Research Article

Analysis and Building of Trading Platform of Construction 3D Printing Technology and Products

Hongxiong Yang , Kaozhi Zhu , and Min Zhang

School of Management, Tianjin University of Technology, China

Correspondence should be addressed to Kaozhi Zhu; zhukaozhi2@163.com

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Construction 3D printing technology has been rapidly developed, but in the usual life, there are still many people who have not heard of or used construction 3D printing products, and many people want to buy Construction 3D printing products, but there is no channel. Therefore, through the questionnaire survey of potential customers, from the willingness of potential customers, the influencing factors of construction 3D printing technology product trading platform are analyzed, and the PLD-SEM model is established. The potential customers are analyzed in the 3D printing technology product trading platform, with more attention to factors, including product categories, prices, trading platform customization features, and excellent network capabilities. Finally, the 3D printing technology product trading platform was designed, and the customer management module, construction 3D printing technology product information management module, construction 3D printing technology product retrieval module, and transaction information management were proposed. Building a fully functional 3D printing technology product trading platform that can attract more potential customers provides customers with a channel to understand and purchase 3D printing products and helps solve the current 3D printing technology products difficult to promote and trade problem.

1. Introduction

3D printing is a rapid prototyping technology. It mainly relies on computer pre-edited operation instructions to create a digital model of the product, and the 3D printer prints the product layer by layer according to the model [1]. Since Charles Hull invented the first 3D printer in 1986, 3D printing has been widely used in manufacturing, bio-engineering, automotive engineering, aerospace engineering, food processing, and other fields [2–4]. For example, in medical terms, 3D printing has made it possible to make teeth, drugs, and even bones, where Goyanes et al. [5] manufacture individual tablets containing drug doses tailored to individual patients by fusing filament 3D printing (FF 3DP). The minimum feature can be achieved as 0.1 mm; in some hospitals, the organ model that is usually trained is also printed by 3D printing technology. Even some bones can be printed in 3D and implanted into the patient. 3D printed bones have good compatibility with human tissues [6]. In terms of chemistry, Feng Zhang et al. [7] proposed 3D printed electrochemical energy storage devices compared to

conventional electrochemical energy storage devices. It can better control the electrode and solid electrolyte to ensure its performance. In printing, Zhang et al. [8] use fused deposition modeling (FDM); based on graphene-based 3D printing flexible circuit, the minimum features of 3D printing can be realized, 1.75 mm. It can be said that the current 3D printing technology is developing very rapidly and its use is more and more extensive. Printing accuracy is also getting higher and higher, even reaching nanoscale printing [9]. The number of items that can be printed is also growing, such as Yingchuang Technology in Shanghai, China. In November 2015, the company successfully printed a 15-meter-high 6-story building using 3D printing technology.

As a branch of 3D printing, construction 3D printing (C3DP) has attracted more and more scholars' attention in recent years. Compared with traditional building methods and prefabricated building methods, C3DP has many advantages. First, C3DP can greatly shorten the construction period. In 2014, China Yingchuang successfully used C3DP technology within 24 hours. Print out the blanks of 10 villas. Second, C3DP can produce less construction waste.

In the 3D printing process of the building, new technical materials were used. For example, Biranchi used experiments to develop a printable one-component geopolymer mixture including aluminosilicate as the material of the wall. It can be extruded and stacked by the nozzle of the 3D printer without deforming the bottom layer, which greatly deepens the wall's resistance to the environment [10]. Although C3DP technology has many advantages, it is still not popular around the world. The main reasons are as follows.

The first is safety. In recent years, people have expressed concern about the safety performance of 3D printed products. Buildings that are printed in 3D require not only high load carrying capacity but also high resistance to earthquakes, earthquakes, and harsh environments. This has high requirements for the structure and materials of the building. In fact, with the in-depth study of C3DP in recent years, this problem has gradually been solved. Maier et al. [11] have experimentally proved that calcium aluminate cement (CAC) has high hardening properties and can be applied to C3DP; Khoshnevis et al. [12] proposed a cement composite material composed of mud-like and clay-like materials. The composition can be smoothly extruded through the contour processing system to achieve high surface finish and highest geometric accuracy. Through experiments, Salvador et al. [13] developed a new type of squeezable concrete material: sprayed concrete. It is a blend of optimized aggregate, fine sand, high-content cement and powder additives. It has the advantage of being easy to circulate in 3D printers and easy to extrude, while also having good adhesion and bulk thickness. And in 2007, Italian engineer Enrico Dini invented a large-scale powder 3D printer whose main purpose was to repair Construction artifacts. Biranchi et al. [14] found that adding attapulgite clay (NC) to concrete in 3D printing through nanotechnology can effectively improve the hardness and mechanical strength of concrete. In 2012, Novikov and others successfully designed a construction 3D printer and named it "Stone Spray". In 2014, the Chinese company Qingdao Unique Technology also exhibited a large 3D printer measuring 12 m $\times$ 12 m $\times$, which can extrude a semimolten glass reinforced plastic material layer by layer on the foundation floor to build a prototype [15]. Nowadays, there are already many C3DP companies in the world, and successfully printed the buildings for people to live. All of the above are sufficient to show that C3DP technology has become more mature and can provide sufficient protection for people who use 3D printed buildings.

Secondly, the promotion of C3DP is not strong enough for people. This paper has conducted a questionnaire survey of people from all walks of life in 165 communities. In the survey results, 56% of people have never heard of C3DP, and 12% have heard it but have no interest in C3DP. 21% of people have heard but have not used C3DP products, and only 11% have used C3DP products. And in China, the number of 3D printing technology trading platforms is very small. Some companies or individuals want to customize some personalized 3D printing technology products, but they have to give up because there is no channel to buy. Although there is a trading platform for C3DP DreamWorks in China (<http://www.mayidida.com/>), the platform is currently in the

initial stage, with less customer demand, fewer products, and less influence. Some customers also reported that the platform still has shortcomings such as unreasonable website design and no product recommendation page, which makes customers reluctant to use the platform again. Taobao, Jingdong, and other trading platforms also sell some 3D printing technology products but cannot meet the individual needs of customers for products. This indicates that the existing C3DP technology product trading platform cannot meet the needs of the contemporary society. To this end, it is urgent to solve the problem that building a customer-satisfied 3D printing technology product trading platform that can meet various needs.

In the current research literature on C3DP, most of them study its material composition and structure, how to attract potential customers to understand and use C3DP products, and how to build C3DP technology. There are few studies on product trading platforms. Through the specific analysis of existing literature and examples, according to the particularity of the 3D printing technology product trading platform, the impact of three factors is based on network capabilities, C3DP technology products and platform functions on potential customers, and potential customers to the building. The influence of 3D printing technology product trading platform, combined with PLS-SEM tool research to build a customer-oriented 3D printing technology product trading platform with customized functions.

2. Research Hypothesis

2.1. Relationship between Network Capabilities and Product the Willingness of Potential Customers. Mayidida is the only existing trading platform of C3DP technology and products in China. It is a web-based website, and its network capabilities have a great impact on whether product customers are willing to use the platform. Network capabilities include both the network technology capabilities built by the website and the network propaganda capabilities. A technology and products trading platform with good network technology capabilities, including a fast open platform and a retrieval system, can attract potential customers to use this trading platform [16]. The network propaganda capabilities are also very important to the potential customer. No matter how good the product trading platform is built, if the network propaganda capability is not enough, the product customer's attention may be little and far between. Based on this, in order to build a trading platform of C3DP technology and products, the following assumptions are made:

H1: Network technology capabilities have a positive impact on the willingness of potential customers.

H2: Network propaganda capabilities have a positive impact on the willingness of potential customers.

2.2. The Relationship between C3DP Technology and Products and the Willingness of Potential Customers. The C3DP technology and products here include categories, quality, and price. These are also the most concerned content on trading platform of C3DP technology and products to potential

customers. If the product in the platform is rich in variety, is reasonable in price, and is good in quality, the potential customers will be more willing to use the trading platform [8]. Based on these, there are the following assumptions.

H3: The categories of C3DP technology and products have a positive impact on the willingness of potential customers.

H4: The quality of C3DP technology and products has a positive impact on the willingness of potential customers.

H5: The price of C3DP technology and products has a negative impact on the potential customer wishes.

2.3. Relationship between Platform Function and the Willingness of Potential Customers. A trading platform with multiple functions can attract potential customers to purchase products in the trading platform. Taobao, Jingdong, and other trading platforms have product push function, which collects product keywords searched by potential customers in the platform. When the next potential customers log into the trading platform, the platform actively pushes the same type of quality products with keywords to satisfy potential customers demand. Sometimes the products sold on the platform can't meet the customer needs. For example, the size of the 3D printed chair sold in the platform may be too large or too small for the customer. Many potential customers want the platform to have product customization function. Based on this, the paper makes the following assumptions:

H6: Product push function has a positive impact on the willingness of potential customers.

H7: Product customization function has a positive impact on the willingness of potential customers.

2.4. Relationship between Willingness of Potential Customers and Trading Platform of C3DP Technology and Products. C3DP technology and products are sold to potential customers, so the willingness of potential customers is crucial for trading platform of C3DP technology and products. The more potential customers, the higher visibility of C3DP trading platform. At present, the transaction methods of C3DP technology and products are mainly based on customer active search. The social formed C3DP technology and products market transactions are not standardized, and the scope is small, which cannot meet the needs of potential customers. Based on this, the following assumptions are made:

H8: The potential customer wishes have a positive impact on the C3DP trading platform.

In summary, the theoretical model of this study is presented, as shown in Figure 1.

3. Introduction to PLS-SEM

Partial least squares structural equation model (PLS-SEM) is a new method proposed by Wold [17] equal to the regression in the 1980s. It is suitable for measuring multi-index aggregation problems, mainly through the use of iterative. The method performs operations to effectively estimate the relationship between explicit and implicit variables and the relationship between hidden variables [18]. Compared with

the Maximum Likelihood Estimation Method (LISREL), the PLS method can also be highly adaptable to small samples, can better deal with the multicollinearity problem between indicators, and can study latent variables and their measured variable groups. The relationship [19] and the construction of 3D printing products customers are small, the group is special, and the use of PLS-SEM method can reflect the interaction between various factors, so that a more realistic 3D printing technology product trading platform can be designed. The PLS-SEM method does not require the data to obey the multivariate normal distribution in the study sample data distribution, and is especially suitable for small sample conditions, and can combine two different index types: formative indicators and reflective indicators, especially directly obtaining R^2 , to maximize the interpretation of the variation variance of the dependent variable, closer to the data, and enhance the accuracy of exploratory research and data analysis. At present, the PLS-SEM method has been widely used in economic management, biomedicine, etc. and has been recognized by most scholars.

The specific model of PLS-SEM method is as follows.

External Model. Suppose that each explicit variable is: $X_j = (x_{j1}, x_{j2}, \dots, x_{jp})$, $j = 1, 2, \dots, J$, $p = 1, 2, \dots, P$. In this paper, X_j denotes the question J , and x_{jp} denotes the load of the person P on the question J , and assume that each explicit variable X_j corresponds to a hidden variable ξ_j , ($j = 1, 2, \dots, J$), of which the mean of ξ_j is 0 and the variance is 1. The measurement model is the relationship between X_j and ξ_j [20].

In the form of expression, the measurement model usually has two forms of reflection, as shown in formula (1).

$$x_{jp} = \lambda_{jp}\xi_j + \varepsilon_{jp} \quad (1)$$

ε_{jh} is a random error, and the mean of ε_{jh} is 0; it is not related to ξ_j . λ_{jp} is its load factor. The upper formula should meet the following conditions:

$$E(x_{jp} | \xi_j = \lambda_{jp}\xi_j) \quad (2)$$

In the way of reflection, the only dimension test needs to be done, and the principal component analysis can be used to test it.

Another way is to constitute the way that ξ_j has a linear combination with its explicit variable group X_j , which is

$$\xi_j = \sum_{p=1}^J \omega x_{jp} + \delta_j \quad (3)$$

where δ_j is also a random error term that satisfies formula (3) and

$$E(\xi | x_1, x_2, \dots, x_j) = \sum_{p=1}^P \omega x_{jp} \quad (4)$$

It shows that δ_j mean value is 0, and it is not related to the explicit variable x_{jp} .

FIGURE 1: Theoretical model of this study.

4. Empirical Research

4.1. Data Collection and Classification. The data collected by the study was obtained by distributing questionnaires to potential customers of a regional product. The questionnaire answer is a single choice, the answer is a five-scale, 5 means “strongly agree”, 4 means “agree”, 3 means “indifferent”, 2 means “disagree”, and 1 point means “strongly disagree” [21]. The specific measurement scale is shown in Table 1.

In the two cities of Beijing and Tianjin in China, 170 questionnaires were distributed and 165 were returned, of which 150 were valid questionnaires and 15 were invalid questionnaires. The effective rate is 90.9%, which is in line with the validity of the questionnaire. In the specific statistical group, it includes age, gender, city, and whether you have heard of four types of C3DP products. Judging from the specific types of projects, the distribution of the survey objects basically covers various types, reflecting the high quality of the survey questionnaires. Descriptive statistics for specific questionnaires are shown in Table 2.

4.2. Data Processing. After the latent variable index is determined, the reliability and validity of the SPSS software are first analyzed. For model reliability evaluation, we mainly evaluate the reliability of the scale by measuring the internal consistency of items. The internal consistency is tested by the value of Composite Reliability and Cronbach Alpha (α) coefficients. In the exploratory study, Composite Reliability is required to be above 0.7 and Cronbach Alpha (α) to be greater than 0.6 [22]. It can be seen from Table 2 that the Composite Reliability of all the latent variables and Cronbach Alpha (α) coefficients meet the requirements, which indicates that the measurement model has good reliability.

When all loads are greater than 0.6, the latent variables can be reasonably explained. As shown in Table 3, all the loads in this study satisfy the requirements of structural validity. In addition, the convergence validity and discriminant validity of the PLS model are mainly based on Average

Variance Extracted, requiring Average Variance Extracted (AVE) greater than 0.5 and requiring that the square root of the Average Variance Extracted (AVE) value be greater than the correlation of other latent variables Coefficient [23]. From Tables 3 and 4, we find that the research data satisfy the above conditions, indicating that there is a good linear equivalence relationship between the measured variable and the latent variable. The measured variable can explain the latent variable well.

The predictive ability of the C3DP trading platform model is evaluated by the multiple decision coefficient R^2 (see Table 5). The larger the value, the stronger the ability of the measured variable to interpret the latent variable [24]. It can be seen from Table 5 that the degree of interpretation of the model by potential customers is 0.696. R^2 of the network technology capability to the potential customer's will is 0.702, and R^2 of the network propaganda capability to the potential customer's will is 0.659. R^2 of the C3DP technology and products category to the potential customer's wishes is 0.684, R^2 of the C3DP quality to the potential customer will is 0.822, R^2 of product price to product potential customers is 0.738, R^2 of the product push function to potential customers is 0.872, and R^2 of product customization to the potential customer wishes is 0.885. In general, R^2 has a weaker interpretation ability between 0.25 and 0.5, and an interpretability between 0.5 and 0.75 is moderate. The values in Table 5 indicate that the interpretation ability of the model meets the requirements.

4.3. Hypothetical Verification. The model of Figure 1 was solved by Smart-pls 3.0, and the obtained path is shown in Figure 2. The path coefficient represents the influence relationship between the various latent variables. The larger the absolute value of the path coefficient, the stronger the influence of these two latent variables. It is generally considered that the path coefficient exceeds 0.7, which is a strong influence. The 0.5-0.7 are a general influence, and the following 0.5 is a weak influence. It can be found from the

TABLE 1: Measurement scale entries and numbers.

Latent variable	Measuring variable		number
network capabilities	Network technology capabilities	Is a clear and concise C3DP trading website important to you? If the C3DP trading website opens quickly, would you frequent it?	A11 A12
	Network propaganda capabilities	If someone tells you the C3DP trading website that you have never heard before, would you browse it? For a publicity C3DP trading website, will you browse it?	A21 A22
C3DP technology and products	categories	If there are many kinds of products on C3DP trading website, would you often browse it?	B11
		If there are only a few special products on the C3DP trading website, would you often browse it?	B12
		If there is a defect product on C3DP trading website, will you continue to visit it?	B21
		If the quality of the products sold on a C3DP trading website is good, will you continue to visit it?	B22
platform function	quality	If the price of a product on a C3DP trading website is very high, would you always log into it?	B31
		If the price of a product on a C3DP trading website is very cheap, would you often log into it?	B31
		If a C3DP trading platform has a product push function, would you consult it?	C11
		If a C3DP trading platform often pushes products for you, would you frequent it?	C12
potential customer's wishes	price	If a C3DP trading platform can publish your specific requirements information, will you frequent it?	C21
		If a C3DP trading platform can produce products to meet your specific requirements, would you frequent it?	C22
		If a C3DP trading platform can meet all of the above requirements, are you willing to buy products on it?	D11
		If a C3DP trading platform can meet all of the above requirements, would you like to sell the products on it?	D12

FIGURE 2: PLS-SEM model path coefficient map.

TABLE 2: Descriptive statistics.

Group	Project	Quantity
Age	<30	68
	30-45	44
	45-60	33
	>60	5
Gender	Male	82
	Female	68
City	Beijing	62
	Tianjin	88
Have you heard of C3DP products?	YES	66
	NO	84

data in Figure 2 that H1, H4, H5, H6, H7, and H8 are all strongly positive, assuming H2 and H3 are generally positive effects.

4.4. Discussion of Results. The above research results show that the willingness of potential customers has a strong influence on the C3DP trading platform. When designing and constructing the C3DP trading platform, we should pay attention to the willingness of potential customers. Network capabilities, platform capabilities, and products have a positive impact on potential customers who have not used C3DP, with customized features and product prices that are more attractive to them. In other words, when establishing a C3DP trading platform, the first thing to focus on is whether the sellers in the platform have the ability to customize personalized products and cooperate with companies that can manufacture personalized products and need to control the building. The price of C3DP is to win more potential customers. At the same time, we must also pay attention to the network technology capabilities, product quality, product push function, and other factors of the platform. These are also the places to be considered when establishing the C3DP trading platform.

5. C3DP Trading Platform Construction

Java ranks first in common languages due to its inherent network mobility, object-oriented, platform-independent, secure, and reliable features. The portability of the Java language can save development costs and resources by sharing a large amount of code. Therefore, Java language is the implementation tool for the website of the C3DP trading platform, providing user-oriented design [25]. Background mainly provides database support and system management and maintenance. SQL language structure is simple, powerful, and widely used. MySQL, Oracle, and other database development systems support SQL language as the query language. Therefore, the C3DP trading platform system uses SQL language and MySQL for database data storage design. In order to meet the demand of potential customers to purchase C3DP technology and products, the C3DP trading system mainly includes customer information management, technical product information management, technical product retrieval, and transaction information management, four modules [26]. The platform provides the following functions: (1) users can query the price and quality of the products they need from the C3DP trading platform; (2) users can post their own personalized needs from the C3DP trading platform. Its specific design is shown in Figure 3.

The system has a total of four modules, which are described as follows.

5.1. The Management Module of Customer. There are two kinds of customer management. One is the basic information management of customers. With the information of customers, it is possible to carry out the work of order delivery, data statistics, and collation according to these information. Customers must be registered to become a member to log in and need to pass the authentication (including name, ID number, foreign passport, or other equivalent documents), and you have the right to use, purchase, communicate, etc. after logging in. The other is customer search information management. The platform collects C3DP technology and products type information that customers frequently check

TABLE 3: Test results of the measurement model.

Index	Mean	Standard deviation	Load
Network technology capabilities(Composite Reliability = 0.818, AVE = 0.739, Cronbach' α = 0.883)			
A11	3.75	1.114	0.892
A12	3.64	1.178	0.877
Network propaganda capabilities(Composite Reliability = 0.754, AVE = 0.628, Cronbach' α = 0.759)			
A21	4.12	1.117	0.791
A22	4.23	1.155	0.746
Products categories(Composite Reliability = 0.745, AVE = 0.703, Cronbach' α = 0.811)			
B11	3.54	1.078	0.841
B12	3.53	1.079	0.849
Products quality(Composite Reliability = 0.872, AVE = 0.664, Cronbach' α = 0.759)			
B21	3.56	1.085	0.744
B22	3.01	1.059	0.782
Products price(Composite Reliability = 0.901, AVE = 0.756, Cronbach' α = 0.942)			
B31	4.24	0.867	0.987
B32	4.20	0.927	0.900
Product push function (Composite Reliability = 0.885, AVE = 0.769, Cronbach' α = 0.803)			
C11	4.35	1.011	0.827
C12	4.17	1.032	0.793
Product customization function (Composite Reliability = 0.927, AVE = 0.855, Cronbach' α = 0.875)			
C21	3.41	1.034	0.852
C22	3.28	1.025	0.848
potential customer's wishes (Composite Reliability = 0.792, AVE = 0.656, Cronbach' α = 0.780)			
C11	3.32	1.009	0.827
C12	3.27	0.872	0.793

FIGURE 3: C3DP technology and products trading system design.

TABLE 4: Correlation coefficient between AVE square root and latent variable.

	Network technology capabilities	Network propaganda capabilities	Products categories	Products quality	Products price	Product push function	Product cus- tomization function	potential customer's wishes
Network technology capabilities	0.860							
Network propaganda capabilities	0.786	0.815						
Products categories	0.764	0.795	0.870					
Products quality	0.732	0.751	0.662	0.810				
Products price	0.802	0.741	0.703	0.721	0.722			
Product push function	0.850	0.795	0.753	0.807	0.844	0.823		
Product customization function	0.876	0.772	0.727	0.829	0.851	0.825	0.931	
potential customer's wishes	0.821	0.902	0.759	0.848	0.882	0.861	0.917	0.903

FIGURE 4: Database concept design E-R diagram.

TABLE 5: R^2 values of each variable.

Measuring variable	R^2 value
Network technology capabilities	0.702
Network propaganda capabilities	0.659
Products categories	0.684
Products quality	0.822
Products price	0.738
Product push function	0.872
Product customization function	0.885
potential customer's wishes	0.696

on the platform. On the next customer login platform, it can actively push new products of this type for customers, attracting potential customers to purchase and use C3DP technology and products.

5.2. The Information Management Module of C3DP Technology and Products. This section includes the attributes (product type, product size, product production location, price, and quantity) of the C3DP technology and products that the sellers upload. It also includes the satisfaction level of the customer. And it allows users to add, delete, and update the products information which consumer uploaded.

5.3. The Search Module of C3DP Technology and Products. This module is divided into general technical product search and personalized product custom search. The purpose of general technical product search is to facilitate customers to search for products, including specific product search and fuzzy search, which is a module for customers. Personalized product customization search is to meet the needs of potential customers. After collecting the types, sizes, and materials of the personalized C3DP technology and products that potential customers want to customize, the information is summarized and placed. On the customized platform,

the seller decides whether the product can be customized through evaluation information. If seller can do it, the seller will discuss price with the customer and finally finish the transaction on the platform. This module faces the customer and the sellers.

5.4. The Information Management Module of Transaction. After the potential customer retrieves the product he wants, he adds it to the shopping cart. The shopping cart can keep the product for 1 hour. If the order is not generated after 1 hour, the shopping cart will be automatically cleared. If the order is generated, the C3DP trading platform provides customers with a variety of flexible trading methods: ① online payment and distribution; customers need to clearly indicate the address of the product, contact information; ② online payment and self-collection; close to the business, customers can choose this way, can save the delivery time, and get the product as soon as possible; ③ payment on site and removal of products. the transaction method, the order is reserved for 3 days, if the user does not take the product after 3 days, the seller can close the order; ④ independent trading between sellers and customers. This method is only applicable to customized C3DP technology and products. After the transaction is completed, the customer can cancel the product demand information.

This is according to the above four modules involved in the entity and relationship drawing database concept design E-R diagram, as shown in Figure 4.

6. Conclusion

In order to promote the development of C3DP in China, the C3DP trading platform can attract more potential customers and functions are built. This paper builds network capabilities by investigating some people in Beijing and Tianjin, China. Based on the PLS-SEM model combined with 150

questionnaires and the empirical study of the above model, the conclusions are as follows:

(1) Product customization and product push have a strong positive impact on potential customers. Compared with other trading platforms, the C3DP technology product trading platform should have product customization function and product push function to attract more potential customers. The product push function is to let potential customers passively understand the C3DP products, increase the way for potential customers to know the C3DP products, and lay a good foundation for the promotion of C3DP in China. The product customization function can meet the individual needs of today's potential customers and bring out the technical advantages of C3DP: product diversification.

(2) The type and price of the product have a strong positive impact on potential customers. So the type and price of products are also important ways to attract potential customers. C3DP products should meet the purchasing power of the masses. If the price is too high, it will eventually lead to the loss of potential customers, which will make it difficult for C3DP to be promoted in China. On the basis of product safety, C3DP companies should be encouraged to carry out various types of development, which can make 3D printing products available to people of different occupations.

(3) Attracting more potential customers, the C3DP technology trading platform itself should also have perfect functions, which can organize and store different kinds of information, such as customer information, product information, and C3DP enterprise information. At the same time, having certain network technology capabilities is also an important factor in ensuring the long-term development of the 3D printing technology trading platform.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

- [1] T. Owens, "7 Things you should know about 3D printing," *EDUCAUSE Learning Initiative (ELI)*, 2013.
- [2] D. Zhang, B. Chi, B. Li et al., "Fabrication of highly conductive graphene flexible circuits by 3D printing," *Synthetic Metals*, vol. 217, pp. 79–86, 2016.
- [3] J. Sun, Z. Peng, L. Yan, J. Y. H. Fuh, and G. S. Hong, "3D food printing—an innovative way of mass customization in food fabrication," *International Journal of Bioprinting*, vol. 1, pp. 27–38, 2015.
- [4] G. Ma, L. Wang, and Y. Ju, "State-of-the-art of 3D printing technology of cementitious material—an emerging technique for construction," *Science China Technological Sciences*, vol. 61, no. 4, pp. 475–495, 2018.
- [5] A. Goyanes, A. B. M. Buanz, A. W. Basit, and S. Gaisford, "Fused-filament 3D printing (3DP) for fabrication of tablets," *International Journal of Pharmaceutics*, vol. 476, no. 1, pp. 88–92, 2014.
- [6] S. L. Sing, S. Wang, S. Agarwala, F. E. Wiria, T. M. H. Ha, and W. Y. Yeong, "Fabrication of titanium based biphasic scaffold using selective laser melting and collagen immersion," *International Journal of Bioprinting*, vol. 1, no. 3, pp. 65–71, 2017.
- [7] F. Zhang, M. Wei, V. V. Viswanathan et al., "3D printing technologies for electrochemical energy storage," *Nano Energy*, vol. 40, pp. 418–431, 2017.
- [8] S. Zhang, X. U. Yansong, S. Sun et al., "A Review on the Progress of 3D Printing Materials," *China Plastics*, 2016.
- [9] R. P. Aquino, S. Barile, A. Grasso, and M. Saviano, "Envisioning smart and sustainable healthcare: 3D-printing technologies for personalized medication," *Futures*, vol. 103, pp. 35–50, 2018.
- [10] E. Furlani, S. Maschio, M. Magnan et al., "Synthesis and characterization of geopolymers containing blends of unprocessed steel slag and metakaolin: the role of slag particle size," *Ceramics International*, vol. 44, no. 5, pp. 131–142, 2018.
- [11] A.-K. Maier, L. Dezmirean, J. Will, and P. Greil, "Three-dimensional printing of flash-setting calcium aluminate cement," *Journal of Materials Science*, vol. 46, no. 9, pp. 2947–2954, 2011.
- [12] B. Khoshnevis, S. Bukkapatnam, H. Kwon, and J. Saito, "Experimental investigation of contour crafting using ceramics materials," *Rapid Prototyping Journal*, vol. 7, no. 1, pp. 32–41, 2001.
- [13] R. P. Salvador, S. H. P. Cavalaro, M. A. Cincotto, and A. D. D. Figueiredo, "Parameters controlling early age hydration of cement pastes containing accelerators for sprayed concrete," *Cement & Concrete Research*, vol. 89, no. 2016, pp. 230–248, 2016.
- [14] B. Panda, S. Ruan, C. Unluer, and M. J. Tan, "Improving the 3D printability of high-volume fly ash mixtures via the use of nano attapulgite clay," *Composites Part B: Engineering*, vol. 165, pp. 75–83, 2019.
- [15] L. Feng and L. Yuhong, "Study on the status quo and problems of 3D printed buildings in China," *Global Journal of Human-Social Science Research*, vol. 14, pp. 7–10, 2014.
- [16] Y. S. Shi, L. C. Zhang, B. Yu et al., "The development of 3D printing technology and its software implementation," *Scientia Sinica Informationis*, vol. 45, no. 2, article 197, 2015.
- [17] H. Wold, "The basic design and some extensions," *Systems Under Indirect Observations Causality Structure Prediction*, vol. 2, 1982.
- [18] L. C. Sun, Q. Mei, and J. Zhou, "Study on the gas station customer loyalty based on PLS-SEM model," *Journal of Applied Statistics and Management*, vol. 32, pp. 608–616, 2013.
- [19] H. P. Cheng, L. Wan, and M. Zhang, "An study on development level of regional public libraries in china: based on partial least squares structural equation model," *Library Intelligence Work*, vol. 12, pp. 19–23, 2015.
- [20] R. Schlittgen, C. M. Ringle, M. Sarstedt, and J.-M. Becker, "Segmentation of PLS path models by iterative reweighted regressions," *Journal of Business Research*, vol. 69, no. 10, pp. 4583–4592, 2016.
- [21] Y. Tyrinopoulos and C. Antoniou, "Analysis of passengers' perception of public transport quality and performance," *International Journal of Information Systems and Supply Chain Management*, vol. 7, no. 1, pp. 56–72, 2014.
- [22] S. M. Roni, H. Djajadikerta, and M. A. Ahmad, "PLS-SEM approach to second-order factor of deviant behaviour: constructing perceived behavioural control," *Procedia Economics and Finance*, vol. 28, pp. 249–253, 2015.

- [23] R. Singh, H. S. Sandhu, B. A. Metri, and R. Kaur, "Modeling supply chain performance: a structural equation approach," *International Journal of Information Systems and Supply Chain Management*, vol. 6, no. 4, pp. 18–41, 2013.
- [24] O. U. Feng, M. Zou, and L. I. Xiao-Zhen, "Survey on Java Technology Framework," *Computer Systems & Applications*, vol. 8, pp. 236–239, 2012.
- [25] S. Wang, W. Lei, Y. Li et al., "Development of personalized 3D printing products online trading platform," *Electronic Test*, vol. 6, pp. 86–87, 2016.
- [26] Y. Jiang, B. Lu, X. Fang, and H. Long, "3D printing-based Internet collect-manufacturing mode," *Computer Integrated Manufacturing Systems*, vol. 22, no. 6, pp. 1424–1433, 2016.

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