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## Analysis of interaction function of modern graphic design based on technical-aided design

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## ABSTRACT

This study employs a comprehensive methodology that involves a thorough review of the existing literature and case studies to understand the current state and trends in modern graphic design. It then delves into technical-aided design tools that graphic designers widely used to create interactive designs. The methodology also encompasses empirical analysis that entails conducting surveys and interviews with industry professionals and design experts. It seeks to identify the key elements and techniques that contribute to effective interaction design and discusses the importance of considering the user experience in the design process. Ultimately, this study aims to provide valuable insights into the ever-evolving world of graphic design and its intersection with technology. Aim: This article aims to improve the knowledge of modern graphic design and propose new ideas for graphic design by exploring the interaction function of modern graphic design based on technical-aided design software. Evaluation tool: The analysis is assessed using the Analysis of variance (ANOVA), Multivariable Logistic Regression, and Chi-Square tests. Results: The interaction of modern graphic design with technically aided design was examined, and it was found to improve modern graphic design significantly.

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## 1. Introduction

Graphic design has come a long way in recent times, encompassing all the aspects of human existence that involve visual communication. From simple things like books and posters to more complex things like advanced mobile apps and 3D animation, graphic design can produce rich materials when aesthetic aspects are incorporated into the design process. This can help broaden and deepen the reach of graphic design in the art-design realm. In contemporary graphic design, the trend is to promote public specificities and integrate their qualities at the worldwide architectural level. This is done to communicate the nationwide spirit of design and make international design more accessible to a broader audience (Ding et al., 2020). At its core, graphic design involves organizing and presenting concepts and events using graphical and linguistic information. It involves planning and projecting ideas and situations using visual and written materials to create a con-

versation between people and a commodity, technology, or service. This conversation is both physical and emotional and is reflected in how forms, purposes, and innovation interact with one another over time. Interactive design (IxD) is a graphic design that focuses on interactive goods and solutions. In this type of design, the designer considers the object being developed and how people engage with it. This ensures that the end product is not only aesthetically pleasing but also functional and user-friendly. Therefore, designers can adapt the output to fit the exact demands when they perform in-depth analyses of users' wants, limits, and circumstances (Ahmad et al., 2021).

Digital entertainment technology combined with interactive functionality is now extensively employed in various industries because of the ongoing technological advancements in graphics processing. Digital audiovisual innovative designs and graphic elements are now used in China's electronics sector, film and television industry, art industry, marketing design world, and the art industry. Graphic design has evolved from two-dimensional graphics to interactive design. This transition has exposed people to a wide range of methods and styles of graphic design. With modern media technology and the increasing popularity of media, people now have higher expectations for the aesthetic appeal of media forms. They are no longer satisfied with conventional forms and are more interested in the overall effect and perceived notion of

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what they see (Liu, 2022). The Interaction Design Framework attributes the field's origins to cave drawings that precede Egyptian hieroglyphs. Therefore, graphic design has been in use for hundreds of years. More recently, the printing industry created the word "graphic design" to express fundamental design components, including typeface, logo design, and color theory. Although these fundamental design components have generally stayed the same over the last century, the industry has seen several additional changes, most notably with the introduction of the digital world and the latest design tools. One of the most widespread applications of design is the creation of visual identity design. Design is an incredibly versatile field that has applications in numerous industries. One of its most widespread applications is creating visual identity design. This involves creating design components that can be used across various visual media, from print to digital. To specialize in visual identity design, graphic artists need to have a broad understanding of all forms of graphic design. This knowledge allows them to create designs that are effective, cohesive, and creative (Mardov, 2022).

The world of computer-aided design is vast and contains many different technologies and tools that planners use to create their designs. The primary categories of these technologies include computer-aided design (CAD), a 2D design tool, and other graphic design programs. There are also 3D production tools, such as Maya, 3DSMAX, and SketchUp, which represent 3D technology. These additional techniques, such as 3D manufacturing and virtual reality innovations, are incredibly beneficial to planners. They help to increase the effectiveness of their work and allow them to communicate their design thoughts with greater accuracy. With the help of assistive technologies such as augmented environment technology, 3D printing, 2D sketching devices, and 3D manufacturing technology, designers can now work together in one area of design rather than separately (Mody and Bhoosreddy, 1995). This integration of interdisciplinary expertise has substantially expanded the scope and meaning of the household architecture and layout. Precision management and the foundation of engineering development are the two key areas where computer-aided design innovation exhibits accuracy. By using powerful computer computing capabilities to address the issues arising throughout the planning and design processes, designers can increase work efficiency and ensure the correctness of data in the drawing activity (Wang, 2021).

With advancements in technology and the emergence of digital platforms, the future of graphic design appears promising. As the digital landscape continues to evolve, there is a demand for skilled graphic designers to create engaging and interactive visual content. The need for designers to seamlessly integrate design principles with coding skills is on the rise, further expanding the scope of graphic designers. With an increasing focus on user experience and user interface design, graphic designers are expected to possess a solid understanding of human-centered design principles. This includes the ability to analyze user needs, create intuitive navigation systems, and ensure consistent brand experiences across different digital platforms. The integration of animation and motion graphics also opens new avenues for graphic designers, as it allows them to bring designs to life and enhance user engagement. As technology advances, graphic designers need to adapt and acquire new skills to remain relevant. Graphic designers can continue to play an integral role in shaping memorable and impactful visual experiences.

As technology continues to advance at an unprecedented rate, the role of technical-aided design in graphic design practices has become increasingly significant. This article aims to analyze the interaction function of modern graphic design through the lens of technical-aided design, highlighting the interlinkages between the two. In the current digital age, graphic designers rely heavily

on software and technical tools to create visually appealing and effective designs. By examining the interaction function of modern graphic design, this study sheds light on how these technical aids have revolutionized the field. It explores the impact of software applications and other design tools on the overall design process. It explores the interlinkages between technical-aided design and the principles and theories that underpin modern graphic design. It discusses how technological advancements have influenced design concepts, color theory, typography, and other fundamental elements of graphic design. By understanding these interlinkages, designers and researchers can gain valuable insights into the future of graphic design and how technology will continue to shape the field. This research provides a comprehensive analysis of the interaction function of modern graphic design based on technical-aided design. By filling the existing research gap, this study contributes to a broader understanding of the impact of technology on graphic design practices.

This article aims to analyze the interaction function of modern graphic design based on technical-aided design. With the advent of new technologies, designers now have access to a wide range of advanced tools and software that enhances their ability to create captivating user experiences. These tools not only enable designers to experiment with different visual elements and typography but also allow them to incorporate interactive features that engage the audience at a deeper level. By analyzing the interaction function of modern graphic design, we can understand how designers create aesthetically pleasing designs and provide a seamless user experience.

## 2. Literature survey

Sun et al. (2020) examined how traditional Chinese patterns relate to contemporary graphic design, how they are composed, what they symbolize, and how they might be organically combined with modern design concepts. The author argues that contemporary graphic design can learn from preserving and evolving traditional Chinese patterns. By restoring traditional Chinese patterns, we may better nurture traditional Chinese culture and create works with national characteristics by understanding the patterns' implied meanings and cultural implications. There has been a significant shift in the field of graphic design owing to the advent of new media and its impact on the industry. It not only aids in expanding the graphic design industry but also hastens the notion of teaching visual communication design. Education in graphic design in the context of digital information can increase student satisfaction through stunning visual effects; however, the conventional approach to the subject needs to meet students' needs. Therefore, it is crucial to examine how graphic design is taught in the 21st century, specifically in the digital media context. Liu et al. (Ahmad, 2021) begin with a history of digital media art and its impact on the field of graphic design education, then moves on to examine the connection between graphic design education and mobile digital media, and finally concludes with a discussion of the importance of digital media art in the classroom and the value it adds to the reform of the field.

Advertising, animation, web design, packaging, and book design are examples of the numerous facets of graphic design. Designers can effectively communicate their thoughts and ocean concepts to the general audience using various visual elements. Graphic designers can move others through the fluid transmission of their ocean ideas through their design works. As technology and art have advanced, graphic design has become a multifaceted profession. Photoshop, CorelDRAW, and Illustrator are examples of modern computer graphics and image applications that have made graphics creation more accessible and versatile. Designers now

have access to a broader range of tools for self-expression, leading to more vibrant and original results. A better understanding of the ocean can be achieved through ocean graphic design, which provides designers with more avenues to express their thoughts (Zhang et al., 2022). The rapid growth of modern information has resulted in the emergence of new communication channels, one of which is the Internet, which is both widely utilized and extremely quick. Not only does it make people's lives easier, but it also contributes a great deal of design sense to contemporary graphic design. Today, when the modern goal of diversity is actively pursued, it is imperative that the design of print advertisements demonstrates more fundamental types of diversity. At this time, the Internet has demonstrated many appeals and advantages. Shujuan (Mardov, 2022) provides an overview of the fundamentals of print advertising design, discusses the connection between the Internet and contemporary print advertising design, and investigates the significant role that the Internet plays in the field of print advertising design.

Yeo and Cao (Mody and Bhooresddy, 1995) analyze the Bete script, with its specific expression and connotation, the nature and peculiarities of the Bete writing system, and approaches to renewing it based on modern typography principles. This study employed descriptive and experimental methodologies to create a sample of Bete script graphic works to disseminate this writing notion in graphic design culture. A new method was developed for designing Bete fonts based on this idea. It investigated Bete scripts in poster, logo, and book design. In light of the communication functions of design, Oliinyk (Wang, 2021) and Garg and Harita (Sun, (2016).) investigate the informative and aesthetic possibilities of the graphic novel, and they aim to define the nature and purpose of the graphic novel's communication and semantic saturation. Modern graphic design, a different art form, has been innovated by extensively using traditional calligraphy, thus capturing its cultural meaning and unique appeal of traditional calligraphy.

To begin with aesthetics, calligraphy is an artistic endeavor that allows artists to express their aesthetic ideals and feelings in various ways. The aesthetics of classical calligraphy are essential to many branches of graphic design. Within the realm of graphic design, both language and images play significant roles in the production of visual information, as well as its subsequent translation (Liu, 2021; Zhang, 2020). AUTOSIGN is an optimization solution for building signs that include a user feedback loop and considers many factors (Shujuan, 2021; Yeo and Cao, 2021). It used a two-step approach to solve a multi-objective optimization problem with competing objectives. First, an evolutionary technique optimizes navigation pathways based on cognitively inspired goal functions. Second, particle swarm optimization is used to enhance individual signage placement to enhance the wayfinding information. The author tested this technology by designing signs for two simulated 3D structures. The author also developed and optimized signage layouts for both buildings. Agent-based simulations were used to analyze the optimum and non-optimized architectures.

Lin et al. employed a digital photograph-assisted virtual smile design technique to create aesthetically pleasing ceramic veneers in the maxillary anterior region of patients (Oliinyk, 2021). This approach, combined with intraoral digital impressions and CAD/CAM fabrication, facilitates effective communication among patients, dentists, and dental laboratory technicians, leading to predictable and satisfactory aesthetic outcomes. Ensuring efficient communication is vital for achieving desirable results in aesthetic treatments.

Salihi et al. devised strategies to overcome the difficulties in learning technical graphic/drawing skills. They suggested integrating information and communication technology (ICT) into class-

room practices can significantly enhance education (Ahmed and Ali, 2020). Studies have shown that incorporating programs such as CAMED and multimedia computer-based training can improve students' abilities to acquire and apply technical graphics/drawing skills. These findings highlight the importance of addressing the current gaps in technical drawing education and emphasize the role of CAD and ICT in improving pedagogy, promoting continuous professional development (CPD), and facilitating effective learning processes. The goal of this collective (Dubey et al., 2020) is to determine what a graphic novel is and how it differs from the classic relationship between illustrations and texts in books. The author explains the role of design in communication and semantic saturation. The author also wants to show what makes graphic novels different from other types of books and to look for the informational and aesthetic potential of graphic novels. Collins et al. (Shahabaz and Afzal, 2021) discuss the laborious process of conceptualizing, designing, and executing the manufacture of real, printed, or otherwise imaged items with which consumers engage regularly. Most contemporary graphic designs are generated on computers using design tools, ideas, and concepts that do not remain on the computer. When the concepts are finished in the computer software, it is time to move on to the imaging (or "printing") stage. Angelova et al. (Lin et al., 2015) defines and categorize typographic skills in the field of graphic design. Orthotypography is a crucial factor in the quality of design products, which can be measured and categorized. The meaning of the term "typographic competence" is clarified, and the term "typographic literacy and font culture" (TLFC) is introduced. The connection between the two is clear: typographic literacy and font culture develop because of building typographic competence. Five types of TLFC were found by examining the modern aspects of professional design practice. Xu (Li, 2022) begins with an interpretation of the notion of traditional Chinese culture and contemporary graphic design and then moves on to a discussion of the benefits of combining the two by examining how Chinese culture is now being used in the design field. The author also emphasizes the need for designers to treat and incorporate traditional culture properly. Designers must also be familiar with the rich symbolism of traditional Chinese culture and the concept of national feelings. Wu (Chedi, 2015) investigates the usage of "stylistic" design thinking and methodologies in graphic design, as well as the inspiration of "stylistic" applications to graphic design, and it concludes with an investigation into the future of graphic design. In conclusion, this study investigates the potential for further growth in the "Stylistics" field related to graphic design applications.

### 2.1. Problem statement

The field of graphic design has undergone a significant transformation with the advent of technical-aided design. This has resulted in a shift in the interaction functions of modern graphic design. However, there needs to be more analysis of this shift and its impact on how designers work. We propose an analysis of the interaction function of modern graphic design based on technical-aided design. This study aims to identify changes in the interaction function of modern graphic design, the impact of technical-aided design on the interaction function, and the implications for designers. This study contributes to the understanding of the interaction function of modern graphic design and provides insights into the impact of technical-aided design on the design process. The study results will be valuable to designers, design educators, and design researchers. This study provides a deeper understanding of changes in the interaction function and their impact on the design process.

### 3. Analysis method

Graphic design includes modern graphics as a crucial component. Modern graphics vary from conventional graphics in terms of their creative and aesthetic qualities. Graphic design is used across all technological platforms; it is the projection of visual communications meant to communicate particular information to sociological divisions with specific goals. An integrative area of design and the fine arts in graphic design. When used with manual or digital instruments, it demands imagination, innovation, and analytical thinking. Content and visuals are often used to convey ideas graphically. Hence, we analyzed the interaction function of modern graphic design based on technical-aided design.

#### 3.1. Technical aided interaction function design

The majority of technical-aided design technology may be broken down into two categories: 2D drawing technology, which is mostly represented by computer-aided design (CAD), and other graphic design applications. Planners will benefit from the development and implementation of these new approaches, which include innovations in 3D fabrication exemplified through firm creation and experience engagement, innovations in virtual reality, and other upcoming technology. Planners can improve the efficiency of their operations and better communicate their design ideas as a result of the creation and usage of various technologies that assist. Rather than being used in isolation, the technologies of augmented environments, 3D printing, devices for drawing in 2 dimensions, and 3D production are all integrated into a single section of the design. Computers, artwork and architecture, environmental design, and other related fields are examples of these new technologies. Integrating knowledge from other fields of study significantly broadens the purview of residential architecture and layout while also extending its significance in new directions. Technical-aided design invention displays reliability in two major areas: dexterity control and the basis of industrial applications. Both of these areas are essential to the growth of the engineering field. Using powerful processing computational resources to effectively tackle the challenges that arise across the process of designing and planning not only accelerates work efficiency but also ensures the truthfulness of statistics in the drawing interaction from the perspective of precise administration. This is important to note from the perspective of accuracy leadership. Conventional interaction task requires the organizer to function physically with the assistance of measurement devices such as leaders and round test equipment. This makes it challenging to verify the precision of the statistics in the design procedure, and the organizer spends a lot of time quantifying interactively, which drastically reduces the effectiveness of the design work. The modern designing task, on the other hand, utilizes computer-aided design (CAD) software to automate many of the manual processes that are required in conventional designing tasks. The application of technical-aided design tools in the interaction process can produce information that is precise to the micrometer. As a result, the organizer will have more period and power to move to the interaction architecture module.

#### 3.2. Technical-aided design-based interaction function technology in modern graphic design

From an objective viewpoint, we can gain a unique perception of a design that is computed by the computer. By adjusting the observation angle, substance, and other aspects according to the client's specifications, we can achieve a higher degree of realism and consistency in the design. Examining and modifying works from a vari-

ety of angles provides designers with a new interactive function and presentation environment. This, in turn, allows designers to express themselves creatively while also improving their efficiency. The invention of the camera signified the beginning of a new age in terms of the dissemination of visible information. The painter Corot is a classic example of a painter who "rediscovered" the material object in photojournalism since he has incorporated photographic methods into his conventional canvases and has painted scenes that resemble photographs. His previous paintings displayed a focus on capturing instantaneous impressions, an interest that was most clearly expressed in the impressionist pieces he produced later in his career. The length of time required for an exposition in photographs had been reduced to only a few seconds, and even an exposition duration of one second posed a significant challenge when photographing scenery. For instance, the light that is captured in the photograph will be altered if leaves are blowing in the breeze. Because of this advancement in science and technology, painters have been able to get a more profound knowledge and expression of the world, which has had a ripple effect on the evolution of aesthetics throughout the whole civilization. For instance, the computer infrastructure wandering graphics in the technical-aided conditions interaction function design can more authentically reflect the meaningful scenario, and the audience can observe the spatial impact from various angles, thereby giving people the impression that they are completely immersed in the experience. It is impossible to obtain the same impact using other articulation techniques since this form of digital space translation method is so near to the impact achieved by actual space. The use of three-dimensional programming innovation on a computer enables the creation of a non-existent virtual environment, which in turn makes it possible for the designer's inventive vision to be brought to life. In the artworks, illumination, music, and other effects may be employed to create the mood of the setting, which in turn makes the works more realistic and increases their credibility. Because of the use of graphic design program technology, the scope for interaction function and performance in the atmosphere has become much larger and more productive.

#### 3.2.1. Analysis of interaction function in media and art technology

The researcher discovered in the procedure of contextualizing the investigative study that with the continual enhancement of equipment settings to support artistic conception experiments, the fine art interpretation form has successfully converted from hand drawing to software fabrication. This was discovered following the stages in the project interaction process. However, the present state of graphic design creation is comprised of an infinite number of inventive concepts and styles of expression. Since it is difficult to be inspired by or extract individual components of a fashion, this has resulted in a singular means of affirmation and a reduction in the effectiveness with which graphical art is created. Therefore, in an attempt to adjust to the necessities of contemporary industrial manufacturing, it is essential to discover techniques that really can facilitate craft designers in completing their design creation in a quite sustained and reliable manner. This is a necessity because it is essential to change to the demands of modern economic output. This enables artists to devote more of their attention to artistic creativity and the further improvement of their creative abilities, as well as to increase the level of layout and the effectiveness of design, and to exhibit graphic creations of excellent quality.

#### 3.3. Technical-aided design interaction function framework perfectly integrates the significance of science and innovation and artistic presentation

This novel form may be thought of either as a type of technological graphic expression or as a form of technical interaction

function. Both of these interpretations are possible. To be more specific, it is a form that exemplifies the seamless integration of the signification of graphic expression with the tenets of research and innovation. The computer has steadily evolved into the primary instrument for the presentation of architecture. The execution of interior and outdoor architecture effects grow more vivid and realistic as a result of ongoing upgrades and renewals of many different kinds of three-dimensional design applications. The whole process of creating representations is a kind of technology; hence, the general method and vocational experience of the evolution of graphic interaction design, ceramics, textiles, carving, and most educated people are unable to comprehend the significance of its growth. There is a strong connection between the many forms of sorcery practiced in China. The creation of new modes of articulation and senatorial representations are both possible via the use of innovation. The technical process is an integration of particular human talents that are used to accomplish the aims listed above. It is clear to us from this sentence that Susan's investigation uncovered the significant value that innovation contributes to the field of visual interaction. However, when it comes to the creation of technical-aided contextual creative expression, placing an emphasis only on equipment is not sufficient. It ought to include the notion of graphic interaction since it is one of its functions—the interaction function. The artistic element of interaction function is preserved in a particular artistic pattern, which is the form of graphical interaction. This is because the artistic component is considered to be a significant component.

The selection of the final sample plays a crucial role in conducting a comprehensive analysis of the interaction function of modern graphic design based on technical-aided design. Several factors have been considered to justify this selection. First, the chosen sample should be representative of the target population, ensuring a fair and accurate reflection of the broader graphic design industry. To achieve this, careful randomization or stratification is often employed. Randomization assigns equal chances to all potential samples, whereas stratification divides the population into relevant subgroups to ensure proportional representation. By implementing these methods, potential biases can be minimized, allowing for more reliable and generalizable findings. Moreover, the final sample selection should consider the desired sample size. This decision depends on various factors such as available resources, time constraints, and the level of detail required in the analysis. A larger sample size increases the statistical power and confidence in the results, while a smaller sample size may provide a more focused and in-depth analysis. Selecting the final sample requires careful consideration of representativeness, randomization or stratification methods, and desired sample size. By following these principles, we ensured that the analysis of the interaction function of modern graphic design based on the technical-aided design was rigorous and informative.

### 3.4. Statistical analysis

The statistical analysis assists with the data analysis enabling the application of relevant evaluations and facilitating the efficient presentation of findings. Utilizing statistics is necessary for all aspects of the breakthrough, information selection, and projection processes. To assess the state of the patient, statistical methods such as the Chi-square test, the ANOVA test, and the multivariable logistic regression test are used.

### 3.5. Chi-square test

Chi-square analysis is an effective statistical method for testing a hypothesis when the number of variables being considered is small, as is the case in clinical tests. Chi-square analysis may be

performed separately. The Chi-square test is a method that may be applied in an attempt to compare the findings that were obtained to the outcomes that were expected. The purpose of this test is to determine whether or not a discrepancy between the data that has been seen and the data that has been projected is the product of arbitrary chance. It stands to reason that the identified data will diverge from the predicted values to a larger extent if there is a strong connection between the two nominal variables. This is since the predicted data are relying on the assertion that there is no connection between the two nominal variables. Even if we were to find that there is a connection between the two, this does not provide us with any further information on the connection. This is because the Chi-square can identify which groups are responsible for the differences, it is denoted in Eq. (1).

$$\sum X_{j-k}^2 = \frac{(P - E)^2}{E} \tag{1}$$

Where: P = present point, R = real point, X<sup>2</sup> = Chi-square value,  $\sum X^2$  = to total the entire cell Chi-square values, use the equation.

Specified Chi-Square values are determined in below Eq. (2):

$$E = \frac{N_S \times N_D}{a} \tag{2}$$

Where: E = indicates the amount of time that went into producing the product, N<sub>D</sub>= indicates an error, N<sub>S</sub> = denotes designers, and a = indicates the example designs.

Eq. (3) indicates how the random sample is divided by the multiple of the row marginal and the column marginal for each graphic design.

$$x^2 = \frac{(P - E)^2}{E} \tag{3}$$

Statistics-based evaluations of the strength of a link are called correlated measures. The most popular Chi-square efficiency test is Cramer's V test. It's simple to figure out using the equation in procedure 4 below:

$$\sqrt{\frac{x^2/o}{(l - 1)}} = \sqrt{\frac{x^2}{o(l - 1)}} \tag{4}$$

A chi-square analysis was carried out to determine the degree of connection between the different graphic design frameworks. The findings of the association chi-square test pointed to evidence that contradicted the null hypothesis, which indicated that the null hypothesis was incorrect. The Chi-Square test was used in an investigation of the interaction function of modern graphic design based on technical-aided design. The findings of this study revealed that technical-aided design enhances the interaction function of modern graphic design.

### 3.6. ANOVA test

Analysis of Variance (ANOVA) Using ANOVA, a research study on the interaction function of modern graphic design based on the technical-aided design was evaluated. An (ANOVA) shows how the application of the technical-aided design and its influence on how it reflects, supports, and enhances the interests, attitudes, views, and design throughout analysis are interconnected with concerns. In an attempt to determine whether the technical-aided design is effective, several early data analysis was performed. In this case, there were three or more data sets, thus a single-method analysis of variance (ANOVA) was performed to determine the association between the variables. The standard E-statistic for ANOVA is calculated by dividing the sum of squared averages of the null model with the anthropic principle by the whole model. The variables are determined by utilizing the method of minimiz-

ing squared errors, with each of the variances being treated the same. This may be shown mathematically using Eqs. (5)–(7).

$$A = MS_{\text{between}}/MS_{\text{error}} \tag{5}$$

Where

$$MS_{\text{between}} = \frac{\sum_{u=1}^v o_u (\bar{X}_u - \bar{X})^2}{v - 1} \tag{6}$$

$$MS_{\text{error}} = \frac{\sum_{u=1}^v \sum_{k=1}^{o_u} (X_{uk} - \bar{X}_u)^2}{O - v} \tag{7}$$

The A-test-statistic is defined as in Eq. (8).

$$Z = \frac{\sum_{u=1}^v x_u \left[ (\bar{X}_v - \bar{X})^2 / (u - 1) \right]}{1 + \frac{2(v-2)}{v^2-1} \sum_{u=1}^h \left[ (1 - y_u/u)^2 / (o_u - 1) \right]} \tag{8}$$

Where  $Z_u = \frac{m}{t^2}$ ,  $u = \sum_{u=1}^h Z_v$  and  $X = \frac{1}{v} \sum_{u=1}^v X_u Z_u$  is denoted as in 9:

$$d = \frac{v^2 - 1}{3 \sum_{i=1}^j \left[ (1 - x_u/u)^2 / (o_i - 1) \right]} \tag{9}$$

The Brown-Forsythe-test-statistic is defined as in Eq. (10):

$$D^* = \frac{\sum_{u=1}^j o_u (\bar{X}_v - \bar{X})^2}{\sum_{u=1}^v (1 - o_u/O) T_u^2} \tag{10}$$

When  $L_0$  is verified, a central D probability with degrees of freedom of  $v - 1$  and  $g$  is used to determine an acceptable distribution of  $D^*$ . The value of  $g$  is determined using Eq. (11), which can be found here.

$$1/d = \sum_{u=1}^v d_u^2 / (o_i - 1), d_i = \frac{(1 - o_u/O) T_u^2}{\sum_{v=1}^h (1 - o_u/O) T_u^2} \tag{11}$$

It is now possible to determine the modified p-value by using the formula  $p = 1 - r$ , where  $r$  is the group amount and is represented by the number 12.

$$r = E \left( I_{d-1,0-d} \left( \frac{O-v}{v-1} \tilde{r} \left( \frac{o_1 t_1^2}{C_1 C_2, \dots, C_{v-1}}, \frac{o_2 t_2^2}{C_1 C_2, \dots, C_{v-1}}, \frac{o_3 t_3^2}{(1-C_2) C_3, \dots, C_{v-1}}, \dots, \frac{o_1 t_v^2}{(1-C_{v-1})} \right) \right) \right) \tag{12}$$

The calculation for the forecast is done based on a distinct beta randomized procedure, which is indicated in Eq. (13) as having an E-distribution.

$$C_k \text{ Beta} \left( \sum_{u=1}^k \frac{(o_u - 1)}{2}, \frac{o_{k+1} - 1}{2} \right), k = 1, 2, \dots, u - 1 \tag{13}$$

### 3.7. Multivariable logistic regression test

Multivariable Logistic Regression Test is a well-known and commonly utilized method of statistical analysis that is comparable to linear regression analysis, with the exception that the results are presented in a dichotomy format. A concise description of the logic behind logistic regression and how it is an expansion of multivariate linear regression may be found in the section of the design course devoted to regression analysis. In essence, we look at how likely it is that a certain result will take place (or not take place), and we use the proportional log of the chances of the result as the dependence parameter in an attempt to linearize the associations and handle them in a manner that is comparable to multiple linear regression. When there is a solitary dualistic result but more than one autonomous parameter, one would use multiple logistic regression analysis rather than simple logistic regression analysis.

Simple logistic regression analysis refers to the regression application in which there is only one dualistic result and one autonomous factor. Once again, we will explain the overarching idea in this section. Hosmer and Leme show provide a highly in-depth explanation of the logistic regression analysis as well as its many applicability.

In logistic regression analysis, the result is often represented as either a 0 or a 1, where a 1 represents that the desired result is present and a 0 represents that the result of the relevance is not present. The equation for the multiple logistic regression models may be stated as followed Eq. (14) and if we consider  $p$  as the possibility that the result is 1:

$$\tilde{p} = \frac{eya(a_0 + a_1 y_1 a_2 y_2 + \dots + a_p y_p)}{1 + eya(a_0 + a_1 y_1 a_2 y_2 + \dots + a_p y_p)} \tag{14}$$

$P$  is the likelihood that one should anticipate that the result would take place;  $Y_1$  through  $Y_p$  are separate autonomous variables, and  $a_0$  through  $a_p$  are the regression values. The model of multivariate logistic regression is often stated in a variety of unique ways. The result is the anticipated log of the probability that the result is stated in Eq. (15). This is shown in the following form:

$$\ln \left( \frac{\hat{p}}{1 - \hat{p}} \right) \tag{15}$$

$$\ln \left( \frac{\hat{p}}{1 - \hat{p}} \right) = (a_0 + a_1 y_1 a_2 y_2 + \dots + a_p y_p) \tag{16}$$

Take note that the right-hand side of the equation looks very much like the equation (Shujuan, 2021) for multiple linear regressions. However, the method that is utilized to approximate the regression parameters in a logistic regression model is not the same as the method that is utilized to measure the regression constants in a multiple sequential regression model. Rather, the logistic regression model utilizes a method that is known as logistic regression analysis. In the statistical technique of logistic regression, the variables that are obtained from the model (such as  $a_1$ ) represent the change in the anticipated log odds related to a one-unit variation in  $Y_1$ , while maintaining all other variables constant. Therefore, the odds ratio may be calculated by taking the antilog of an estimated regression coefficient, which is denoted by  $\exp(ai)$ . Thus, this test is employed to analyze the interaction function of modern graphic design based on technical-aided design.

## 4. Result and discussion

By developing or merging components like patterns, pictures, and language, graphic design products convey a certain concept in a graphical format. Owing to its distinctiveness, graphic design must have evolved into a crucial worldwide communication. The evolution of research, innovation, and environmental factors has helped to broaden the scope of graphic design. In this research, we examined the interaction function of graphic design based on technical-aided design. Based on the analysis, in this section, we demonstrate the efficiency and assets of graphic design and graphic designers in terms of graphical representation.

After analyzing the significance of graphic design and its success rate, we found that it can have a significant impact on the exposure and profits of an industry. As a result, more visitors can lead to greater possibilities for business. The level of significance was varied, as shown in Fig. 1. The necessary access level for significance was described as very important, moderately important, neutral, slightly important, and not important, with percentages of 49%, 31%, 10%, 7%, and 3%, respectively. The data reinforce the

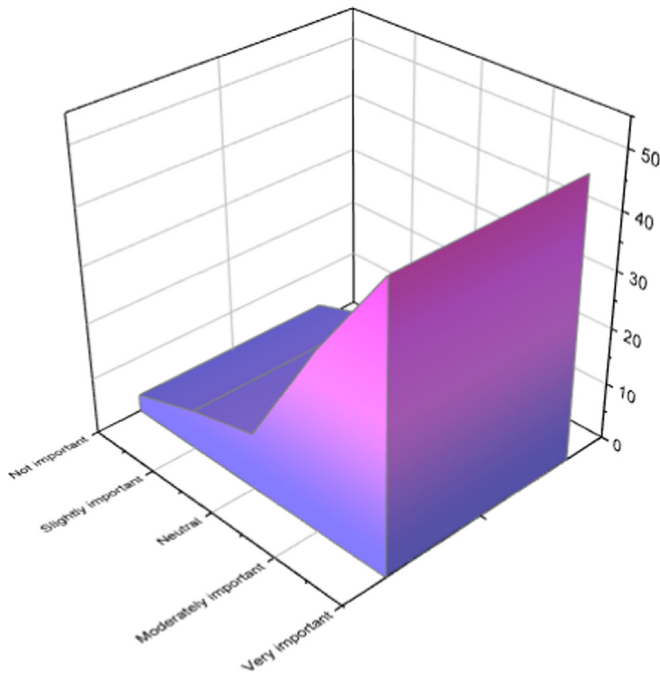


Fig. 1. Highlighting the Role and Influence of Graphic Design.

importance of investing in graphic design to succeed in today's highly competitive markets.

Additional images, known as visual assets, can be beneficial to enhance an institution's design aesthetics. These assets are not intended to replace the official portal mark or serve as emblems but rather to assist broadcasters in creating more imaginative artistry. Visual assets can be used to mark goods or represent different aspects of an organization's mission through symbols, colors, packages, and typography. Fig. 2 shows the visual assets of designers, including stock photography (40%), original graphics (4%), charts and data visualization (37%), video and presentation (7%), and GIFs and memes (12%). By applying these concepts, designers can create stunning visual content that captures the essence of an organization's brand.

The color concepts in graphical form with the appropriate visual designs were extracted. Fig. 3 shows the most commonly chosen colors by graphic artists, which are blue, green, white, black, red, yellow, orange, grey, and purple. After investigating, it was found that the majority of graphic designs used blue the most at 57%, followed by green at 35%, white at 32%, black at 29%, red at 21%, yellow at 14%, orange and grey at 12% each, and purple at 10%.

The success of a design project hinges on the ability of a designer to meet all the expectations and requirements of the cli-

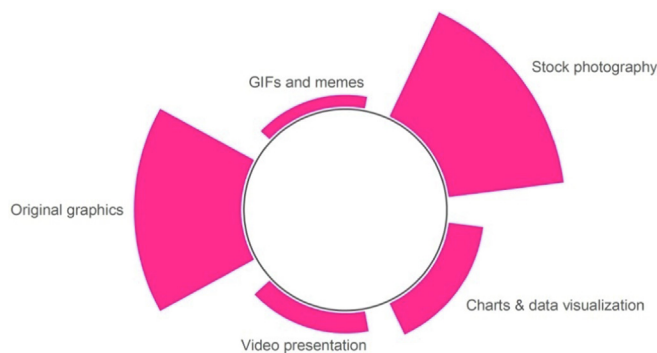


Fig. 2. Visual assets of graphic designers.

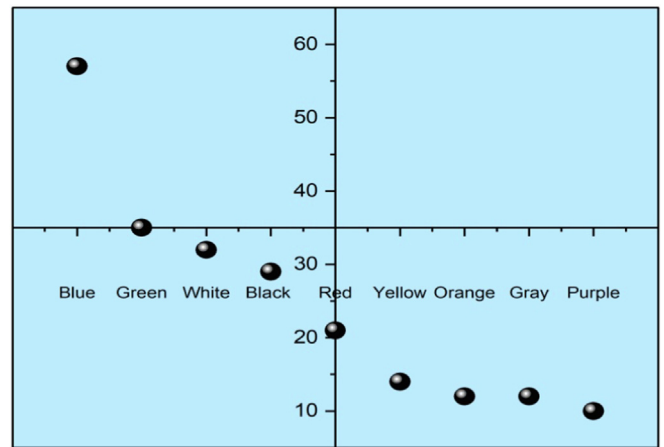


Fig. 3. Common color used by graphic designers.

ent. This can be achieved through graphic design as long as it does not distract from the primary objective. When used correctly, visual design can help guide the designer toward meeting the client's needs. The effectiveness of a design is judged by how well it performs the task at hand. The final stages of the design process are crucial to achieving efficiency and effectiveness, as demonstrated in Fig. 4.

Organizations that hire multiple creative individuals belong to six key sectors: Technology, Education, Finance, Internet, Health Care, and Insurance. Fig. 5 shows various groups of individuals that work as graphic designers. According to the findings, the sectors use 10%, 8%, 4%, 3%, 3%, and 2% of graphic designers to aid their organizational growth.

Exporting graphic design responsibilities could potentially improve the efficiency of many other areas of the profession. As shown in Fig. 6, graphic designers typically spend a significant amount of time designing graphics every week. Of the respondents, 22.3% reported spending between five and ten hours on this task alone, while an even more staggering 13.9% reported spending more than 20 h on it. Additionally, 28.3% of respondents stated that they spent between 2 and 5 h designing graphics, while 20.5% spent less than two hours on it. Finally, 15.1% of the respondents reported spending between 10 and 15 h of graphic design work. These findings highlight the importance of considering the potential benefits of outsourcing graphical design tasks.

## 5. Result of statistical analysis

### 5.1. Chi-square test

The Chi-square test was used to analyze the p value of graphic designs. Table 1 denotes the chi-square test for the interaction function of graphic design.

### 5.2. ANOVA test

ANOVA test was used to analyze the p- of graphic designs. Table 2 shows the ANOVA test for the interaction function of graphic design.

### 5.3. Multivariable logistic regression test

A multivariable logistic regression test was used to analyze the p- of graphic designs. Table 1 denotes the chi-square test for the interaction function of graphic design.

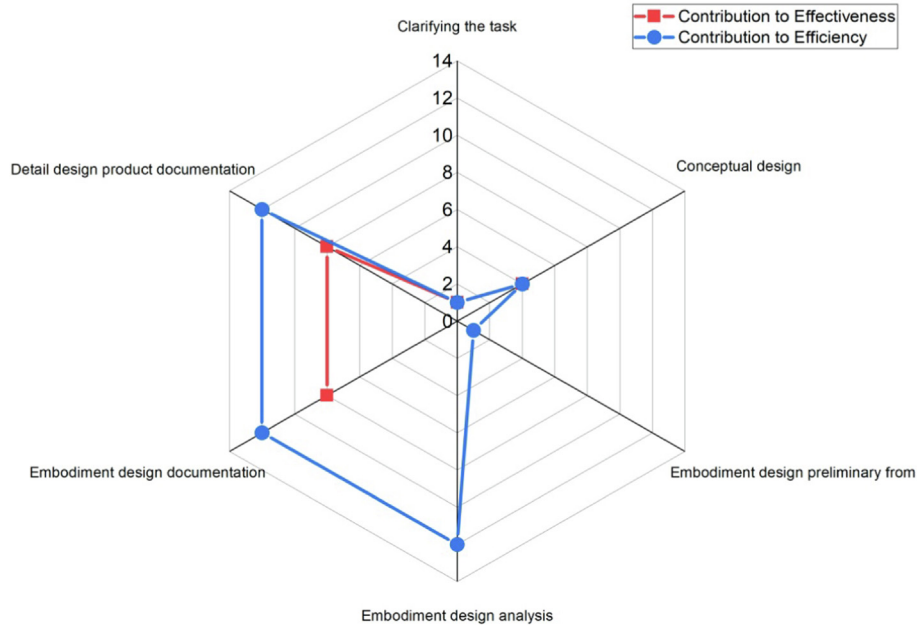


Fig. 4. Contribution to efficiency and effectiveness.

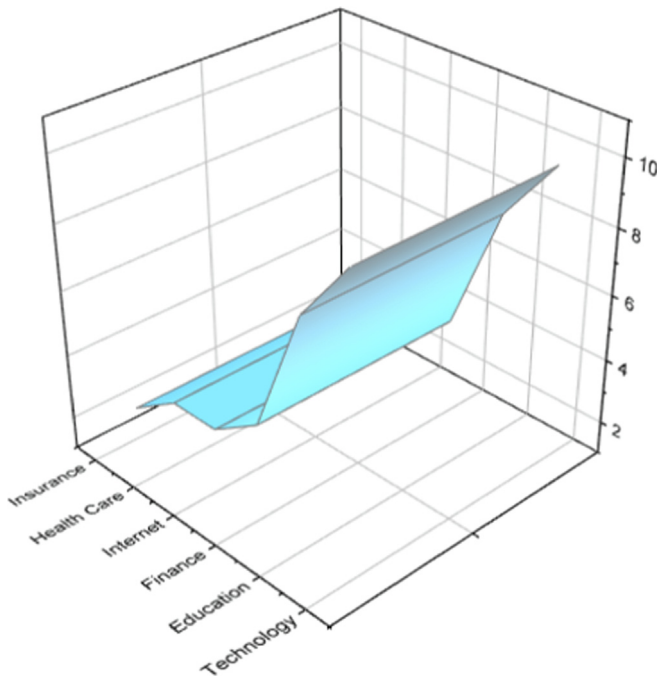


Fig. 5. The major organizations that utilize graphic designers.

Features	P-value
Innovation based	65
Technical-aided-based	98

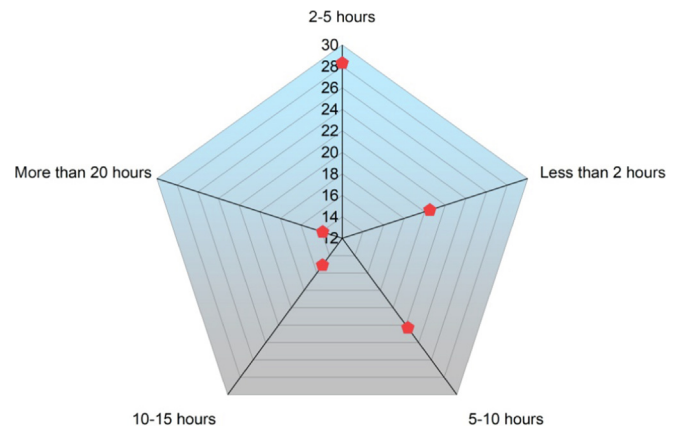


Fig. 6. Graphic designer's weekly schedule.

Table 1  
Interaction function of graphic design using chi-square.

Features	p-value
Innovation based	70
Technical-aided-based	86

Table 2  
Interaction function of graphic design using ANOVA.

Features	P-value
Innovation based	80
Technical-aided-based	85

The data suggests that a well-designed graphic can attract visitors through its aesthetic appeal, clear concept delivery, and increased trustworthiness. This can lead to more opportunities for business growth. These findings reinforce the importance of investing in graphic design to succeed in today's highly competitive market. The use of visual assets has proven to be an effective method to enhance

an institution's design aesthetics. These assets, which are not meant to replace the official portals or serve as emblems, can assist broadcasters in creating more imaginative artists. By incorporating symbols, colors, packages, and typography, designers can create stunning visual content that captures the essence of an organiza-



tion's brand. By applying these concepts, designers can create engaging and dynamic visual content representing different aspects of an organization's mission. After a thorough investigation, the proportion of colors used in most graphic designs was determined. The findings show that the most commonly used colors are shades of blue, followed closely by shades of green and gray. However, there was also a significant amount of variation in the color schemes used across different designs, indicating that there is no one-size-fits-all approach to creating effective graphics. The data suggest that designers should experiment with various color options to determine the best fit for their projects. Specifically, the study found that the technology sector uses 10% of graphic designers, whereas the education sector uses 8%. The Finance sector uses 4%, the internet sector uses 3%, the healthcare sector uses 3%, and finally, the insurance sector uses 2%. These findings shed light on the importance of graphic designers in various sectors and their role in organizational growth.

Du et al. (2022) investigated the impact of interactive design elements on user engagement and found that incorporating interactive features in graphic design significantly enhances user interaction and experience (Du and Xu, 2022). However, their study focused primarily on traditional design methods and did not extensively explore the potential of technical-aided design in this context. Wu et al. (2020) examined the role of user interface design in facilitating effective communication through graphic design. While their research highlighted the importance of visual aesthetics and usability, they did not specifically address the integration of technical-aided design in enhancing interaction functions (Wu, 2020). Li et al. (2020) conducted a comprehensive analysis of design automation techniques and their impact on the interaction function of graphic design (Li, 2020). Their findings revealed that implementing technical-aided design tools and algorithms could significantly improve the efficiency and effectiveness of interactive graphic design processes. However, their study mainly focused on specific automation techniques and lacked an in-depth exploration of broader interaction functions.

These studies highlight the significance of the interaction function in graphic design and its impact on user experience and communication. However, there needs to be more research in the understanding of how technical-aided design methodologies can further enhance and optimize interaction functions. Therefore, the present study addresses this gap by thoroughly analyzing the interaction function in modern graphic design using technical-aided design principles. Through a thorough investigation of the capabilities of technical-aided design, this study makes a significant contribution to the advancement of modern graphic design. By focusing on the interaction function, this study offers valuable insights for both practitioners and researchers.

## 6. Conclusion

The integration of technical-aided graphical environmental design has brought about significant progress and innovation in graphic design. Considerable progress has been made in the interaction function of modern graphic design in technical-aided contexts. However, there is still a need for suitable modernization actions to be taken in learning graphic interaction design to develop reliability and visual interaction achievement. The objective of this study was to investigate how well the interaction function of graphic design may be adapted for use in motion pictures and broadcast marketing using the many interaction channels made available by technical-aided innovation. Our findings showed that film and television ads can now guarantee more effective aesthetic attention and impact creative expression due to the

contemporary style and form of contemporary graphic design. The Multivariable logistic regression test, ANOVA test, and chi-square test provided significant findings. Our findings suggest that the interaction function of modern graphic design may be improved using technical-aided design. This will enable designers to create more directed images and text, contribute to the formation of their one-of-a-kind interaction function style, and ultimately lead to more effective aesthetic attention and impact on creative expression.

### 6.1. Recommendations and scope for future research

As technology advances at an unprecedented rate, the potential for innovative design solutions has expanded exponentially. This article aims to provide an in-depth analysis of the interaction function of modern graphic design, shedding light on how technical-aided design enhances the creative process and user experience. To begin with, future research in this field could focus on understanding the psychological impact of interactive design elements on users. By delving into the cognitive processes activated when individuals engage in modern graphic design, researchers can uncover insights that will enable designers to create more compelling and engaging visual experiences. Additionally, exploring the potential implications of virtual reality and augmented reality in graphic design can provide valuable insights into the future of this field. As AI becomes more prevalent in the creative industry, investigating its implications for the design process can reveal new opportunities and challenges. This research could delve into the potential of AI to generate automated designs, assist in decision-making processes, or even collaborate with human designers. The analysis of the interaction function of modern graphic design based on technical-aided design is a topic with potential for future research. By understanding the psychological impact of interactive design elements and exploring the role of emerging technologies, such as virtual reality and artificial intelligence, designers can push the boundaries of creativity and deliver unprecedented user experiences. Through continued research and exploration, the field of modern graphic design will evolve and thrive in the ever-changing technological landscape.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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