



# Research on the Application of Multimedia Interactive Technology in the Design of Intelligent Exhibition Halls

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**Abstract.** Today's Internet technology continues to innovate with the development of the times, and as the coverage of the field of science and technology design increases year by year, it has prompted the exhibition hall design field to cover a large area with technology interactive multimedia equipment, from emerging products to widespread, multimedia equipment has been skillfully applied to the major exhibition hall design space, leading the exhibition hall information transfer mode and exchange experience mode. In recent years, the concept of intelligent exhibition hall has gradually developed towards design innovation, awareness leading and interactive immersion. In this paper, the innovative connotations and advantages of multimedia technology-led wisdom exhibition hall design are studied and discussed, and the innovative ideas and design strategies of multimedia devices in wisdom exhibition hall design are proposed, creating a new perspective for the immersive multimedia exhibition hall space design.

**Keywords:** intelligent exhibition hall · multimedia technology · immersive experience

## 1 Introduction

The core point of the interactive design of the exhibition hall space lies in the innovative application of multimedia equipment. In order to strengthen the interactive relationship between space and people and promote the perceptual experience of emotions and objects, the wisdom exhibition hall design aims to achieve the innovation of multimedia immersive experience and is committed to online exhibition hall interaction innovation, offline exhibition hall space multimedia intelligent interaction and the influence and dissemination of new technologies on the modern multimedia-led wisdom exhibition hall interaction Experience development provides innovative assistance.

## 2 Multimedia Technology Overview

In recent years, the innovation of multimedia technology in the intelligent exhibition hall space is mostly reflected in the touch interaction, surround sound and visual and immersion perception.

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The use of emerging technologies in exhibition halls mostly refers to the space in the application of multimedia software interaction in the form of spatial information analysis, scene dimensional simulation, visual impact expansion and experience immersion guidance, etc., to bring the audience a virtual simulation, audio interaction, immersive, imaginative and immersive interactive environment [1].

In today's development of multimedia technology, the interactive design of intelligent exhibition hall space is mediated by equipment touch sensing technology and information synthesis technology to immerse the audience to experience, perceive and touch the three-dimensional visual and image touch of virtual things under the innovation of multimedia technology.

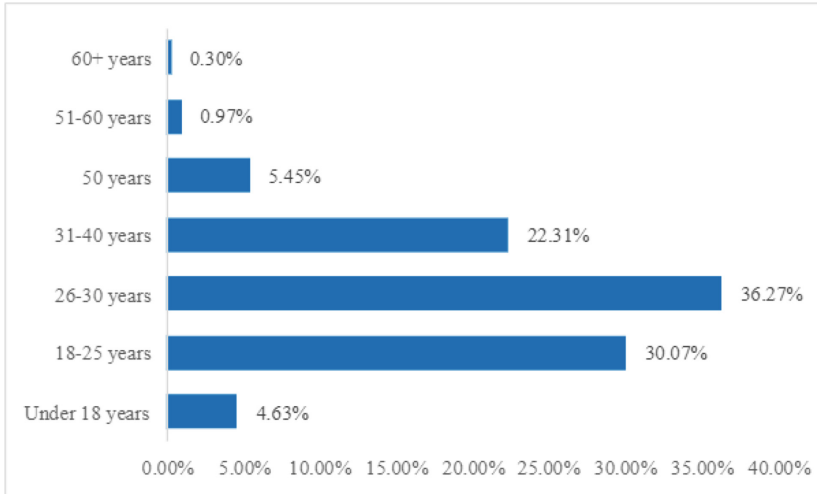
The application of physical sensory equipment under multimedia technology in the design of intelligent exhibition halls can intuitively feel the subtle texture, structural level and property connotation of the items displayed in the space, which is an immersion experience under the spiritual dimension of the audience, a breakthrough under the category of virtual space-time experience and perception created by the exhibition hall, and an infinite impetus and impact for the epoch-making development of the exhibition hall. Through the continuous innovation of multimedia equipment, more products with super foresight are emerging, choosing the equipment suitable for the exhibition hall, bearing on the development of the concept of multimedia equipment, in order to make the audience more intuitive and immersive experience and understanding of the product [2]. This virtual, technical and scientific development of technology is the new direction of the future showroom design navigation.

In order to better implement the application of multimedia equipment in the exhibition hall space, the following principles should be followed: (1) the principle of human-centredness. When using multimedia equipment for interactive programme design, "people" must be placed at the core of the design concept, and then through the analysis of the exhibitors, accurately grasp the purpose and needs of their exhibitors, etc., and then based on this to design a programme in line with the modern space multimedia interactive immersion experience; (2) the principle of visibility. That is, whether the exhibition hall display function can be intuitively reflected, significantly enhance the visual experience of the viewer, the viewer body is the key to the exhibition hall to a great extent to drive the experience. (3) The principle of feedback. While actually visiting the exhibition, the viewer will give feedback on his or her feelings, thus providing continuous support to the whole exhibition hall in the process of future development and optimization [3].

### **3 Analysis of Exhibition Users**

The design concept of the intelligent exhibition hall is to allow the viewer to be intuitively immersed in the human-machine interactive immersive experience space created by the technical equipment. In the design of the interactive experience in the exhibition hall space, the focus is on the combination of technology, space and the viewer, creating a sense of immersion and participation in the immersive experience of the space with the application of multimedia equipment, high technology and sound and light technology.

The user experience is often a key objective for designers to analyse at the beginning of the design process. The human senses play an important role in the perception of

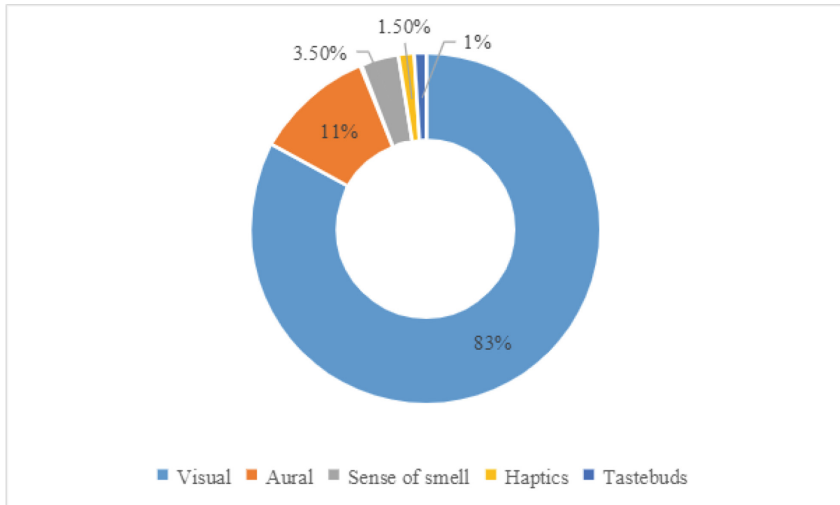


**Fig. 1.** Analysis of visitors to the exhibition

the world and different sensory stimuli can leave different impressions [4]. The design of this paper also analyses the future users of its exhibition hall, and it is clear from the data that the experience of different age groups coming to the exhibition hall will be different, roughly divided into the following categories: 4.63% under 18 years old, 30.07% between 18–25 years old, 36.27% between 26–30 years old, 22.31% between 31–40 years old, 5.45% between 50 years old, 0.97% between 51–60 years old and 0.3% for those aged 60 years and above (Fig. 1). According to psychologist Treicher’s famous psychological experiments, 83% of the information people obtain through their senses is provided by sight, 11% by hearing, 3.5% by smell, 1.5% by touch and 1% by taste (Fig. 2). It is clear from this analysis that when people use their senses to perceive and understand the world, it is through the combined action of all their sensory systems that they gain the ultimate experience. In the design of the wisdom exhibition hall, if the sensory stimulation of the viewing user can be fully mobilised and integrated with the space as a whole, and the visitor’s perception, interest and action can be practically integrated into the overall interactive immersion experience of the wisdom exhibition hall, only then can the complete display of the interactive immersion experience space using multimedia technology and equipment be enhanced.

#### 4 Outline of the Display of the Smart Exhibition Hall

The overall technical composition of the exhibition hall design is divided into four parts: smart communication, service, operation and management. The core part located in the space technology is the intelligent communication space, which mainly has “interaction between the exhibition hall and users, connection between the department and management, and decision making between business and exhibits”, the integration of these three parts mainly solves the aspects of attraction, information and communication in the intelligent exhibition hall design in this paper, which specifically involves the content



**Fig. 2.** Proportion of sensory systems when accessing information

level including online digital exhibition hall Communication, collaboration and cloud-based community platforms, while multimedia interactive technology is also reflected in a series of behaviours such as ticketing, security checks, guided tours, navigation, interaction, evaluation and feedback after users enter the exhibition space [6]. Through the intelligent construction of media information technology, the normal service of the exhibition hall is guaranteed as well as the multimedia technology of the exhibition hall to create an immersive space experience. In addition, it also reflects a higher level of technical effectiveness in the use and operation of multimedia technology equipment, with data visualisation forming intuitive graphics that are presented in real time in LED and holographic projection equipment. Finally, the management role of technical equipment in the work and daily business processing of the exhibition hall is reflected in its technical effectiveness, which is mostly shown in the management personnel to view all the information of the wisdom system through the integrated management platform, to grasp the operation of the whole hall in real time, and to efficiently and conveniently give instructions for management, observation, refreshing and rectification, so as to achieve the maximum technical equipment use practice of the wisdom exhibition hall design and to interpret the multimedia technical equipment-led The wisdom of the exhibition hall immersive interactive experience space.

## 5 Analysis of Multimedia Equipment for Smart Showrooms

Now recognised as one of the world's most innovative visual technology companies, Christie was the first to license DLP Cinema technology and it was the first digital cinema technology to be adopted by the Hollywood film industry. The Christie D4K40-RGB is used in large venues and showrooms (Fig. 3 and 4), where the integrated 40,000 lm RGB true laser projector raises the bar in design, image quality, processing and



**Fig. 3.** Front view of the D4K40-RGB unit



**Fig. 4.** Side view of the D4K40-RGB unit

connectivity. SDVoE input card, and Covis Christie Link, allowing easy connection to a variety of sources. It is also compatible with most Christie 4 K lenses, making it easy and cost-saving to replace. And it uses a single-phase 220 V power supply, with simple power requirements. d4K40-RGB reveals stunning colour detail, adds high frame rate (HFR) performance of up to 120fps, 5000:1 switching contrast ratio, comprehensiveness and sets a new benchmark for large scale true laser projection, which takes large scale projection to new heights. The centrepiece of Dubai Expo 2020, Al Wasl Square, is also an architectural creation, with its 252 KOSI D4K40-RGB pure laser projectors will light up the dome from both inside and outside at 10 million lumens, bringing the audience on an immersive journey of experience.

The analysis of the parameters of the Christie D4K40-RGB (Table 1) and the results of its use in the Dubai Expo 2020 exhibition hall allow for a practical analysis of the role of this equipment in the design of an immersive experience in an intelligent exhibition hall, and the following is a systematic analysis of the three aspects of its multimedia technology: “digital audiovisual, media interaction and optimised display”, The following is a systematic analysis of the three aspects of this technology: “digital audio-visual, media interaction and optimised display”.

### 5.1 Digital Audio-Visual Technology

In multimedia digital audio-visual technology, it includes “holographic photography, 3D display technology and new two-dimensional display technology”. Visitors can see the real images or virtual image legends recovered from the exhibition through modern

**Table 1.** Christie D4K40-RGB product parameters configuration

Christie D4K40-RGB			
Brightness	Contrast ratio	Resolution	Direction
40,000 ANSI lumens (typical) @ 25 °C	5000:1 switch	4096 x 2160 (4 K)	Omni-directional
Display type	Type of lighting	Image processing	Frame rate
3DLP® 1.38' sealed prisms	Covidien Christie® RealLaser™ (Solid State Light Emitting)	Coventry Christie TruLife™ electronic platform, 1.2Gpx/s	option 96–120 Hz 4 K, 240–480 Hz 2 K scaling
Luminous performance	Input circuit voltage	Working environment	Size
4 timed from power on at 10,000 lumens to 20,000 h (to 60% brightness) 3 million lumens at 30,000 h from power on (to 80% brightness)	Single phase 220VAC, 19A, 4000 W, 13650 BTU/h Connector: 30A IEC309	5–40 °C (41–104°F) Relative humidity: 10–80% (non-condensing)	Dimensions (not including lens): (LxWxH): 37 x 28 x 21.8" (947 x 711 x 553 mm) Weight:285lbs (130 kg)
Input		Footage	
Standard	Optional	0.72:1	
2 x 12G-SDI x HDMI 2.0	Dual 3G SD/HD-SDI input card	0.9:1	
1 x DisplayPort 1.2 (HBMIC)	Dual-link DVI input card	1.13–1.31:1	
1 x Fiber Optic (QSFP +) available for Coventry Christie Link transmitter HDBaseT	4 x DisplayPort input card	1.31–1.63:1	
	Dual HDMI input cards	1.63–2.17:1	
	Terra (SDVoE) input card	1.99–2.71:1	
		2.71–3.89:1	
		3.89–5.43:1	

high-speed computer holographic image processing technology to obtain and feedback information content, get an effective audio-visual experience and stimulate people's perception of the surrounding context. Secondly, 3D display technology (Table 2) uses multimedia sound, light and electricity to display together, with the help of large blower displays and factors related to environmental shaping such as wind, snow and rain, combining visual, auditory and tactile senses to give the audience a sense of immersive reality, stimulating their audio-visual senses and leaving unique memories [7]. Finally, the flat two-dimensional display technology of digital media, mainly using text and images as the main elements, presents specific display information, with touch-screen operation, allowing the audience to have a more detailed understanding of the exhibits.

**Table 2.** Classification and characteristics of 3D display technologies

Passive	Proactive	Proactive	Proactive
Binocular vision	Structured Light	Flight time	Triangulation
2x NIR camera or 2x colour camera Two cameras capture the image simultaneously and the visual difference between the two images calculates the depth information of each pixel according to the triangle definition	1x transmitter + 1x camera The emitter of a speckle or encoded graphic causes deformation as the distance changes The depth algorithm calculates the relative depth distance based on the deformation	1x near infrared emitter + 1x CCD/CISS time-of-flight camera Image head Emitter: pulsed or modulated light Depth information is based on time differences	1x transmitter + 2x camera Two cameras capture images simultaneously and the visual difference between the two images is calculated based on the triangular definition of the depth distance of each image colour

**5.2 Media Interaction Technology**

Media interaction technology is an important means of expression in the interactive design of the intelligent exhibition hall space. Compared with the traditional display space, media interactive technology can be based on its innovative interaction, creating a multi-sensory experience such as audio-visual. The technology can also be used in the exhibition hall interactive space for computerised information modelling and flexible use of media interactive technology equipment to present visual effects, bringing the audience a virtual simulation, audio interaction, immersive and imaginative 3D virtual environment [8]. With a variety of touch sensors and computerised synthesised images, sounds and graphics, the interactive media technology allows visitors to experience the full range of physical sensations between the tactile and computerised virtual still life in an intelligent immersive experience exhibition hall, and to feel more intuitively the multifaceted nature and characteristics of the objects on display, which is a virtual reality realm that cannot be expressed in words or graphics. The technology is even more through virtual reality technology, so that the audience can more intuitively understand the advantages and multiple functions of the exhibits, but also in the operation of a realistic physical sense, this virtualisation, technology and science is multimedia-led wisdom immersive experience showroom design development direction [8].

**5.3 Optimising the Display Space**

The equipment required to optimise the multimedia technology in the exhibition hall space is generally technology-based screens, projectors, etc., which can save space in the exhibition hall and make it possible to express unlimited ideas and artistic space in a limited area [9]. Optimising intelligent showroom space with new media technology is a way of filtering and enhancing information for display interaction and immersive experiences. In order to display the internal shape structure of the space, the design should

create more functional areas for communication and display, such as entertainment and communication areas, franchise experience areas, etc. The use of digital media technology optimises the display space by adding various functional areas, combining artificial intelligence, modern technology and interactive devices to optimise the display environment of the display space and maximise people's spiritual and psychological needs for the display space [10]. Digital media technology optimises the modern intelligent display space, enabling designers to comprehensively analyse, collate and edit display information data, understand history, culture and display needs for the benefit of the audience, ultimately reflecting the value of the application of digital media technology [11].

## 6 Conclusion

Intelligent exhibition hall is the inevitable trend of modern multimedia to create an immersive interactive experience, which is oriented to provide more efficient exhibition setting services for exhibition-viewing users, enhance the enthusiasm of the public to visit and make them immerse themselves in the process of viewing the exhibition to feel the cultural inculcation [12]. Continuously improve the multimedia interactive experience function of the smart exhibition hall, promote the communication between the viewing user and the overall display space, so as to build a more immersive exhibition hall environment experience.

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