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Emotions Memory: Effects of Farmers' Markets on Place Attachment

Yang Chen[a], Tao Wang[a,*]

[a]*Faculty of Art and Design, Beijing Institute of Technology, Beijing 100081, China*

Abstract

As urbanization advances and policies are implemented, farmer's markets, as an important part of urban life, face dilemmas that urgently require academic exploration of countermeasures for market development models. This study takes Xuzhou Jiefangqiao Farmers' Market as an example, and under the guidance of place attachment theory, it integrates the questionnaire and observations, combined with SPSS software to analyze the case place site situation and sort out the factors influencing attachment perception. Extenics innovation method and Superiority evaluation strategy were used to investigate the results of the place attachment study. A quantitative conservation renewal strategy to improve the perception of place attachment of farmers' market users is proposed.

Keywords: Place Attachment; Farmer's Market; Design Practice; Environmental Perception; Extenics

1. Research site

1.1. Site Overview

The Jiefangqiao Farmers' Market was completed in 2001, with a business area of 3850 square meters. The site is interspersed with urban auxiliary roads, cannot meet the market traffic requirements. The region is dominated by commerce, and the site is complex. Under the impact of the sharing economy, the Jiefangqiao Farmers' Market can no longer meet the demand of consumer use. 2021 Kuihe opening cover, residents' emotional memory activation, new challenges in market renewal. Therefore, how to reactivate the market and explore the emotional connection between people and environment is the key challenge for the renovation of Jiefangqiao Farmers' Market in Xuzhou.

* Corresponding author. Tel.: +86-1861-831-7060 .
E-mail address: 630411240@qq.com (C. Yang), wangtao1020@126.com (W. Tao)

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1.2. Site Status

The building of Xuzhou Jiefangqiao Farmers' Market has four floors, the negative and first floors are for the farmers' market. The population mainly consists of three categories of people: residents, consumers and vendors. The market mainly sells cooked and fresh food, with 71 stalls in total. The internal sales space of the building adopts the way of surrounding island platform, and the functional space of the stalls is divided into two parts: selling and auxiliary. The traditional fixed shelf selling method is used, and the display area is limited. The market facilities are gradually aging, with insufficient indoor light and poor environmental ventilation. The effectiveness of many empty stalls is declining, which affects the management of the market. Street congestion caused by haphazard stacking of vendors outside the market; Fixed stalls make garbage not timely disposal, leading to environmental problems; The parking lot planning is unreasonable, the utilization rate of parking spaces is low, and the potential fire hazards are high. Although the outdoor landscape part is more green, but the functionality is weak, relying on the bus station only plays a traffic role and does not attract people to stay, the Kui River river space form is relatively old.

2. Research situation

2.1. Hypothesis formulation and index selection

Studies are based on the nature of disciplines such as landscape architecture, architecture and, art. Based on the classical two-dimensional structure of place attachment[1], combined with the research of Hammitt W E et al.[2], Xiang, L. L. et al.[3], Fu, H. et al.[4] , and other relevant scholars and the actual situation of the site, the dimension indicators are partially revised to form a new scale and items. These include uniqueness(naturallandscape), uniqueness(architectural space), Scale Sense, Peripheral Relations, and environmental situation of the environment perception dimension; Satisfaction (life), Satisfaction (leisure), irreplaceability, activity number, and life-related for the location dependence dimension; and belongingness, specialness, identity, familiarity, and dependence for the place identity dimension. The study proposed the following hypotheses:

- H1: Place attachment is correlated with the personal background characteristics of farmers' market users.
- H2: Place attachment, place identity, and environmental perception are related to each other.
- H3: Place dependence, place identity, and environmental perception influence factors have a significant effect on farmers' marketplace attachment.

2.2. Questionnaire analysis

The questionnaire was divided into two parts: basic information and place attachment perception scale. A total of 198 questionnaires were collected and scored on Likert scale. Statistical analysis of the questionnaire data was performed using SPSS. The results yielded high reliability and high significance of the questionnaire. Factor analysis was used to optimize the question items and finally construct a model of the influence of place attachment in Xuzhou Jiefangqiao Farmers' Market. The results of the study were as follows:

（1）By Spearman's correlation and Pearson's correlation coefficient analysis, H1 and H2 hold;

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[2] Hammitt, W. E., Backlund, E. A. & Bixler, R. D. (2006). Place bonding for recreation places: conceptual and empirical development. Leisure studies, 2006, 25(1): 17–41.

[3] Xiang, L. L., Ye, Y, F., Pan, J. D., & Wang, Z.L.(2022). A study on place attachment of residents in historical districts based on life world: a case study of Qianjin Street in Yining, Xinjiang[J]. Acta Scientiarum Naturalium Universitatis Pekinensis,2022,58(03):488-502.

[4] Fu, H., Liang, R., & Wang, B.,X.(2022). A Study on Influencing Factors of Place Attachment in Lingnan Rural Public Building Design [J]. Furniture & Interior Design,2022,29(12):112-117.

（2）Through correlation and regression analyses, it was explored that four influencing factors, uniqueness(natural landscape), scale sense, specialness, and dependence, showed significance with place attachment .H3 is not valid. However, based on the results of H2, the improvement of environment perception and place identity dimensions will effectively promote the development of the place dependence dimension.

2.3. Interview observation

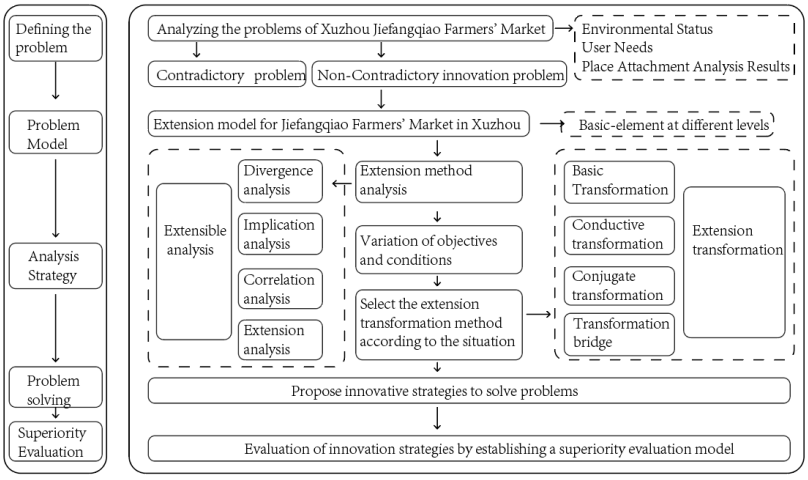
Based on the quantitative results, using interviews and observations, the specific reasons and future hopes of the respondents for the strong correlation of place attachment in the four influencing factors (Table1) can be summarized as culture, form and space.

Table 1. Interview Content

Topic Keywords	Summary of the interview
uniqueness(natural landscape)	"Kui River", "lots of greenery", "plenty of sunshine", "shady and comfortable", "stories happening by the Kui River", "walking in the square", "water view", "fresh air", "You can see flowers and trees as well as cars and people".....
Scale Sense	"comfortable communication", "uncrowded space", "comfortable building height",.....
specialness	"Meeting familiar friends and neighbors", "The Kui River moat has a long history",,.....
dependence	"Most of what you want can be bought", "Online shopping", "Morning exercise, daytime shopping, nighttime fun".....

3. Xuzhou Jiefangqiao Farmers' Market Optimization Strategy

The emotional connection of farmers' markets is complex and requires a thorough analysis of the site using a scientific and rational mindset.The main object of Extenics research is the Contradictory problem[1]. By establishing "Basic-element", Extenics thinking is used to carry out Extensible analysis and Extension transformation. By building a formal model, things are disassembled, analyzed and changed to generate an extension strategy.Superiority evaluation is the basic method of evaluating the advantages and disadvantages of things, strategies, and methods in Extenics[1]. By specifying the measurement indexes to reflect the degree of advantages and disadvantages of the object and the possible changes according to the actual problem and the technical, economic and social requirements, the most suitable method is finally calculated. Therefore, in this paper, based on the results of the place attachment study of Xuzhou Jiefangqiao Farmers' Market, a strategy is generated by using the Extenics method and resolving the contradiction through the Extension transformation method. Finally, the strategy is evaluated for its superiority and the design of Xuzhou Jiefangqiao Farmers' Market is put into practice.



[1] Cai, W. (1998). Introduction of Extenics[J]. Systems Engineering-Theory & Practice,1998(01):77-85.
[1] Yang, C. Y. & Cai, W. (2000). Extension engineering research[J]. Strategic Study of CAE, 2000(12):90-96.

3.1. Innovation and project problem definition

The first step of Extenics in solving a contradictory problem is problem definition, which includes defining the objectives and conditions of the contradictory problem in order to properly model the basic-element of the contradictory problem[1].For the analysis results of Xuzhou Jiefangqiao Farmers' Market, we build a model of the innovation problem. The Non-Contradictory innovation problem model of this problem is P=G ↓ {L} ({L}: denotes the set of Condition-element)

$$G=\begin{bmatrix} \text{Conformity, Application object, Xuzhou Jiefangqiao Farmers' Market} \\ \text{Domination object, Environmental Status} \wedge \text{User Needs} \wedge \text{Place Attachment Analysis Result} \end{bmatrix}$$

$$L=\begin{bmatrix} O, C_1, V_1 \\ C_2, V_2 \\ C_3, V_3 \\ C_4, V_4 \\ C_5, V_5 \\ C_6, V_6 \\ \vdots, \vdots \end{bmatrix}=\begin{bmatrix} \text{Update,} & \text{Application object,} & \text{User} \\ & \text{Domination object,} & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location,} & \text{Xuzhou City} \\ & \text{Pre-renovation status,} & \text{Old and outdated} \\ & \text{Transformation style,} & \text{Unlimited} \\ & \text{Transformation method,} & \text{Diversification} \\ & \vdots & \vdots \end{bmatrix}$$

Through Implication analysis, the diversification of the transformation methods of V6 in the innovation target L can be decomposed into protection, renovation, and new construction, and finally, the model is obtained as follows:

$$L=\begin{bmatrix} O, C_1, V_1 \\ C_2, V_2 \\ C_3, V_3 \\ C_4, V_4 \\ C_5, V_5 \\ C_6, \{V_{61} \wedge V_{62} \wedge V_{63}\} \\ \vdots, \vdots \end{bmatrix}=\begin{bmatrix} \text{Update,} & \text{Application object,} & \text{User} \\ & \text{Domination object,} & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location,} & \text{Xuzhou City} \\ & \text{Pre-renovation status,} & \text{Old and outdated} \\ & \text{Transformation style,} & \text{Unlimited} \\ & \text{Transformation method,} & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & \vdots & \vdots \end{bmatrix}$$

The model L1 is obtained by discretizing the values of V11 and V15 in L and establishing the first-level discretized basic-element expression.Further divergence is performed on L1 to obtain the second-level discretized basic-element expression L11. And so on, based on L11, the final three-level expressions for L are formed.

$$L\dashv\begin{bmatrix} O, C_{11}, \{V_{111}, V_{112}, V_{113}\} \\ C_{12}, V_{12} \\ C_{13}, V_{13} \\ C_{14}, V_{14} \\ C_{15}, \{V_{151}, V_{152}\} \\ C_{16}, \{V_{161} \wedge V_{162} \wedge V_{163}\} \\ \vdots, \vdots \end{bmatrix}=\begin{bmatrix} \text{Update,} & \text{Application object,} & \{\text{Customer, Vendor, Manager}\} \\ & \text{Domination object,} & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location,} & \text{Xuzhou City} \\ & \text{Pre-renovation status,} & \text{Old and outdated} \\ & \text{Transformation style,} & \{\text{Single Style, Various Mix}\} \\ & \text{Transformation method,} & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & \vdots, & \vdots \end{bmatrix}=L_1$$

$$L_{1111}=\begin{bmatrix} O, C_{11111}, \{V_{111111} \wedge V_{111112}\} \\ C_{11112}, V_{11112} \\ C_{11113}, V_{11113} \\ C_{11114}, V_{11114} \\ C_{11115}, \{V_{1111151} \wedge V_{1111152} \wedge V_{1111153}\} \\ C_{11116}, \{V_{1111161} \wedge V_{1111162} \wedge V_{1111163}\} \\ \vdots, \vdots \end{bmatrix}=\begin{bmatrix} \text{Update,} & \text{Application object,} & \{\text{Surrounding people} \wedge \text{Visitors}\} \\ & \text{Domination object,} & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location,} & \text{Xuzhou City} \\ & \text{Pre-renovation status,} & \text{Old and outdated} \\ & \text{Transformation style,} & \{\text{Modern} \wedge \text{Tradition} \wedge \text{Future}\} \\ & \text{Transformation method,} & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & \vdots, & \vdots \end{bmatrix}$$

According to the survey results, most of the research subjects are customers, so only the customer needs are analyzed, and L111 is obtained by diverging L11. L111 divergence results are converged to obtain L1115 and L1116 Basic-element expressions. Finally, the converged divergence results of L1115 and L1116 are organized by Implication analysis to obtain L11111.

Therefore, when renewing the Jiefangqiao Farmers' Market in Xuzhou City, it is necessary to consider both the needs of the surrounding people and visitors in terms of the application objects and to protect, renovate, and new construction of the farmers' market in terms of modern, traditional and future renovation styles.

[1] Lian, F. & Zou, G. T., (2010). Dependence and transformation of conjugate，transformation for innovation：Conjugate methods and tactics creation of extensive architecture programming[J]. Huazhong Architecture, 2010, 28(2)：97-99.

$$L_1 \dashv \begin{bmatrix} O, & C_{111}, & V_{111} \\ & C_{112}, & V_{112} \\ & C_{113}, & V_{113} \\ & C_{114}, & V_{114} \\ & C_{115}, & V_{115} \\ & C_{116}, & \{V_{1161} \wedge V_{1162} \wedge V_{1163}\} \\ & \vdots, & \vdots \end{bmatrix} = \begin{bmatrix} \text{Update}, & \text{Application object}, & \text{Customer} \\ & \text{Domination object}, & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location}, & \text{Xuzhou City} \\ & \text{Pre-renovation status}, & \text{Old and outdated} \\ & \text{Transformation style}, & \text{Various Mix} \\ & \text{Transformation method}, & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & \vdots, & \vdots \end{bmatrix} = L_{11}$$

$$L_{11} \dashv \begin{bmatrix} O, & C_{1111}, & \{V_{11111}, V_{11112}, V_{11113}, V_{11114}, V_{11115}, V_{11116}, V_{11117}, V_{11118}, \ldots\ldots\} \\ & C_{1112}, & V_{1112} \\ & C_{1113}, & V_{1113} \\ & C_{1114}, & V_{1114} \\ & C_{1115}, & V_{11151}, V_{11152}, V_{11153}, V_{11154}, V_{11155}, V_{11156}, V_{11157}, \ldots\ldots\} \\ & C_{1116}, & \{V_{11161} \wedge V_{11162} \wedge V_{11163}\} \\ & \vdots, & \vdots \end{bmatrix} = \begin{bmatrix} \text{Update}, & \text{Application object}, & \{\text{Elderly, Middle-aged, Teenagers, Children, Surrounding people, Visitors, Men, Women, ...}\} \\ & \text{Domination object}, & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location}, & \text{Xuzhou City} \\ & \text{Pre-renovation status}, & \text{Old and outdated} \\ & \text{Transformation style}, & \{\text{Simplicity} \wedge \text{Modern}, \text{Simplicity} \wedge \text{Tradition}, \text{Future} \wedge \text{Fun}, \text{Modern} \wedge \text{Future}, \text{Modern} \wedge \text{Tradition} \wedge \text{Future}, \text{Fun} \wedge \text{Simplicity} \wedge \text{Future}, \text{Tradition} \wedge \text{Simplicity} \wedge \text{Fun}, \ldots\ldots\} \\ & \text{Transformation method}, & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & \vdots, & \vdots \end{bmatrix} = L_{111}$$

$$L_{1115} = \begin{bmatrix} O, & C_{11151}, & V_{11151} \\ & C_{11152}, & V_{11152} \\ & C_{11153}, & V_{11153} \\ & C_{11154}, & V_{11154} \\ & C_{11155}, & V_{11155} \\ & C_{11156}, & \{V_{111561} \wedge V_{111562} \wedge V_{111563}\} \\ & \vdots, & \vdots \end{bmatrix} = \begin{bmatrix} \text{Update}, & \text{Application object}, & \{\text{Surrounding people}\} \\ & \text{Domination object}, & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location}, & \text{Xuzhou City} \\ & \text{Pre-renovation status}, & \text{Old and outdated} \\ & \text{Transformation style}, & \{\text{Modern} \wedge \text{Tradition}\} \\ & \text{Transformation method}, & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & \vdots, & \vdots \end{bmatrix}$$

$$L_{1116} = \begin{bmatrix} O, & C_{11151}, & V_{11151} \\ & C_{11152}, & V_{11152} \\ & C_{11153}, & V_{11153} \\ & C_{11154}, & V_{11154} \\ & C_{11155}, & V_{11155} \\ & C_{11156}, & \{V_{111561} \wedge V_{111562} \wedge V_{111563}\} \\ & \vdots, & \vdots \end{bmatrix} = \begin{bmatrix} \text{Update}, & \text{Application object}, & \{\text{Visitors}\} \\ & \text{Domination object}, & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location}, & \text{Xuzhou City} \\ & \text{Pre-renovation status}, & \text{Old and outdated} \\ & \text{Transformation style}, & \{\text{Tradition} \wedge \text{Future}\} \\ & \text{Transformation method}, & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & \vdots, & \vdots \end{bmatrix}$$

3.2. Problem Model and analysis strategy

Based on the definition of the innovation problem and the project problem, the composite element problem model is established based on the results of 3.1. For V111112 to establish the Divergence tree of the Matter-element model, combined with the current situation of the market and quantitative results of the Matter-element from indoor, indoor, and outdoor transition areas, and outdoor three parts of the current situation to analyze(Only the indoor part is shown here), summarize the Xuzhou Jiefangqiao farmers market contradictory problems:

$$L_{1111} = \begin{bmatrix} O, & C_{11111}, & \{V_{111111} \wedge V_{111112}\} \\ & C_{11112}, & V_{111112} \\ & C_{11113}, & V_{111113} \\ & C_{11114}, & V_{111114} \\ & C_{11115}, & \{V_{111151} \wedge V_{111152} \wedge V_{111153}\} \\ & C_{11116}, & \{V_{1111161} \wedge V_{111162} \wedge V_{111163}\} \\ & \vdots, & \vdots \end{bmatrix} = \begin{bmatrix} \text{Update}, & \text{Application object}, & \{\text{Surrounding people} \wedge \text{Visitors}\} \\ & \text{Domination object}, & \text{Xuzhou Jiefangqiao Farmers' Market} \\ & \text{Location}, & \text{Xuzhou City} \\ & \text{Pre-renovation status}, & \text{Old and outdated} \\ & \text{Transformation style}, & \{\text{Modern} \wedge \text{Tradition} \wedge \text{Future}\} \\ & \text{Transformation method}, & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & \vdots, & \vdots \end{bmatrix}$$

$$V_{1111121} = \begin{bmatrix} \text{Indoor}, & \text{Function}, & \text{Sale} \wedge \text{Management} \wedge \text{Auxiliary} \\ & \text{Streamline}, & \text{Linear type} \\ & \text{Style}, & \text{Standardized Old Farmers' Market} \\ & \text{Space}, & \text{Selling space} \wedge \text{Office space} \wedge \text{Support space} \\ & \text{Material}, & \text{Cement} \wedge \text{Tile} \wedge \text{Metal} \wedge \text{Plastic} \\ & \text{Color}, & \text{Gray} \wedge \text{White} \wedge \text{Gold} \wedge \text{Silver} \wedge \text{Green} \wedge \text{Red} \\ & \text{Area}, & 96600(\text{m}) * 9700(\text{m}) + 78600(\text{m}) * 15000(\text{m}) \\ & \text{Performance}, & \text{Damaged facilities} \wedge \text{Poor ventilation} \wedge \text{Dim light} \wedge \text{Poor drainage} \wedge \text{Inconvenient traffic} \\ & \text{Status}, & \text{Old form} \wedge \text{Single function} \wedge \text{Single space} \\ & \text{Vegetation}, & \text{None} \\ & \text{Landscape}, & \text{None} \end{bmatrix}$$

According to the analysis results of V111112, The transformation direction of Jiefangqiao Farmers' Market in Xuzhou is briefly summarized as inherited culture, diversified form, and shared space. Combining the quantitative values in the V111115 transformation style and V111116 transformation method respectively to establish the first-level Basic-element expression to get(In the article, only the traditional transformation in the form of multiple types is analyzed as an example). The divergence analysis is performed on the quantities of V11 and V12 in M1, and a second-level divergence Basic-element expression is established to obtain the models M11. Based on M11, the final three-level expressions for M are formed (for example, M111 is obtained by divergence of M11).The results of the

divergence are converged to obtain M11, M12, and M13, and the contradictory problem of the Jiefangqiao farmers' market in Xuzhou is summarized.

$$O=O_1 \oplus O_2 \oplus O_3=\text{Diverse Forms} \oplus \text{Heritage Culture} \oplus \text{Shared Space}$$

$$M_1=\begin{bmatrix} O_1, & C_{11}, \{V_{111} \wedge V_{112} \wedge V_{113}\} \\ & C_{12}, \{V_{121} \wedge V_{122} \wedge V_{123}\} \\ & \vdots \quad , \quad \vdots \end{bmatrix} = \begin{bmatrix} \text{Diverse Forms}, & \text{Transformation style}, & \{\text{Modern} \wedge \text{Tradition} \wedge \text{Future}\} \\ & \text{Transformation method}, & \{\text{Protection} \wedge \text{Renovation} \wedge \text{New Construction}\} \\ & & \vdots \quad , \quad \vdots \end{bmatrix} = M_{11}$$

$$M_{11}=\begin{bmatrix} O_1, & C_{111}, V_{111} \\ & C_{112}, V_{112} \\ & C_{113}, V_{1131} \wedge V_{1132} \\ & C_{114}, V_{114} \\ & C_{115}, V_{1151} \wedge V_{1152} \wedge V_{1153} \wedge V_{1154} \wedge V_{1155} \\ & C_{116}, V_{1161} \wedge V_{1162} \wedge V_{1163} \\ & \vdots \quad , \quad \vdots \end{bmatrix} = \begin{bmatrix} \text{Diverse forms}, & \text{Transformation style}, & \text{Tradition} \\ & \text{Transformation method}, & \text{New Construction} \\ & \text{Form}, & \text{Folding line type} \wedge \text{Curve type} \\ & \text{Space}, & \text{Kuihe River bank} \wedge \text{Play} \wedge \text{Experience} \\ & \text{Material}, & \text{Glass} \wedge \text{Metal} \wedge \text{Woodwork} \wedge \text{Concrete} \wedge \text{Tile} \\ & \text{Color}, & \text{Gray} \wedge \text{White} \wedge \text{Wood} \\ & \vdots \quad , & \vdots \end{bmatrix}$$

$$M_{11} \dashv \begin{bmatrix} O_1, & C_{111}, V_{111} \\ & C_{112}, V_{112} \\ & C_{113}, V_{113} \\ & C_{114}, \{V_{1141}, V_{1142}, V_{1143}, V_{1144}, V_{1145}, V_{1146}, \ldots\} \\ & C_{115}, V_{1151} \wedge V_{1152} \wedge V_{1153} \wedge V_{1154} \wedge V_{1155} \\ & C_{116}, V_{1161} \wedge V_{1162} \wedge V_{1163} \end{bmatrix} = \begin{bmatrix} \text{Diverse forms}, & \text{Transformation style}, & \text{Tradition} \\ & \text{Transformation method}, & \text{New Construction} \\ & \text{Form}, & \{\text{Linear type, Curve type, Folding line type, \ldots\ldots}\} \\ & \text{Space}, & \{\text{Drink, River, Watch, Play, Exchange, Experience, \ldots\ldots}\} \\ & \text{Material}, & \text{Glass} \wedge \text{Metal} \wedge \text{Woodwork} \wedge \text{Concrete} \wedge \text{Tile} \\ & \text{Color}, & \text{Gray} \wedge \text{White} \wedge \text{Wood} \end{bmatrix} = M_{111}$$

$$M_{11}=\begin{bmatrix} O_1, & C_{111}, V_{111} \\ & C_{112}, V_{112} \\ & C_{113}, V_{113} \\ & C_{114}, V_{114} \\ & C_{115}, V_{1151} \wedge V_{1152} \wedge V_{1153} \wedge V_{1154} \wedge V_{1155} \\ & C_{116}, V_{1161} \wedge V_{1162} \wedge V_{1163} \\ & \vdots \quad , \quad \vdots \end{bmatrix} = \begin{bmatrix} \text{Diverse forms}, & \text{Transformation style}, & \text{Tradition} \\ & \text{Transformation method}, & \text{New Construction} \\ & \text{Form}, & \text{Diverse} \\ & \text{Space}, & \text{Leisure space} \\ & \text{Material}, & \text{Glass} \wedge \text{Metal} \wedge \text{Woodwork} \wedge \text{Concrete} \wedge \text{Tile} \\ & \text{Color}, & \text{Gray} \wedge \text{White} \wedge \text{Wood} \\ & \vdots \quad , & \vdots \end{bmatrix}$$

We disassembled the composite-element problem model and performed an extension analysis. Taking the M13 composite-element model as an example, in the diversified form, the user proposed to adopt the traditional renovation style, and wanted to retain the characteristics of the Kuihe cultural space, but also wanted to take the form of curves and folds. Further analysis of the contradictory problem of extension is carried out. We take the barge form of the riverbank as an example. First, the kernel problem model of the contradictory problem is listed according to the user's needs and the current situation of the dominant object. P={G1∧G2} ↑ {L} ({L}:denotes the set of Condition-element);

$$G_1=\begin{bmatrix} \text{Performance}, & \text{Application object}, & \text{Diverse forms} \\ & \text{Domination object}, & \text{Preservation of Kuihe cultural space features} \end{bmatrix} \quad G_2=\begin{bmatrix} \text{Performance}, & \text{Application object}, & \text{Diverse forms} \\ & \text{Domination object}, & \text{Form of the curve} \end{bmatrix}$$

$$L=\begin{bmatrix} \text{Kui River Barge}, & \text{Status}, & \text{River open cover} \\ & \text{Function}, & \text{River} \oplus \text{Viewing} \end{bmatrix}$$

$$L\text{-}1=\begin{bmatrix} \text{Kui River Barge}, & \text{Status}, & \text{River open cover} \\ & \text{Function}, & \text{River} \oplus \text{Viewing} \end{bmatrix}^{-1} = \begin{bmatrix} \text{Kui River Barge}, & \text{Status}, & \text{River open cover} \\ & \text{Function}, & \text{M} \end{bmatrix}^{-1}$$

$$L_1 \dashv \begin{bmatrix} (\text{Natural prototype barge, c, v}) \\ (\text{Pebble slope barge, c, v}) \\ (\text{Stone barge, c, v}) \\ (\text{Eco-bag, c, v}) \\ (\text{Stone masonry artificial barge, c, v}) \\ (\text{Composite artificial barge, c, v}) \\ (\text{Stepped artificial barge, c, v}) \\ \vdots \end{bmatrix}$$

M_1= (Composite artificial barge, c, v) M_2= (Natural prototype barge, c, v) M_3= (Stone barge, c, v)

T_1= (Kui River Barge, Function, River ⊕ Viewing ⊕ Composite artificial barge)

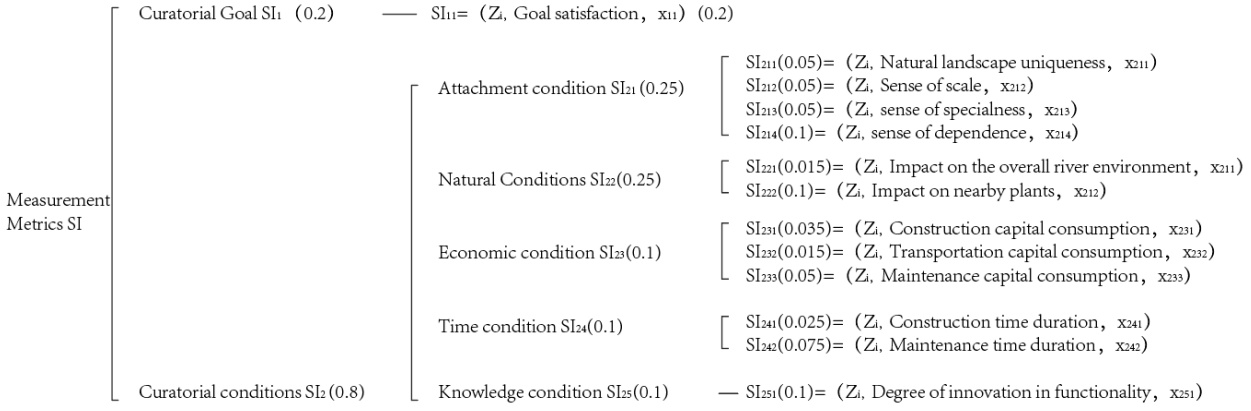
T_2= (Kui River Barge, Function, River ⊕ Viewing ⊕ Natural prototype barge)

T_3= (Kui River Barge, Function, River ⊕ Viewing ⊕ Stone barge)

We apply inverse thinking to the condition-element L to obtain the basic-element model of L-1 and perform divergence analysis on L1. The convergence of the divergence results is based on other conditions to obtain M1, M2, and M3. Increase/decrease transformation for Condition-element T yields three different innovation strategies.

3.3. Extensible Superiority Evaluation

Superiority evaluation is a comprehensive evaluation of the superiority or inferiority of an object, solution, strategy, etc., based on a combination of measures. The objective is "to preserve the characteristics of the Kuihe cultural space, but also to adopt the form of curves and folds", and the condition is "to adopt the traditional style of multi-faceted transformation". By using the extension analysis and extension transformation, the solution strategy is derived.ZI=(Kui River Barge, Function, River ⊕ Viewing ⊕ Composite artificial barge);ZII=(Kui River Barge, Function, River ⊕ Viewing ⊕ Natural prototype barge);ZIII=(Kui River Barge, Function, River ⊕ Viewing ⊕ Stone barge).First, based on the content of Wang Tao,Li Wenjie[1] indicators and combined with the results of the location attachment study to determine the measurement indicators, and the indicator weights were assigned. Then the evaluation indicators were screened according to the requirement of "must meet" and the first evaluation was conducted. Screening results: ZI, ZII, and ZIII all satisfy the index. The next step is alculate the superiority of the correlation degree.



（1） According to the direction of the correlation of index content(Table 2), SI11, SI211, SI212, SI213, SI214, SI242, and SI251 have a positive correlation with the evaluation target, and the discrete dependent function K1 (x) is established. SI221, SI222, SI231, SI232, SI233, and SI241 have a negative correlation with the evaluation target, and the discrete dependent function K2 (x) is established.

Table 2. An example of a table.

	Very high	High	General	Low	Very low
K1（x）	5	4	3	2	1
K2（x）	1	2	3	4	5

（2） Give the correlations of the three strategies to be evaluated, ZI, ZII, and ZIII, respectively, concerning each measure. Calculate the canonical correlations of the three strategies to be evaluated, ZI, ZII, and ZIII, concerning each metric.(Table 3)

Table 3. The goodness calculation of evaluation indexes ZI, ZII and ZIII

	Composite artificial barge	Stone barge	Natural prototype barge		Composite artificial barge	Stone barge	Natural prototype barge
SI11	ZI=0.8	ZII=0.4	ZIII=0.6	SI231	ZI=0.14	ZII=0.07	ZIII=0.14
SI211	ZI=0.1	ZII=0.15	ZIII=0.2	SI232	ZI=0.045	ZII=0.03	ZIII=0.06

[1] .Wang, T. & Li, W. J. (2022). A Study on the Innovative Design of Transforming Traditional Residential Buildings Based on the Topologic Theory: A Case Study of Baoshui Village in Fangshan District, Beijing[J]. Journal of Guangdong University of Technology, 2022,39(02):26-31.

SI212	ZI=0.15	ZII=0.1	ZIII=0.15	SI233	ZI=0.15	ZII=0.3	ZIII=0.2
SI213	ZI=0.1	ZII=0.1	ZIII=0.15	SI241	ZI=0.1	ZII=0.05	ZIII=0.075
SI214	ZI=0.4	ZII=0.2	ZIII=0.2	SI242	ZI=0.225	ZII=0.15	ZIII=0.225
SI221	ZI=0.045	ZII=0.06	ZIII=0.075	SI251	ZI=0.3	ZII=0.4	ZIII=0.2
SI222	ZI=0.3	ZII=0.4	ZIII=0.5				

（3） The superiority of the last three indicators to be evaluated, ZI, ZII, and ZIII, are C(ZI) = 2.855; C(ZII) = 2.41; C(ZIII) = 2.775;

（4） Based on the indicators and assigned values of the superiority evaluation, it can be seen that: ZI has the highest superiority evaluation, and the stability of the indicators is good. ZIII has a moderate superiority evaluation and performs best in natural conditions, but the degree of innovation is not good. ZII has a high degree of functional innovation, but performs poorly in economic conditions, with construction, transportation, and post-maintenance being more costly.Therefore, Xuzhou Jiefangqiao Farmers' Market can be renewed by constructing a composite artificial barge. The superiority evaluation method is used to solve the contradictory problem of the project to arrive at the design strategy of Xuzhou Jiefangqiao Farmers' Market.

4. Prospect

While the study remedies the lack of quantitative research on farmers' markets from an affective perspective, some problems were found in the Extenics study.Only relying on interviews and observation methods to establish the "question base" is small in number. The quantity division in Extension analysis is not comprehensive, which leads to the controversy of the results. The establishment of the dependent function in the Superiority evaluation method does not accurately quantify a design element. The results of the study may not be consistent with the results of other methods when only Extenics is used for analysis. Therefore, more scholars need to explore it in the future.

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