Green packaging use willingness factor scale development

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Abstract. Through reviewing and summarizing the related research on the influencing factors of green packaging practice, it is proposed that the influencing factors can be divided into four dimensions: functional value, aesthetic value, affective value and social value, and developed the influence of green packaging use willingness factor measurement scale, through its investigation and analysis, used SPSS and Amos to test the reliability and fitting model of the scale. The results show that the proposed measurement model of the influence factors of green packaging use has good reliability and validity.

1. Introduction
As environmental damage and resource shortages intensify, green environmental protection and energy-saving and low-carbon have caused widespread concern in society. The Green Revolution has gradually emerged and developed in all walks of life, and the packaging industry related to it has followed the trend of the times and has begun to explore and develop green packaging. For green packaging manufacturers, not only focus on the research of green packaging technology, but also pay more attention to consumers' exploration of the value of green packaging. In the new marketing era that focuses on the consumer experience, if you want to distinguish yourself from competitors, the first thing to do is to understand demands of consumers. As the packaging industry, the rise of green packaging has attracted widespread attention in recent years. How to combine the consumer's willingness to consume and the green packaging practices of enterprises is extremely important.

2. Literature review
Scholars have carried out research on what kind of attributes consumers buy green packaging based on. Liang Zhengbo et al. (2016) believe that emotional factors affect consumers' purchase of green packaging products, consumers' general attitudes toward environmental protection, and consumers' specific attitudes toward green packaging and consumer responsibility all have positive effects on consumers' purchasing of green packaging products. [1] Wang Guomeng (2010) and others believe that there is a significant positive correlation between personal values, environmental attitudes and green buying behaviors. [2] Qiu Fengxiang and Zou Mengqing (2019) believe that the modern packaging market not only needs to meet the emotional needs of people but also meet the green sustainable development path of the environment. [3] Pan Chi and Guo Zhida (2019) believe that the usefulness, ease of use, consumer awareness of environmental responsibility and adequate publicity and education of green packaging are the key to enhancing consumers' willingness to accept. [4] Dai Xiufang (2008), the design of packaging should follow the unification of aesthetic requirements and functions. Only when the packaging of a single commodity is unified with other commodities, corporate representation, corporate philosophy and other elements of the enterprise can it meet the current business pair. The
shaping of the brand can also cater to the current mass consumer psychology with aesthetics and culture as the main consumption concept. Li Na and Li Xiaodong (2019) constructed a multi-level green packaging evaluation index system from four dimensions: environment, resources, economy and function. Deng Yingyi (2019) analyzed the packaging appearance, environmental labeling content and packaging materials of green environmental protection packaging products based on three factors, and constructed a new hypothesis model of purchase intention. Hao Xiaodan (2018) believes that the public's perception of usefulness of green packaging, environmental responsibility and public perception of behavioral factors have a positive and significant impact on public acceptance. Liu Yiqing (2018) analyzed the impact of green environmental protection packaging, green packaging labeling and green packaging material factors on consumers' purchase of green packaging products.

In the literature, we can easily find that scholars are based on one or two influencing factors to provide reference for the practice of green packaging. After analysis and research, we found that consumers' consideration of purchasing green packaging is a combination of various influencing factors. Based on the four potential variables of consumers' perception of green packaging (functional value, aesthetic value, emotional value and social value), the joint research has not been covered in the previous literature. This article is based on this interview and questionnaire survey. Propose the consumer to buy green packaging influencing factors measurement scale, on the one hand to make up for the lack of relevant aspects of the previous literature, on the other hand to provide practical significance for the relevant companies to provide green packaging practices and improve consumer satisfaction in purchasing green packaging, so that consumption and corporate reciprocity.

3. Research design

The research on green packaging value adopts the method of single dimension measurement, and there are few empirical studies on the factors affecting consumers' purchase of green packaging. This paper firstly uses the interview method and comprehensive literature review to make a preliminary division of the factors affecting consumers' purchase of green packaging. Then, using the method of questionnaire survey, the reliability and validity of the factors affecting the purchase of green packaging by consumers were tested.

3.1. Qualitative research

Select 10 consumers who regularly use and purchase green packaging to conduct in-depth interviews to understand their changes in the use and purchase of green packaging, decision-making process and considerations, the basic situation is shown in Table 1. By recording, refining and analyzing the interviewer's information, it is preliminarily believed that the influencing factors of consumers purchasing green packaging can be divided into four dimensions: functional value, aesthetic value, emotional value and social value. The key language description of the interview record can be seen in Table 2.

| Table 1. Basic information of interviewees |
|-------------------------------------------|
| **Gender**                                 |
| Male 5 (50%)                              |
| Female 5 (50%)                            |
| **Age**                                    |
| Under 20 years old 6 (60%)                |
| 20 - 30 years old 4 (40%)                 |
| **Education**                              |
| Bachelor 7 (70%)                          |
| Master degree and above 3 (30%)           |
| **Career**                                 |
| Student 8 (80%)                           |
| Institution employee 2 (20%)              |
| **Monthly income**                        |
| Less than 2,000 yuan 5 (50%)              |
| 4000 - 8000 yuan 3 (30%)                  |
| 2000 - 4000 yuan 2 (20%)                 |
Table 2. Interview record

| Dimension      | Summary of the issue                                                                 |
|----------------|--------------------------------------------------------------------------------------|
| Functional value| Easy to use green packaging                                                         |
|                | Whether the packaging takes up space                                                 |
|                | Practicality, is it easy to be bad                                                  |
|                | The material of the package is the factor I considered                              |
| Aesthetic value| Packaging shape characteristics                                                      |
|                | Is the color of the package good                                                    |
|                | Does the appearance of the package appeal to me?                                    |
|                | Cultural elements of packaging patterns                                             |
| Emotional value| Emotional association                                                               |
|                | Contact with yourself                                                               |
|                | Influence on mood                                                                   |
|                | Collection value                                                                     |
| Social value   | Wrapped material                                                                     |
|                | Environmental impact after packaging                                                |
|                | National guidance on energy conservation and emission reduction                     |
|                | Whether the packaging can be recycled                                               |

From the interview results, the influencing factors of consumers purchasing green packaging can be summarized as functional value, aesthetic value, emotional value and social value.

3.2. Variable measurement

According to the results of the dimension of the factors affecting the purchase of green packaging by consumers in qualitative research, the following measurement scales are made in four dimensions.

Table 3. Consumers buy green packaging influencing factors measurement items

| Potential variable | Observation variable | Problem                                                                 |
|--------------------|----------------------|-------------------------------------------------------------------------|
| Functional value   | A01                  | I value the convenience of green packaging.                             |
|                    | A02                  | I value the ease of storage of green packaging.                         |
|                    | A03                  | I value the convenience of green packaging.                             |
|                    | A04                  | I value the use of green packaging more.                                |
|                    | B01                  | I use green packaging to focus on packaging art.                        |
|                    | B02                  | I use green packaging to focus on the design of the packaging.          |
|                    | B03                  | I use green packaging to focus on packaging visual experience.          |
|                    | B04                  | I use green packaging to focus on packaging culture elements            |
|                    | C01                  | I value the emotional experience of green packaging.                    |
|                    | C02                  | I value the humane care of green packaging.                             |
|                    | C03                  | I value the emotional impact of green packaging on people.              |
|                    | C04                  | I value the commemorative meaning of green packaging.                   |
|                    | D01                  | I am a person who values environmental protection.                      |
|                    | D02                  | I am a strong green person.                                             |
|                    | D03                  | I value the environmental protection of green packaging.                |
|                    | D04                  | I value the recyclability of green packaging.                           |

3.3. Data collection and sample characteristics

In order to obtain the influencing factors of consumers’ purchasing green packaging, a survey was conducted on consumers. The survey is divided into two parts, basic information and factors affecting purchase intention. Basic information includes gender, age, income, education, and occupation. Influencing factors of purchase intentions are combined with 16 items of functional value, aesthetic value, affective value and social value. Using the Likert seven-point scale measurement option, the respondents scored according to the options in the questionnaire. Among them, “1” means very agree, the degree of influence is the biggest, “7” means very disagree, and the impact is the least.

The survey mainly used online random distribution methods, a total of 266 questionnaires were distributed and recovered, 8 invalid questionnaires were eliminated, and 258 valid questionnaires were finally valid. The efficient recovery reached 96.99%.
Table 4. Basic information of the respondent

| Project | Gender | Male 103 (39.92%) | Female 155 (60.08%) |
|---------|--------|-------------------|---------------------|
| Age     |        |                   |                     |
| Under 20 years old | 58 (28.1%) | 20 - 30 years old | 134 (51.94%) |
| 31 - 40 years old | 47 (18.22%) | 41 years old or older | 19 (7.36%) |
| Education |        |                   |                     |
| High school and below | 19 (7.36%) | Specialist | 59 (22.87%) |
| Bachelor | 163 (63.18%) | Master degree and above | 17 (6.59%) |
| Career |        |                   |                     |
| Student | 127 (49.22%) | Corporate employee | 81 (31.4%) |
| Civil servant | 10 (3.88%) | Independent entrepreneur | 16 (6.2%) |
| Institution employee | 21 (8.14%) | other | 3 (1.16%) |
| Monthly income |        |                   |                     |
| Less than 2,000 yuan | 114 (44.19%) | 2000—4000 yuan | 93 (36.05%) |
| 4000—8000 yuan | 29 (11.24%) | More than 8,000 yuan | 22 (8.53%) |

3.4. Exploratory factor analysis

The reliability and validity of the questionnaire data were analyzed. The reliability and validity of the four latent variables were tested by SPSS26.0, and the relevant data in the following table were obtained.

It can be seen from the table that the reliability coefficient values of the four latent variables are 0.934, 0.941, 0.941, and 0.946, respectively. And the reliability coefficient is greater than 0.9, thus indicating that the research data reliability is very high. For the "alpha coefficient of item deleted", the reliability coefficient value after the analysis item is deleted has not been significantly improved, thus indicating that all the original questionnaire questions should be retained, further indicating that the research data reliability level is high. For the "CITC value", the CITC values corresponding to the analysis items are all higher than 0.8, thus indicating that there is a good correlation between the analysis items, and also indicating that the reliability level is good. In summary, the value of the reliability coefficient of the research data is higher than 0.9, and the reliability coefficient value after the deletion of the title is not significantly improved. The comprehensive description indicates that the data reliability is high and can be used for further analysis.

The validity study is used to analyze whether the research items are reasonable. The validity analysis uses factor analysis to conduct a comprehensive analysis by KMO value, commonality, variance interpretation rate value, factor load factor value and other indicators to verify the validity of the data. Level situation. The KMO value is used to judge whether it is valid. It can be seen from the table that the common value corresponding to all the research items is higher than 0.4, indicating that there is a good correlation between the analysis items, and also indicating that the reliability level is high. In summary, the value of the reliability coefficient of the research data is higher than 0.9, and the reliability coefficient value after the deletion of the title is not significantly improved. The comprehensive description indicates that the data reliability is high and can be used for further analysis.

Table 5. Reliability and validity analysis

| Potential variable | Observation variable | CITC | The alpha coefficient of item deleted | Cronbach a coefficient | KMO | Bart spherical value | df | Sig. |
|--------------------|----------------------|------|--------------------------------------|------------------------|-----|---------------------|----|------|
| Functional value   | A01                  | 0.802 | 0.928 | 0.934 | 0.861 | 879.842 | 6 | 0.000 |
|                    | A02                  | 0.887 | 0.901 |                   |               |       |    |       |
|                    | A03                  | 0.857 | 0.91 |                   |               |       |    |       |
|                    | A04                  | 0.835 | 0.918 |                   |               |       |    |       |
| Aesthetic value    | B01                  | 0.859 | 0.923 | 0.941 | 0.869 | 919.017 | 6 | 0.000 |
|                    | B02                  | 0.875 | 0.917 |                   |               |       |    |       |
|                    | B03                  | 0.852 | 0.925 |                   |               |       |    |       |
|                    | B04                  | 0.848 | 0.926 |                   |               |       |    |       |
| Emotional value    | C01                  | 0.878 | 0.916 | 0.941 | 0.864 | 936.485 | 6 | 0.000 |
|                    | C02                  | 0.884 | 0.914 |                   |               |       |    |       |
|                    | C03                  | 0.858 | 0.922 |                   |               |       |    |       |
|                    | C04                  | 0.814 | 0.936 |                   |               |       |    |       |
| Social value       | D01                  | 0.898 | 0.921 | 0.946 | 0.868 | 936.485 | 6 | 0.000 |
|                    | D02                  | 0.855 | 0.935 |                   |               |       |    |       |
|                    | D03                  | 0.89  | 0.924 |                   |               |       |    |       |
|                    | D04                  | 0.842 | 0.939 |                   |               |       |    |       |
3.5. Confirmatory factor analysis

In this paper, Amos24.0 software is used to calculate and test the structural equation model, and the correctness of the model research hypothesis is verified by whether the path coefficient between the latent variables is significant. The validity of each index is verified by observing the load coefficient of the variable; The fitting goodness index of the fitting index, the value-added fitting index and the simple fitting index are used to verify the feasibility of the model.

Using software to model, the path coefficients in the derived calculation results are shown in Figure 1 and Table 6. In Fig. 1, e1, e2, … ,e16 represent the residual terms of the observed variables and the latent variables in turn, and the non-normalized path coefficient values and the values of the residual terms between the paths can be read from Fig. 1. Table 6 shows the output of non-standardized path coefficients, including the path coefficients between the paths and their standard errors, critical ratios, and saliency.

Fig 1. Structural equation model non-standardized path coefficient graph
Table 6. Output results of non-standardized path coefficient

| Path                  | Estimate | S.E.  | C.R.  | P     |
|-----------------------|----------|-------|-------|-------|
| A01 <--- Functional value | 1        |       |       |       |
| A02 <--- Functional value | 1.097    | 0.054 | 20.243| ***   |
| A03 <--- Functional value | 1.083    | 0.057 | 19.14 | ***   |
| A04 <--- Functional value | 1.092    | 0.059 | 18.413| ***   |
| B01 <--- Aesthetic value | 1        |       |       |       |
| B02 <--- Aesthetic value | 1.013    | 0.047 | 21.72 | ***   |
| B03 <--- Aesthetic value | 0.981    | 0.046 | 21.144| ***   |
| B04 <--- Aesthetic value | 1.026    | 0.047 | 21.91 | ***   |
| C01 <--- Emotional value | 1        |       |       |       |
| C02 <--- Emotional value | 0.978    | 0.038 | 25.589| ***   |
| C03 <--- Emotional value | 0.923    | 0.04  | 23.151| ***   |
| C04 <--- Emotional value | 0.859    | 0.042 | 20.279| ***   |
| D01 <--- Social value | 1        |       |       |       |
| D02 <--- Social value | 0.927    | 0.038 | 24.131| ***   |
| D03 <--- Social value | 0.96     | 0.036 | 26.651| ***   |
| D04 <--- Social value | 0.961    | 0.042 | 22.685| ***   |

It can be seen from Table 6. The P value of the load factor is less than 0.05, indicating that the path coefficient is significant, and the path coefficients between the four latent variables and the 16 observed variables are positive. That is, functional value, aesthetic value, affective value and social value have an impact on consumers' purchase of green packaging, and each observed variable can well reflect the meaning of the potential variable to which it belongs.

Table 7. Summary of overall fitness test for the structural equation model

| Statistical test | Adaptation standard | test Result data | model Adaptation standard |
|------------------|---------------------|------------------|---------------------------|
| Absolute fit index | X²                  | P>0.05 (not reaching a significant level) | 0 | YES |
|                   | X²/df               | <3               | 1.615                     | YES |
|                   | RMSEA               | <0.08            | 0.049                     | YES |
|                   | GFI                 | >0.9             | 0.929                     | YES |
|                   | AGFI                | >0.9             | 0.902                     | YES |
| Value added fitting index | NFI | >0.9 | 0.968 | YES |
| Simple fitting index | PGFI | >0.5 | 0.67 | YES |
|                   | PNFI                | >0.5             | 0.791                     | YES |

It can be seen from the fitting index results that the overall model fitting index has reached the adaptation criteria. The chi-square value, the chi-square degree of freedom ratio, the RMSEA value, the GFI value, and the AGFI value in the absolute fitting index satisfy the required adaptation criteria. The NFI value, TLI value and CFI value in the value-added fitting index were all >0.9, which reached a standard close to 1. The PGFI value and PNFI value in the simple fitting index were all >0.5. The above indicators all meet the adaptation criteria required by the model, which can be concluded that the overall fit of the structural equation is good, so the model is considered to pass the test.

4. Conclusions and recommendations

Through exploratory factor analysis, confirmatory factor analysis and related analysis, it can be seen that this paper develops the influencing factors of consumers' purchase of green packaging from the four dimensions of functional value, aesthetic value, affective value and social value. It has good reliability and validity, and the measurement model has good fit and stability. In theory, it provides a tool for measuring the impression factors of consumers' willingness to buy green packaging. The consumer-sponsored green packaging willingness model proposed by the Institute has a certain guiding role for enterprises in time, and provides reference for the enterprise green marketing. At the
same time, in the next study, it is also possible to further influence the influence of the factors affecting consumers' purchase of green packaging on the willingness to use, and make more favorable decisions for enterprises and consumers.

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