

Research on graphic design based on digital media¹

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Abstract. The application of digital media technology has promoted the technical reform in the art field of our country. Under the background of digital media, graphic design is developing rapidly. In order to promote the application of digital media technology in graphic design field, firstly, the research status of digital media and graphic design at home and abroad was introduced in this paper. Then, the multivariate statistical analysis method was applied, and the process of the relationship between digital media and graphic design was expounded. Finally, the data obtained from the multivariate analysis model was analyzed and conclusions were drawn. The results show that the application of digital media technology enriches the means of graphic design, but it has less influence on design thinking and content. According to the research results, the influence of digital media on graphic design was summarized, the direction of improvement was pointed out, and some references were provided for graphic design thinking and content optimization.

Key words. Digital media, graphic design, multivariate analysis.

1. Introduction

In recent years, China's economy and society have been greatly developed, especially in the field of science and technology. The application of computer technology has brought about tremendous impacts on China's economy and society, and has brought about tremendous changes in the lives of our people. The popularization of computer technology and Internet technology has led our country into the digital era.

The advent of the digital media era has provided greater technical support for the development of visual arts and multimedia fields in China, and due to the rapid development of multimedia technology, China has made unprecedented progress in the field of art. Graphic design is one of the most important parts of art. To a great extent, the technology of digital media has promoted the development and

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progress of graphic design in our country. Digital media technology initially has brought great liberation and convenience for the staff of graphic design industry in our country. However, for graphic designers, the most important impact of digital media technology on graphic design industry is that it has led to a qualitative leap in the transmission of design ideas. China's digital media started relatively late. Although it has been generally recognized by our people, how to better understand the impact of digital media on China's graphic design industry and enhance its application effect is still an important topic for our researchers to study deeply.

Based on this, through the construction of multiple-regression analysis model, the graphic design in the background of digital media was analyzed and studied in this paper.

2. State of the art

Foreign scholars have studied digital media technology earlier, while Chinese scholars have fewer achievements, and most of the research results are too theoretical, and there are some deficiencies in the depth and breadth of the research content.

The study of digital time by foreign scholars can be traced back to the 1960s. Hua has proposed that the development of digital media technology will one day replace the traditional media, and people will usher in the digital era [1]. ADI has believed that digital media technology has important implications for modern manufacturing and design industries, and at the same time, he has practically expounded the relationship between the existing digital media technology and graphic design [2]. Gate has believed that media art and media technology are closely related to each other, and meanwhile, he has comprehensively introduced and expounded the development process and major problems of media art in the last century [3]. Discussed was the relationship among new media technology and modern art creation and design teaching, and it was believed that the emergence of digital media technology has historic significance for the design industry [4]. From the point of view of art aesthetics, LAN has expounded the important influence of digital media technology on advertisement design and television art [5].

The above studies are the introduction and discussion of the development process and the influence of digital media technology. Although these studies have conducted a more detailed discussion of the digital media era, there is a lack of research on the practical application of digital technology in graphic design in the era of digital media. Therefore, the in-depth study of the relationship between digital media and graphic design is of great significance. Therefore, in view of the shortcomings of the existing research, a multiple regression analysis model is proposed in this paper, and the graphic design and digital media are analyzed and studied. In addition, in the third part, the specific contents of the research object and the construction of the multiple-regression analysis model are expounded. In the fourth part, the specific data of the multiple-regression analysis model is obtained, and the data results are analyzed. And the fifth part is a summary of the full text.

3. Methodology

Through the method of multiple regression analysis, the graphic design of digital media era was mainly studied in this paper. Some experts thought that in the regression analysis, if there are two or more than two independent variables, it is called the multiple-regression [6]. In fact, a phenomenon is often associated with a number of factors, and it is more effective and more practical to predict or estimate the variables by using the optimal combination of multiple independent variables than with only one independent variable. Therefore, multiple-linear regression is more practical than single linear regression. It was believed that the basic principle and basic calculation process of multiple-linear regression are the same as that of unary linear regression. However, due to the number of independent variables, the calculation is very troublesome, which should rely on statistical software in practical applications [7].

Knight has thought that the units may be different because of the independent variables. For example, in a graphic design level relationship, designer's salary level, education level, occupation, region, family burden and so on will affect the level of graphic design, and the units of these factors are obviously different. Therefore, the magnitude of the coefficient of the independent variable does not explain the magnitude of the factor. To put it simply, the regression coefficient obtained in Yuan is less than the one in 100 yuan in the case of the same wage income, but the effect of the designer's wage level on graphic design will not change. Therefore, each independent variable should be unified into the unit [8]. According to Oswald, the common standard used in theoretical research has this function. Specifically, all variables, including dependent variables, are firstly translated into standard scores and then carried out in linear regression, and the regression coefficients obtained at this time can reflect the importance of the independent variables [9]. The regression equation at this time is called the standard regression equation. The regression coefficient is called the standard regression coefficient, which is expressed as

$$Z_y = \beta_1 \times 1 + \beta_{2Z} \times 2 + \cdots + \beta_{kZ} \times k.$$

Here, β with different subscripts are independent variables, Z is the dependent variable and k is the regression coefficient.

The method of constructing multivariate analysis model follows.

Firstly, the multiple regression analysis is different from the single linear analysis and the two element linear analysis. In the multiple regression analysis, the following formula should be applied to compare and test the fitting degree of regression equation, so as to determine whether the regression equation matches the object and content of the study

$$y = a + bx.$$

Here, y is the fitting degree, a is one yuan regression coefficient, b is two yuan regression coefficient, and x is the regression variable.

Secondly, according to the results of the above fitting operation, the coefficient of decision is adjusted, and the regression equations used in the study can't be

determined until the resulting fit is high enough. Then, the significance tests should be carried out according to the formula

$$b = \frac{\sum xy - n \sum x \sum y}{\left[\sum x^2 - n \left(\frac{\sum x}{n} \right)^2 \right]}$$

to ensure the accuracy of the research results and to lay a good foundation for modeling. Symbol n denotes the number of variables.

Thirdly, the regression coefficients are used to set and select the regression coefficients and variables, and then, the residual analysis is carried out according to the formula

$$a = \sum y - \frac{b}{n} \sum x.$$

Here, $\sum y$ denotes the residual value of fitness, and $\sum x$ is the residual sum of regression variables. The residual analysis is mainly used to achieve the normal distribution of the original data, so as to check again significant differences on the basis of ensuring the regression operation.

Fourthly, the regression data obtained by the above steps is input into the SPSS statistical software, and after the operation of the software, the final operation results are obtained, thus providing a good reference for the research of this paper.

The SPSS statistical analysis software mentioned above has a higher frequency of application in theoretical research. Zhou has believed that the basic functions of statistical analysis software include data management, statistical analysis, chart analysis and output management [10]. Figure 1 shows the interface of the SPSS statistical software.



Fig. 1. SPSS statistical software interface

There are many statistical analysis methods for this software, and the statistical analysis methods include simple basic statistical analysis and more complex multi-variate statistical analysis, such as the basic statistical analysis, frequency analysis, correlation analysis, regression analysis, cluster analysis, factor analysis and other

statistical analysis methods. Petti has believed that the most important feature of SPSS statistical software are its graphical capabilities. The graphical performance of this analysis software is very good, which can not only help the user analyze the data and get the corresponding analysis results, but also can make graphical statistics of the results of the data, so as to enable users to have a more vivid understanding of the rules of statistical results [11]. SPSS software can generate bar graph, scatter diagram and normal distribution map according to the data, which is helpful for users to understand the statistical results more intuitively. In addition, through the interface, SPSS statistical analysis software can convert data, and carry out statistical analysis. Drucker has believed that SPSS statistical analysis software has a particular graphics system, which can draw graphics on the basis of the data and its results, so as to achieve the different requirements of different users [12]. From the drawing point of view, SPSS statistical software and graphic design have certain commonalities, and the study of graphic design with this software is beneficial for designers to better understand the research results, so as to promote the continuous development of graphic design industry.

SPSS statistical analysis software has a good interface and simple way of operation. Washington has believed that in this software, only data entry and some commands are implemented by keyboard input, while most operations are done by using menus, buttons, and dialog boxes. In the process of using the software, the user only needs to realize the statistical analysis of large amounts of data and achieve the result through the mouse instruction according to the actual demand, and at the same time, users can also get statistical data tables and statistical analysis change icons on the basis of the analysis results [13]. The data analysis and icon analysis can be visually displayed through the screen, and can also be printed on the data analysis tables and charts. Huang has believed that SPSS statistical analysis software has a complete and comprehensive function of data analysis and statistics and contains a statistical type and more than one hundred and thirty kinds of statistical functions [14]. Figure 2 shows the results of the SPSS statistical software application example. SPSS statistical analysis software covers multivariate statistical analysis from simple to complex, such as data exploration, analysis, contingency table analysis, etc. Moreover, SPSS statistical analysis software includes not only conventional statistical analysis methods, but also a variety of multivariate statistical analysis methods, which is very helpful to the users who are not good at mathematics to a certain extent. Steinberg has thought that users can use SPSS statistical analysis software for data analysis without understanding the statistical process of statistical analysis software [15].

4. Result analysis and discussion

The multivariate analysis results obtained by the methods described above are shown in Table that shows the data analysis of the variance analysis and residual analysis of the regression equation. The data shows that the variance and residual error of the regression analysis equation are within a reasonable range, but the mean variance is higher, and the degree of variation is higher, and there is a certain

The screenshot shows the SPSS Data Editor window titled 'carpet.sav - SPSS Data Editor'. The menu bar includes File, Edit, View, Data, Transform, Analyze, Graphs, Utilities, Window, and Help. The toolbar contains various icons for file operations and data analysis. The main data grid shows the following data:

	package	brand	price	seal	money
1	1.00	2.00	2.00	2.00	1.0
2	2.00	1.00	1.00	1.00	1.0
3	2.00	2.00	2.00	1.00	2.0
4	3.00	2.00	3.00	1.00	1.0
5	3.00	3.00	2.00	1.00	1.0
6	1.00	3.00	2.00	1.00	1.0
7	2.00	3.00	3.00	2.00	1.0
8	1.00	1.00	3.00	1.00	2.0
9	3.00	1.00	2.00	1.00	1.0
10	3.00	2.00	1.00	1.00	2.0
11	3.00	1.00	3.00	2.00	1.0

The status bar at the bottom of the window reads 'SPSS Processor is ready'.

Fig. 2. SPSS statistical software application interface

colinearity problem. Because there is a certain interaction between variables, the degree of variation of individual variables affects the accuracy of the results of the entire regression equation. Once the colinearity problem exists in the regression equation, the significance test of the regression equation is performed to ensure the accuracy of the regression equation.

Table 1. Results of regression analysis of variance

Coefficient	Sum of squares	Freedom	Mean square deviation
Regression	42.823	3	14.274
Residual	0.530	10	0.053

According to the colinearity problem of the regression equation described above, a regression test of the regression coefficients was made. The results are shown in Table 2. The data shows that there was a linear relationship between the standard error and the regression coefficient, and the significance test results accorded with the analysis requirement. It can be seen that the coefficients of the regression equation can meet the requirements, and it is feasible to apply the regression equation to the study of digital media and graphic design. At the same time, the results obtained by regression equation have high reference value.

Table 2. Results of regression coefficient test

Model	Standard error	Partial regression coefficient	<i>T</i>
1	7.852	12.322	3.383
2	-0.566	0.174	12.551
3	-1.206	0.501	-0.213

Through the analysis of variance and the significance test of regression equation, on the basis of ensuring the feasibility of the regression equation, the original parameters were entered into the analysis data obtained by SPSS statistical analysis software, as shown in Table 3. Data shows that the application of digital media technology improves the type and quantity of graphic design software, and the function of graphic design software is more powerful. At the same time, the application of digital media technology stimulates the designers' spatial imagination to a certain extent, thus promoting the continuous optimization of their design thinking. In addition, from the point of view of color richness, the application of digital media technology further refines the color hierarchy, which has a very important positive impact on designers. The variety of colors greatly enhances the visual effects of graphic design.

Table 3. Results of SPSS statistical analysis

Serial number	1	2	3	4	5	6	7	8	9	10
1	1.92	408	2.0	10	2.0	155	4.42	0.96	2.02	1.50
2	2.15	412	1.8	8	2.1	140	4.15	0.95	2.10	1.21
3	2.35	421	2.1	11	2.6	156	4.89	0.94	2.65	1.62
4	3.22	432	2.9	12	2.9	175	3.54	0.88	2.45	1.72
5	3.61	456	2.2	16	3.2	180	3.67	0.93	3.01	1.42
6	4.01	526	3.1	7	4.1	150	2.86	0.81	2.77	1.78
7	3.97	550	2.0	9	2.4	161	2.22	0.78	2.98	1.56
8	3.78	563	2.4	9	2.6	170	2.85	0.77	3.12	1.37
9	4.34	604	4.5	7	6.2	137	4.12	0.95	2.45	1.89
10	2.13	634	6.0	13	6.3	156	3.12	0.65	3.09	1.29

As shown in Figs. 3 and 4, the comparative analysis bar graph produced by the statistical software showed the data results more intuitively. By comparing the results of figures 3 and 4, it can be seen that the application of digital media technology had a certain influence on the design performance and the mode of transmission of graphic design. Comparatively speaking, the influence of digital media technology on graphic design performance varied greatly, and showed the trend of increasing year by year. However, the influence of digital media technology on the propagation of graphic design was fluctuating, although it increased, the growth was not stable. The influence of digital media technology on graphic design was mainly composed of three aspects: design means, design contents and design thinking. The impact of digital media technology on graphic design was significant, which can be verified by the richness of design software, and the influence of digital media technology on graphic design was mainly reflected in the two-way communication between designers and customers. The graphic design of digital media technology can better convey and display the designer's design concept and actual effect to the customers.

To sum up, with the advent of the digital media era, the application of digital media technology in graphic design is beneficial to the performance of graphic design, the promotion of the performance, and the optimization of the mode of communication. And digital media technology has a positive influence on enriching graphic design tools and promoting graphic design effects. However, as a technical means,

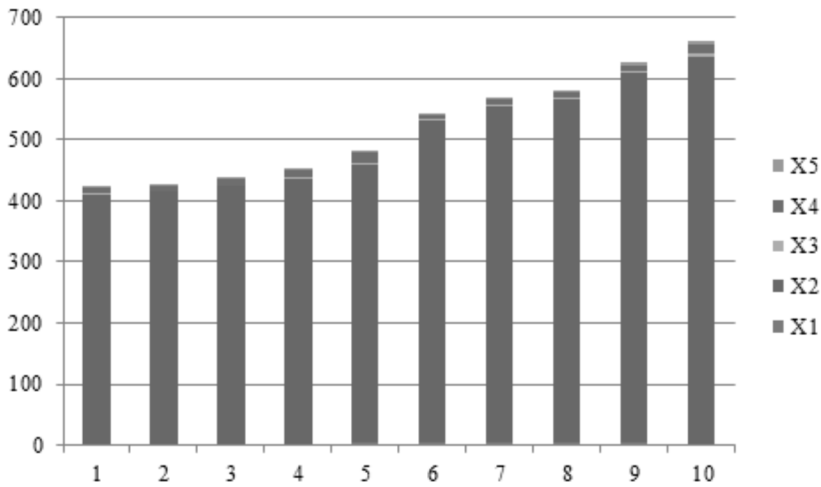


Fig. 3. Analysis of data comparison

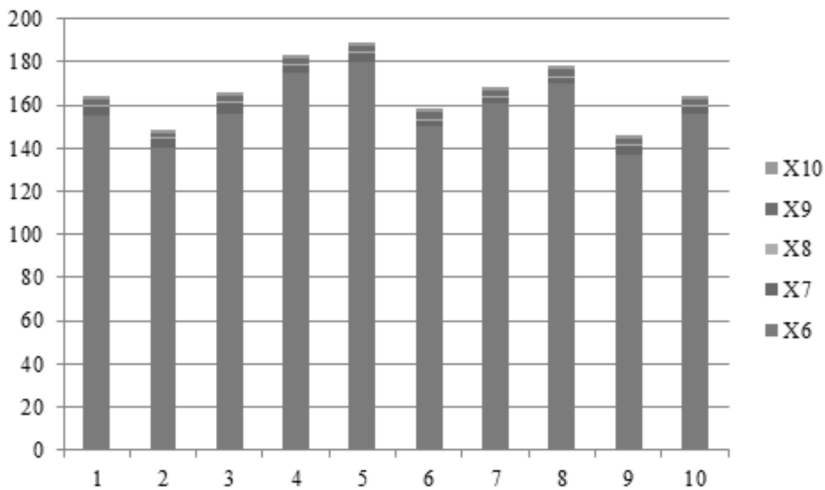


Fig. 4. Analysis of statistical results

the impact of digital media on the design connotation is reflected by quantitative data, and there is a certain error, and the impact will take a long time to validate, and therefore, the degree of positive influence of digital media technology on the design thinking and design content of graphic design is still lacking. The same problems also exist in the study of the influence of digital media technology on graphic design communication, and as a result, although there is some credibility, there are still some errors in the effect of digital media technology on the thinking and content of graphic design. However, the errors do not prevent the research results of the relationship between digital media technology and graphic design. Therefore, it is believed that digital media technology has a higher positive impact on graphic

design, and enterprises and designers can continuously optimize the design content and design thinking on the basis of constantly expanding design tools.

5. Conclusion

In order to enhance the effective application of digital media in graphic design, through the construction of multiple-regression analysis model, the influence of digital media on graphic design was analyzed and studied, and finally, the following main conclusions were obtained in this paper: digital media technology has influence on graphic design, performance, and communication mode, but it has little influence on design performance and communication mode. From the point of view of design performance, digital media technology has a better influence on graphic design, but it has no obvious but positive influence on design content and design thinking.

To sum up, multiple regression analysis model is simple, practical and easy to calculate, but the model of the research object of the professional requirements are higher. The method of multiple regression analysis used in this paper is helpful to make clear the direction of applying digital media to improve graphic design. However, the way of measuring the impact of design thinking and design content is more complex, and therefore, although there is certain reference value in this study, there are still some shortcomings. In future studies, the effectiveness of multiple regression analysis can be improved by increasing the model parameters and improving the comprehensiveness of the parameters, resulting in more credible results.

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