	5.53	1.18
33 Academic level of applicant	185	1	7	5.49	1.19
34 Academic impact of applicant	191	1	7	5.35	1.14
35 Innovation spirit of the applicant	190	1	7	5.75	1.15
36 Innovation resource of applicant institution	190	1	7	5.23	1.23
37 Device input of applicant institution	187	1	7	5.13	1.25
38 Industry university research cooperation of applicant institution	189	1	7	5.04	1.22
39 Innovation excitation of applicant institution	190	2	7	5.54	1.13
40 Comprehensive agricultural competitive strength of applicant region	189	1	7	5.06	1.31
41 Innovative resource of applicant region	189	2	7	5.07	1.00

4.1 Innovation demand, innovation mode, research thinking design and innovation features of agricultural field Fig. 1 is original model of innovation demand, innovation mode, research thinking design and agricultural feature.

It is unobvious to list agricultural features singly, in which treatment method of project difficulty is merged into thinking design. Multidisciplinary integration of project is related to referring to research experience of other fields and innovation mode, and agricultural feature index is deleted (Fig. 2).

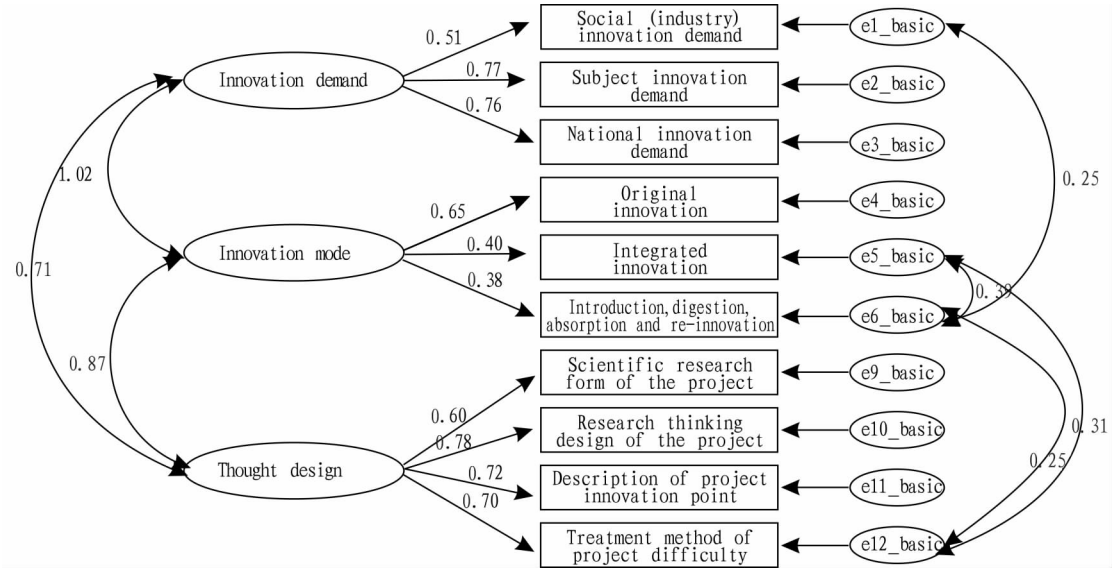
Combining the features of application basic project, integrated innovation and introduction, digestion, absorption and re-innovation are merged. For the project, it should actively encourage original innovation, and consider integrated innovation or introduction, absorption, digestion and re-innovation. Seen from Fig. 3,

via merging integration innovation and digestion, absorption and re-innovation, correlation relationship in factor structure is improved obviously.



Note: Statistical amounts: $\chi^2 = 87.773$, df = 44, GFI = 0.916, TLI = 0.891, CFI = 0.927, RMSEA = 0.083.

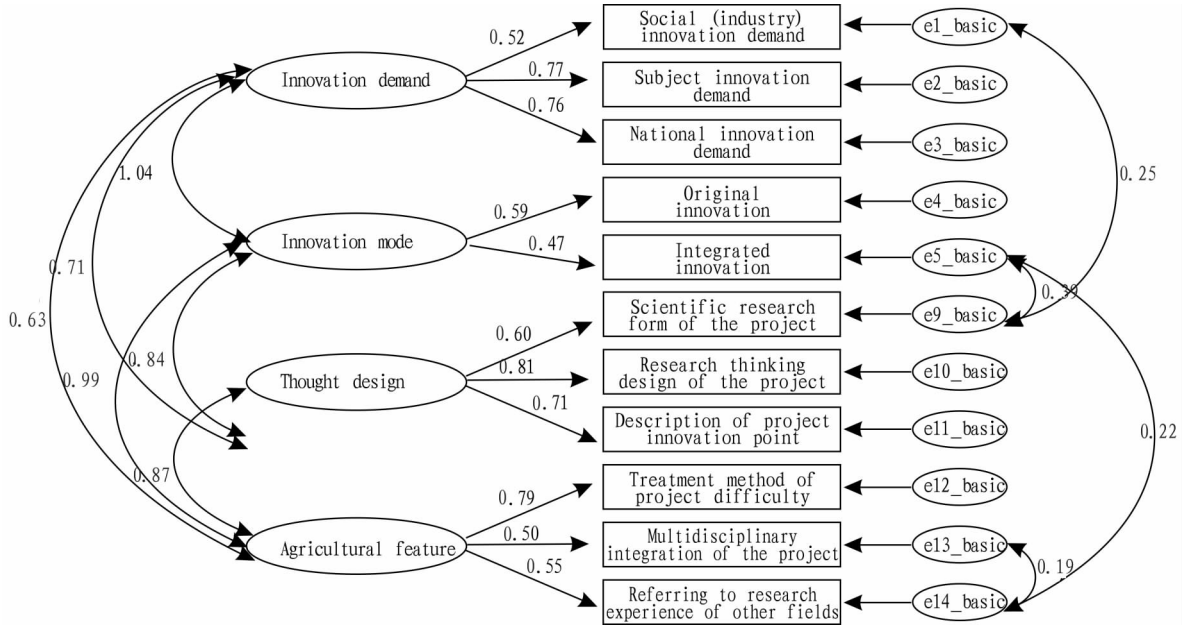
Fig. 1 Original model of innovation demand, innovation mode, research thinking design and agricultural feature



Note: Statistical amounts: $\chi^2 = 54.922$, df = 28, GFI = 0.935, TLI = 0.915, CFI = 0.947, RMSEA = 0.081.

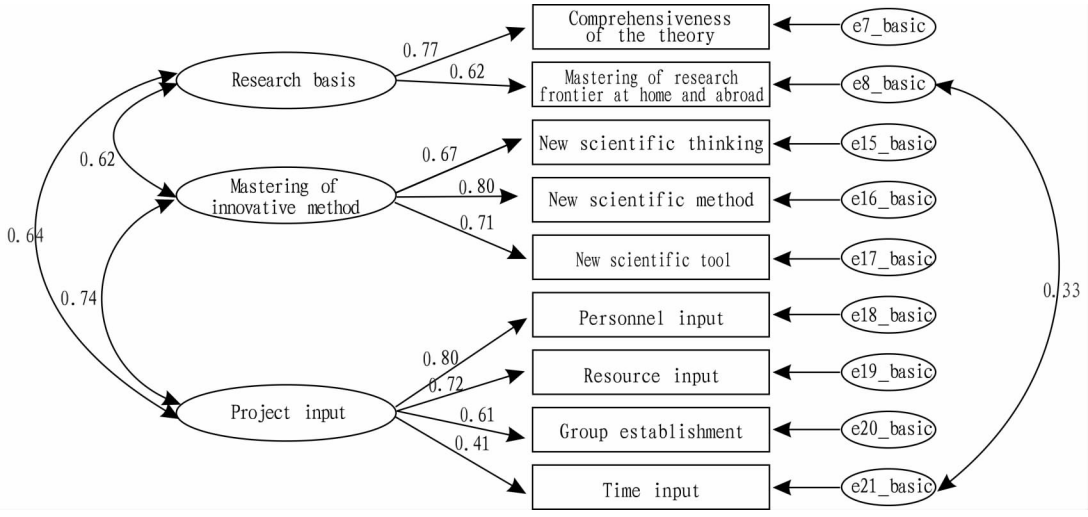
Fig. 2 The model deleting agricultural innovation feature and merging treatment method of project difficulty into thinking design

4.2 Research basis, grasp of innovation method and project input Initial model of research basis, innovation method's grasping and project input is shown as Fig. 4. Whether factor structure or correlation relationship, the index is better. Seen from Fig. 4, "research basis – grasping of research frontier at home and abroad" in application book has residual correlation with "project input – time input". It could be understood that project group which grasps well research frontier at home and abroad may spend more time and experience in project application, and may spend more time in project after project approval. Correlation between two items will be embodied in application development project.



Note: Statistical amounts: $\chi^2 = 74.356$, df = 36, GFI = 0.923, TLI = 0.890, CFI = 0.928, RMSEA = 0.085.

Fig. 3 The model of merging integration innovation and digestion, absorption and re-innovation



Note: Statistical amounts: $\chi^2 = 42.102$, df = 23, GFI = 0.938, TLI = 0.927, CFI = 0.954, RMSEA = 0.075.

Fig. 4 Initial model of research basis, innovation method's grasping and project input

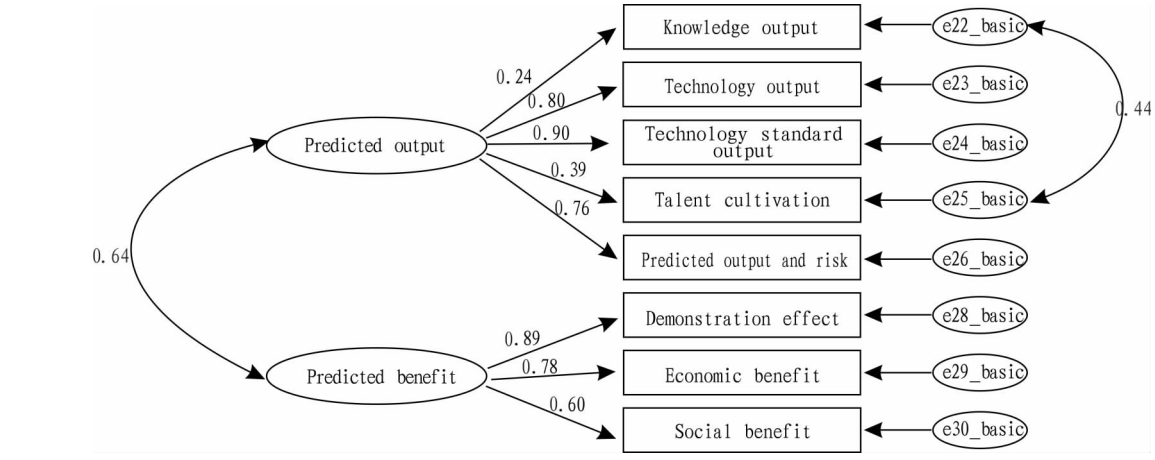
4.3 Predicted output and predicted benefit Seen from Fig. 5, when RMSEA is more than 0.1, model fitting is not good, especially that correlation coefficients between knowledge output, talent culture and predicted output are respectively 0.24 and 0.39. Seen from statistics, when it is weak correlation, it could consider deleting the two factors in the model, but scoring means of the two indexes are respectively 5.64 and 5.13, illustrating that the two indexes are important. That is to say, the two indexes need re-classification. In addition, there exists correlation of multiple factors in the model, which needs adjustment of the model.

Seen from Fig. 6, knowledge output and talent culture are isolated to be a class, which is named as "thesis and talent culture". It is found that although model fitting index is improved somewhat, correlation relationship among factors still exists. Considering that "predicted benefit-promotion of the project on science research" is related to other items, and its correlation coefficient with expected benefit is only 0.18, the index is deleted. Meanwhile, "expected output and risk" is also adjusted, which is merged into "thinking design" (Fig. 7).

4.4 Innovation ability of applicant The original model of innovation ability is shown as Fig. 8.

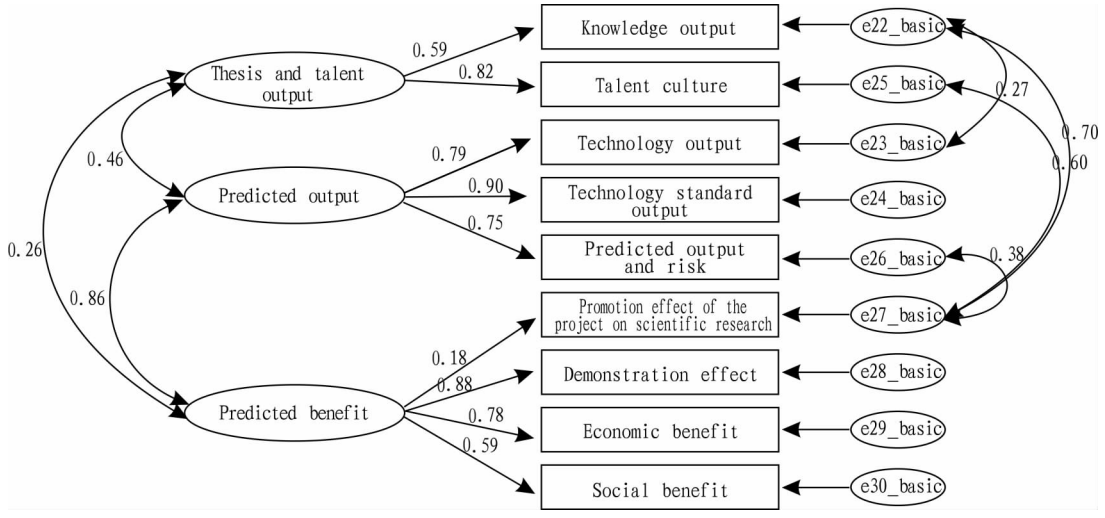
"Academic background" is highly related to "academic influence". By comparing correlation coefficients between the two indexes and upper index of "innovation ability", academic background is deleted, and structure adjustment of innovation ability model is conducted (Fig. 9). It is clear that the model has very good fitting

effect via adjustment, and there does not have residual correlation among indexes.



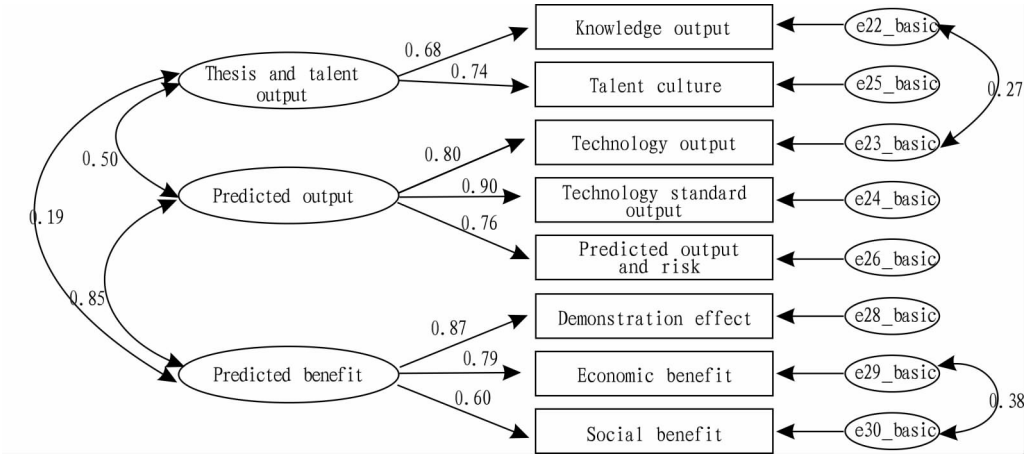
Note: Statistical amounts: $\chi^2 = 45.715$, df = 16, GFI = 0.931, TLI = 0.912, CFI = 0.950, RMSEA = 0.113.

Fig. 5 Initial model of predicted output and predicted benefit



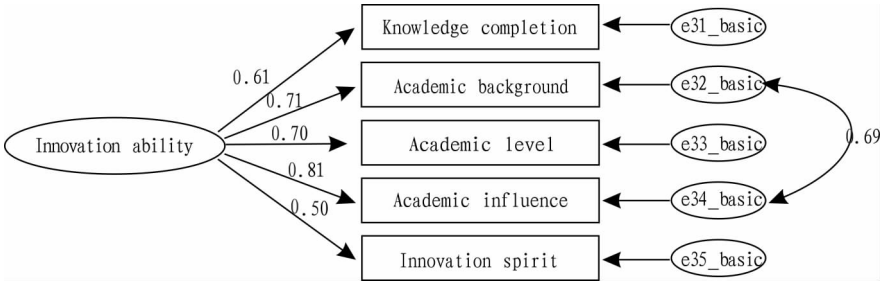
Note: Statistical amounts: $\chi^2 = 45.382$, df = 19, GFI = 0.937, TLI = 0.927, CFI = 0.961, RMSEA = 0.098.

Fig. 6 The model of merging knowledge output and talent culture



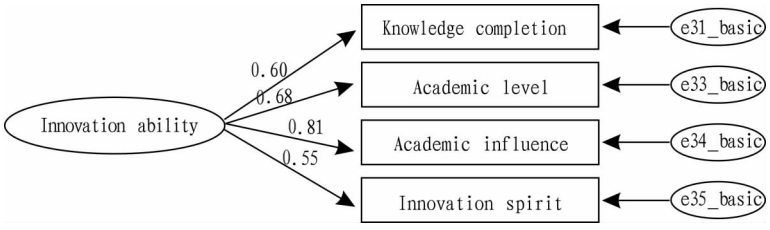
Note: Statistical amounts: $\chi^2 = 36.548$, df = 15, GFI = 0.943, TLI = 0.932, CFI = 0.963, RMSEA = 0.099.

Fig. 7 The model of deleting the promoting effect of project on science research



Note: Statistical amounts: $\chi^2 = 4.047$, df = 4, GFI = 0.947, TLI = 0.999, CFI = 1.0, RMSEA = 0.009.

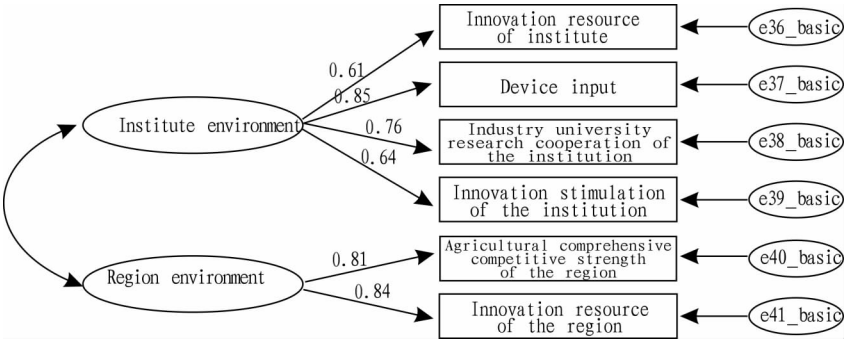
Fig. 8 Initial model of innovation ability



Note: Statistical amounts: $\chi^2 = 0.846$, df = 2, GFI = 0.997, TLI = 1.026, CFI = 1.0, RMSEA = 0.000.

Fig. 9 Structure chart of innovation ability after deleting academic background

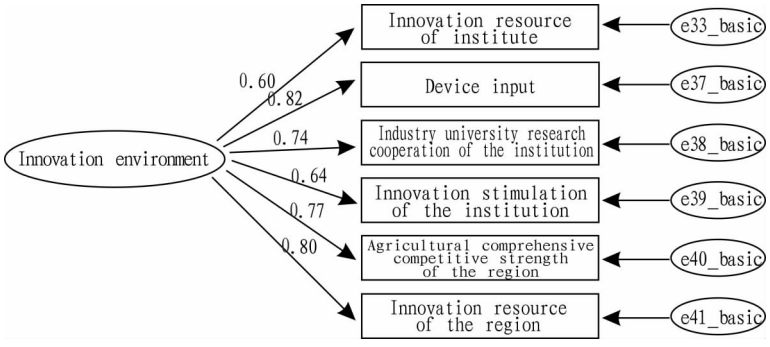
4.5 Innovation environment of institution and innovation environment of region Initial model of institution environment and region environment is shown as Fig. 10.



Note: Statistical amounts: $\chi^2 = 19.936$, df = 8, GFI = 0.957, TLI = 0.944, CFI = 0.970, RMSEA = 0.101.

Fig. 10 Initial model of institution environment and region environment

Because that model fitting index RMSEA is more than 0.1, the two factors could be merged, and the model is shown as Fig. 11. It is clear that institution environment and region environment are merged into "innovation environment", which is more rational.



Note: Statistical amounts: $\chi^2 = 28.649$, df = 9, GFI = 0.943, TLI = 0.917, CFI = 0.950, RMSEA = 0.022.

Fig. 11 The model of merging institution environment and region environment into innovation environment factor

Overall, by verification factor analysis of structural equation model on 5 Grade-one indexes, Grade-two indexes after revise are obtained (Table 3). In addition, it is worthy to specially note that in initial indexes, there is the index for the innovation feature of agricultural field, but its model list as Grade-one index is insignificant. It is because that the innovation of agricultural field corresponds with general rule of scientific development, which has been through to each index in whole research design. For example, the index "integrated innovation of the project/introduction, digestion, absorption and re-innovation in the project" indicates using agricultural science and technology information, agricultural science and technology management and agricultural innovation tool to select and integrate each innovation factor, or using various introduced agricultural technology resources to complete key innovation based on digestion and absorption. The index "science research form of the project" indicates corresponding with general rule, basic method and technical manner of agricultural related field research, especially science attempt of nature and biological rules. The index "treatment method of project difficulty" indicates treatment science and availability of control variables which may appear in agricultural field, such as climate, terrain, nature and life period. The index "expected social benefit of the project" indicates project application and promotion improving farmer's production and living levels, increasing the quality of agricultural product, improving or protecting the environment, and its sustainability, which all bring distinctive agricultural characteristics.

Table 3 Original Grade-two indexes and modified Grade-two indexes

Grade-one index	Original Grade-two index	Grade-two index after model modification
Innovation demand of the project	1 Social (industry) innovation demand of the project	1 Social (industry) innovation demand of the project
	2 Subject innovation demand of the project	2 Subject innovation demand of the project
	3 National innovation demand of the project	3 National innovation demand of the project
Innovation mode of the project	4 Original innovation of the project	4 Original innovation of the project
	5 Integrated innovation of the project	5 Integrated innovation of the project /introduction, digestion, absorption and re-innovation
	6 Introduction, digestion, absorption and re-innovation in the project	Mergence
Whole quality of the project	7 The comprehensiveness of theory	6 The comprehensiveness of theory
	8 Mastering of research frontier at home and abroad	7 Mastering of research frontier at home and abroad
	9 Scientific research form of the project	8 Scientific research form of the project
	10 Design of research thought of the project	9 Design of research thought of the project
	11 Description of project innovation point	10 Description of project innovation point
		11 Treatment method of the project difficulty
Innovation feature in agricultural field	12 Treatment method of the project difficulty	Adjusting
	13 Multidisciplinary integration of project	Deleting
	14 Referring to research experience in other fields	Deleting
Mastering of innovation method	15 Creating new scientific thinking in the project	12 Creating new scientific thinking in the project
	16 Creating new scientific method in the project	13 Creating new scientific method in the project
	17 Creating new scientific tool in the project	14 Creating new scientific tool in the project
Project input	18 Personnel input of the project	15 Personnel input of the project
	19 Innovation resource input of the project	16 Innovation resource input of the project
	20 Establishing of project innovation group	17 Establishing of project innovation group
	21 Time input of the project	18 Time input of the project
Predicted output of the project	22 Knowledge output of the project	19 Knowledge output of the project
	23 Technology output of the project	22 Talent cultivation of the project
	24 Technology standard output of project	20 Technology output of the project
	25 Talent cultivation of the project	21 Technology standard output of the project
	26 Expected output and risk of the project	Deleting
Predicted production efficiency of the project	27 Promotion effect of the project on science research	Deleting
	28 Demonstration effect of the project	23 Demonstration effect of the project
	29 Expected economic benefit of the project	24 Expected economic benefit of the project
	30 Expected social benefit of the project	25 Expected social benefit of the project
Innovation ability of applicant	31 Knowledge completion of applicant	26 Knowledge completion of applicant
	32 Academic background of applicant	Deleting
	33 Academic level of applicant	27 Academic level of applicant
	34 Academic impact of applicant	28 Academic impact of applicant
	35 Innovation spirit of the applicant	29 Innovation spirit of the applicant

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Grade-one index	Original Grade-two index	Grade-two index after model modification
Innovation environment of the applicant agency	36 Innovation resource of applicant institution	30 Innovation resource of applicant institution
	37 Device input of applicant institution	31 Device input of applicant institution
	38 Industry university research cooperation of applicant institution	32 Industry university research cooperation of applicant institution
	39 Innovation excitation of applicant institution	33 Innovation excitation of applicant institution
Innovation environment of the region	40 Comprehensive agricultural competitive strength of applicant region	34 Comprehensive agricultural competitive strength of applicant region

5 Conclusion

After attempting exploratory factor analysis, it is found that the result of factor analysis not only separates from the theory but also does not correspond with actual situation. On the basis of existing theory, confirmatory factor analysis in structural equation model is selected. Via the confirmatory factor analysis, it not only obtains index classification but also finds action mechanism among innovation demand, innovation mode, research thinking, treatment method of difficulty and expected risk. The research could straighten up thinking of review expert of basic research project in agricultural field, and provide the reference for applicant designing the project.

References

[1] LIU DC, PAN R. The example scientific research and innovative methods [M]. Beijing: Science and Technology of China Press, 2012: 25 - 26, 46, 58. (in Chinese).

[2] FU JJ. Technological innovation [M]. Beijing: Tsinghua University Press, 2000: 19, 35 - 37, 82. (in Chinese).

[3] THOMAS K. The structure of scientific revolution [M]. JIN WL, HU XH (Translators), Beijing: Peking University Press, 2012: 9. (in Chinese).

[4] CHEN J, JING JS, TONG L. An empirical study on risk factors of CoPS innovation project [J]. R&D Management, 2013, 17(6): 62 - 68. (in Chinese).

[5] WANG DP. Study on the key problems of science foundation and management [D]. Hefei: Hefei University of Technology, 2015: 23. (in Chinese).

[6] YANG JD. Study on the evaluation of the overall development and financial aid of agriculture——Based on the angle of farmers' specialized cooperative [D]. Chengdu: Southwestern University of Finance and Economics, 2014: 21 - 30. (in Chinese).

[7] JAN F, DAVID M, RICHARD RN. The Oxford handbook of innovation [M]. LIU XL, ZHENG G, LIN L, *et al.* (Translators), Beijing: Intellectual Property Publishing House, 2009: 88 - 112. (in Chinese).

[8] QIU JP, WEN TX. Evaluation science: Theory method practice [M]. Beijing: Science Press, 2010: 108. (in Chinese).

[9] YOU H. A sociological research on the relationship between emotion and trust [D]. Wuhan: Wuhan University, 2009: 88 - 92. (in Chinese).

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house, villages into residents, and farmers into workers. Anji County of Zhejiang Province firstly launched the beautiful countryside construction in the whole province and took it as an important carrier for the new round development. It planned to build all villages in the county into beautiful villages through industrial promotion, environmental improvement, quality boosting, and service improvement in ten years. Besides, Zhejiang Province formulated pilot plans with village as subjects, practically respecting subject role of village-level organizations and villagers, allocating funds to villages, and on the basis of government guidance and expert demonstration, the beautiful countryside construction should be decided democratically by villagers, avoiding the problem of "village branch secretary not understanding village plans". Anji County made differentiated planning for administrative villages in the whole county by the methods of "expert design, opinion poll, and mass discussion", and it passed the inspection and acceptance of the first beautiful countryside standardized demonstration area on October 25, 2013. Chongqing Municipality made clear 87 items of management and maintenance standards related to agriculture, and planed to establish a standard system within one year, to provide references for standardization of the beautiful countryside construction.

4 Conclusions

The beautiful countryside construction should not disconnected with urbanization, but should promote common development of urban and rural areas. At the same time of reflecting ecological civilization construction, it is required to strengthen ideological construction with coordination and participation of all relevant departments. In conclusion, the beautiful countryside construction can manifest characteristics of countryside and practically protect lawful rights and interests of farmers through transformation of agricultural production, construction of ecological agriculture, and integrated development of "industries, villages, and landscape", to realize harmonious and sustainable development of economy, politics, culture, society, and ecology.

References

[1] LU M. Modern ecological agriculture is the main direction of agricultural development in the new century [M]. Beijing: China Agriculture Press, 2002: 3 - 4. (in Chinese).

[2] MA SF, SONG DX. Study on the causes of rural environmental problem and the countermeasures [J]. Productivity Research, 2009(2): 126 - 127. (in Chinese).

[3] LI WH, MIN QW, ZHANG RW. On the technology and mode of ecological agriculture [M]. Beijing: Chemical Industry Press, 2005. (in Chinese).

[4] AO M, JIN MJ. On the spread of ecological civilization idea in rural areas [J]. Agro-Environment and Development, 2010(4): 1 - 4. (in Chinese).

[5] KE FY, ZHANG SM, XU HD. Study on the great-leap-forward developmental road of new countryside construction in mountainous rural areas: A case study in Anji County, Zhejiang Province [J]. Ecological Economy, 2011(5): 113 - 116. (in Chinese).