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International Journal of Multimedia Art, Design and Education

Prof. Siu-Tsen Shen
Editor-in-Chief

A warm welcome to the seventh edition of the International Journal of Multimedia Art, Design and Education (MADE), an open-access resource dedicated to publishing high quality, peer-reviewed research papers in all areas of design research.

The election in the UK is just around the corner, with Labour predicted to win with a landslide majority, which might even eclipse Tony Blair's 1997 election victory.

Blair is quoted as famously saying 'Education, Education, Education' in one of his first election speeches, and this edition of the journal is dedicated to Education in the Digital Age.[1]

The Labour party have insisted that they will not increase taxes during their first five-year term, if they win the election. Instead they are banking on efficiency savings and a growth in the economy driven by productivity gains. This is a large bet on the next generation of employees to drive the economy in the right direction.

Education and training will play a large part in the success of this strategy. The recent explosion of AI inspired software, such as ChatGPT, may enable productivity gains, but only if the user is able and willing to understand and use this powerful tool in a wise and responsible way. [2]

Many countries around the world are currently in an election cycle, with the rise of the far right a worrying trend. As responsible citizens we must be conscientiously vigilant of a return to the dark days of pre-war (1918 and 1939), for it is very easy to fall into the same trap.

Our Editorial Board consists of leading design researchers and practitioners from all over the world, all of whom have proved willing to contribute their valuable time to the development of this new journal. To reach the widest possible audience, the journal will be published both online and in print. The online version will be open access, freely available for anyone, anywhere to download, read, distribute, and use, with proper attribution of authorship, for any non-commercial purpose. A printed version of the journal will also be available at cost.

The journal aims to provide an international forum for exchange of ideas and findings from researchers across different cultures, by encouraging research on the impact of cultural factors on design theory and practice. The journal also seeks to promote the transfer of knowledge between professionals in academia and industry. To help make our vision a reality, we invite you to submit your best work to the MADE Journal and to encourage your colleagues to do the same.

In these turbulent times, we all have a responsibility to use design tools to boost economic growth and provide opportunities to the younger generation. These are our future leaders, and together we can overcome the current challenges of post-Covid-19, recession and geo-political tensions in the world.

Acknowledgements
This seventh issue of MADE was only possible due to the hard work of the four contributors. Each of the contributors went through an extensive revision/review

process, which resulted in works of excellent quality. The reviewers in the various disciplines spent countless hours on top of their already busy schedules to ensure the works included are of the highest quality. The MADE executive committee not only had the goal of creating this journal, but also served a large role in determining the initial format and general guidelines for the journal. They had online meetings to discuss deadlines, submission, and their careful consideration helped the editorial board avoid a number of pitfalls we could have encountered with this issue. They were also charged with the difficult task of selecting the cover design from an impressive set of submissions. I also need to acknowledge the work of Assistant Managing Editor, Zhi-Xing Dai, who spent many hours discussing policies, formatting, and any other number of other details about the journal with me.

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Integrating Digital Art and Cultural Landscape Education: *Innovative Practices at the Pingtung Hakka Museum*

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Digital art has become a popular form of presentation, widely used in art exhibitions, film and television media, electronic games, etc. It possesses interactivity and entertainment value and is gradually being utilized in the fields of culture and education. This paper focuses on the Pingtung Hakka Museum, exploring the application of digital art in cultural landscape education and analyzing its innovative practices in immersive spatial experiences. This study employs observation methods and references an audience feedback survey conducted by the Pingtung Hakka Museum. The results show that digital art not only enhances the audience's cultural landscape experience but also promotes the dissemination of cultural education, significantly increasing museum attendance and visitor satisfaction. However, digital art presentations also face some challenges and areas for improvement, such as incorporating more interactive elements and physical displays. This paper also discusses the challenges and future research directions of digital art in cultural landscape education.

Keywords – Cultural Education, Cultural Landscape, Digital Art, Immersive Experience, Pingtung Hakka Museum

Relevance to Design Practice – This article examines how digital art enhances cultural landscape education at the Pingtung Hakka Museum through innovative, immersive exhibitions. It highlights the potential and challenges of digital art in museum design, offering insights for future cultural and educational applications.

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Introduction

Humanistic geography, first formally proposed by geographer Yi-Fu Tuan in 1976, emphasizes the importance of human experience and meaning in understanding the relationship between people and places and their geographical environments (Tuan, Chih-Cheng, and Zuo Yi-Ou, 2006). Geography gradually developed during the 19th and 20th centuries, focusing on the role and influence of humans in environmental changes and exploring human intervention activities in the evolution of regional landscapes. This focus has made cultural landscape research a significant aspect of geography.

A representative scholar in cultural landscape research, Sauer (1963), defined landscape as the appearance of a region and its inherent meaning. He argued that cultural landscapes highlight their intrinsic significance through the interpretation of regional cultural connotations and historical contexts, referring to "the essence of a region." Modern cultural geographers further view landscapes as "ways of seeing" (Berger, 2008), emphasizing the symbolic meanings of landscapes. For instance, tangible cultural assets like old buildings and monuments, as well as intangible cultural assets like songs and clothing, are seen as symbolic markers of cultural landscapes.

Digital art has become a significant contemporary art form, characterized by high interactivity and entertainment value, and is widely applied in art exhibitions, film and television media, electronic games, and other popular entertainment industries (Ciolfi, 2011). Digital art creates immersive experiences by combining virtual and physical spaces, allowing audiences to experience alternative realities and fulfill their intrinsic need for escapism (Heim, 2017). This has become not only a part of the artistic experience itself but also an important vehicle for cultural education (Harvey, 2002).

This paper takes the Pingtung Hakka Museum as a case study to explore the application of digital art in cultural landscape education, analyzing its innovative practices in spatial experiences. The study references an audience feedback survey conducted by the Pingtung Hakka Museum. The results show that digital art exhibitions not only enhance the audience's cultural landscape experience but also promote the dissemination of cultural education. Through digital technology, the Pingtung Hakka Museum artistically presents the traditionally expressed Hakka cultural landscape, achieving remarkable results. This provides a valuable case study for the application of digital art in cultural landscape education.

The purpose of this study is to explore how digital art, through innovative spatial design, promotes cultural landscape education and enhances the audience's cultural identity and participation. This research aims to provide improvement suggestions for the Pingtung Hakka Museum and offer practical experiences that can be referenced by other cultural landscape education sites.

Overview of Hakka Cultural Landscape in Pingtung

Historical Background & Geographical Distribution

The Liudui Hakka region encompasses administrative areas in both Kaohsiung City and Pingtung County. In addition to the Hakka areas in Meinong, Liugui, Shanlin, and Jiaxian of Kaohsiung City, the Hakka towns in Pingtung County include Changzhi, Linluo, Jhutian, Neipu, Wanluan, Jiadong, Xinpi, and Gaoshu. Research indicates that the Hakka ancestors in these areas mostly originated from the counties of Zhenping (Jiaoling), Chengxiang (Meixian), Pingyuan, and Dapu in Chaozhou Prefecture, and the counties of Yongding, Wuping, and Shanghang in Tingzhou Prefecture, China (Chung, 1973). These ancestors shared common cultural, bloodline, and linguistic ties. Geographically, these areas are mostly located in the central Pingtung Plain, neither mountainous nor coastal, surrounded by Minnan residents speaking Zhangzhou and Quanzhou dialects, and bordered by indigenous peoples in nearby mountainous areas. This unique cultural background reflects diverse ethnic landscape features.

Historically, the prototype of Liudui can be traced back to the Kangxi period of the Qing Dynasty, with a history spanning over three hundred years. According to Chung's (1973) compilation of "The Local History of Liudui Hakka," the Liudui area in the 60th year of Kangxi (1721) included thirteen large villages and sixty-four small villages, covering the current Liudui settlements in the Kaohsiung-Pingtung area. The cultural settlement of Liudui originated from the civil uprising known as the "Zhuyigui Incident," initially referred to as "Seven Camps." The name "Liudui" formally appeared in historical records after the 51st year of Qianlong in the Qing Dynasty (1786) (Shih, 2017).

The Cultural Educational Significance of the Hakka Cultural Museum

According to Sauer's (1963) definition, cultural landscapes highlight their intrinsic significance through the interpretation of regional cultural connotations and historical contexts, referring to "the essence of a region." Modern cultural geographers view landscapes as "ways of seeing," emphasizing the symbolic meanings of landscapes (Berger, 2008). In the Liudui Hakka region of Pingtung County, cultural landscapes include tangible elements such as old buildings and monuments, as well as intangible cultural assets like songs and clothing, which are important symbols of Hakka culture. Cultural landscape education holds significant importance in modern society. Through the interpretation and presentation of cultural landscapes, it can enhance people's understanding of historical culture and strengthen cultural identity.

Cultural landscape education is a comprehensive and profound process that has a far-reaching impact on both individual and societal development. Firstly, cultural landscape education can enhance people's sense of identity with their cultural

heritage, which is the cornerstone of social cohesion and stability. Through the study and appreciation of historical sites, buildings, artworks, and other elements, people can better understand their cultural roots and cultivate a deep appreciation for aesthetics and art.

The Pingtung Hakka Museum successfully integrates cultural landscape education into the spatial experience of its audience through digital art exhibitions. This not only attracts a large number of visitors but also promotes the inheritance and innovation of culture.

The Importance of Cultural Landscape Education

Cultural landscape education is crucial for promoting cultural heritage. In the wave of globalization, maintaining cultural diversity has become a challenge, and education is the key means to ensure the transmission of culture from generation to generation. Through education, younger generations can access and understand traditional values and lifestyles, integrating these cultural elements into their modern lives. Cultural landscape education also enhances people's aesthetic abilities and artistic appreciation. In the learning process, individuals learn to appreciate artworks of different styles and periods, enriching their spiritual world and stimulating their creativity and imagination. This perception and pursuit of beauty are essential for personal development and societal innovation and progress.

On the other hand, cultural landscape education plays an important role in promoting social diversity and harmony. Through the study and appreciation of different cultural landscapes, people can better understand and respect various cultural backgrounds and values, contributing to a more inclusive and harmonious social environment. Economic development is also a significant aspect of cultural landscape education. Cultural landscapes are important factors in attracting tourism and investment. By protecting and promoting these landscapes, the cultural tourism value of a region can be enhanced, thereby supporting economic growth and development. Environmental awareness is another crucial component of cultural landscape education. Many cultural landscapes are closely linked to the natural environment, and educating people about protecting these landscapes can raise their environmental awareness and promote sustainable development (Ishizawa, 2018: 7-19).

In summary, cultural landscape education is essential for cultivating a global perspective and cross-cultural communication skills. In today's globalized world, understanding cultural landscapes from around the world helps broaden horizons and enhance international understanding and cooperation. Cultural landscape education is not only a reflection on the past but also an investment in the future. It plays an irreplaceable role in individual growth, societal development, and cultural heritage. Through cultural landscape education, we can better protect and utilize these valuable cultural resources,

leaving a rich cultural heritage for future generations.

Digital Art & Spatial Experience

Definition and Application of Digital Art

Digital art is an art form that utilizes digital technology for creation, encompassing various forms such as digital painting, animation, visual effects, and interactive media. The rise of digital art marks the diversification of artistic expression and the integration of technological advancement (Ciolfi, 2011). This art form, which combines creativity and technology, continually expands the boundaries of art, providing artists with limitless creative freedom. Digital art not only allows artworks to be widely disseminated on the internet, increasing accessibility, but also attracts broader audience participation due to its interactivity.

Digital art is becoming increasingly important in fields such as education, commerce, game design, cultural heritage preservation, and public art. It enhances students' creativity and technical skills, offers innovative visual effects for commercial brands, creates immersive experiences in the gaming industry, and plays a crucial role in protecting and preserving cultural heritage. With technological advancements, digital art is transforming the art market, providing new opportunities for artists and collectors through concepts like digital collectibles and crypto art. The development of digital art not only enriches people's visual experiences but also opens new avenues for artistic creation and communication, becoming a pioneer in the fusion of art and technology.

Integration of Digital Art and Cultural Landscape

The combination of digital art and cultural landscapes creates a novel way of experiencing art, enriching artistic expression while offering new avenues for the preservation and education of cultural landscapes. Through digital technology, artists can reconstruct historical scenes in virtual spaces, allowing audiences to traverse time and space and personally experience past cultures and lifestyles. This immersive experience not only satisfies people's curiosity for new things but also provides them with a deeper understanding of history and culture while escaping reality (Heim, 2017).

In the display of cultural heritage, digital art offers an innovative presentation method. Using technologies like 3D modeling and digital reconstruction, artists can restore cultural heritage such as artifacts and buildings that have been lost or damaged over time, presenting them to audiences with realistic visual effects. This approach not only aids in the protection and preservation of these valuable cultural assets but also allows audiences to directly experience their allure.

Moreover, the application of digital art in cultural landscape education is also evident in interactive design. Audiences can interact with artworks through touch screens, mobile devices, or VR headsets,

influencing the presentation of the works or participating in the creation process. This sense of participation not only adds interest to the artworks but also enables audiences to learn about and experience culture through interaction, thereby enhancing their understanding and awareness of cultural landscapes.

The integration of digital art and cultural landscapes also promotes cross-cultural exchange. By digitally presenting artworks and landscapes from different cultural backgrounds, audiences can understand and appreciate cultural features from around the world without geographical limitations. This cross-cultural exchange helps increase understanding and respect for different cultures, promoting cultural diversity and inclusion (Agbai, Agbai, & Oko-Jaja, 2024, March). For example, the "Liudui Impressions" exhibit at the Pingtung Hakka Museum uses digital animation projections to recreate the historical development process of the Hakka ancestors, immersing visitors in a sensory experience that highlights the interaction between history and geography.

In summary, the integration of digital art and cultural landscapes offers new possibilities for artistic creation and cultural heritage. It not only enriches visual experiences but also creates new opportunities for art education and cultural exchange. With ongoing technological advancements, this combination will play an increasingly significant role in future cultural landscape education and artistic creation.

Spatial Experience and Immersive Exhibition

Spatial experience is a comprehensive perceptual process that involves not only visual and auditory senses but also tactile, olfactory, and even gustatory senses. The combined effect of these senses collectively shapes the audience's overall perception of a specific space. Pallasmaa (2014) emphasizes in his research that peripheral and unconscious perceptions play an important role in shaping architectural experiences. These subtle perceptions often subliminally influence people's emotions and behaviors.

In this process, the creation of atmosphere is particularly crucial as it can evoke strong emotional responses in the audience, thereby affecting their overall perception of the space. Digital art exhibitions leverage this by using a combination of high-definition videos, animations, music, sound effects, sets, and lighting to create a layered and immersive exhibition environment. This environment not only captures the audience's attention but also provides them with a rich sensory experience, resulting in strong emotional resonance.

The spatial experience of digital art exhibitions often allows the audience to escape the pressures and limitations of reality, entering a meticulously designed world by the artist. In this world, the concepts of time and space are redefined, enabling the audience to explore and experience freely, enjoying a feast for the

eyes and ears. This immersive experience not only stimulates the audience's imagination and creativity but also provides them with profound cultural and emotional experiences in a short period (Westling, 2020).

Moreover, digital art exhibitions can use interactive technology to make the audience a part of the exhibition. Their actions and choices can influence the content and form of the exhibition. This participatory experience not only adds fun and interactivity to the exhibition but also allows the audience to deeply understand and appreciate the artistic content through their involvement. At the Pingtung Hakka Museum, the "Life Rituals" exhibition area uses a large circular projection device to display Hakka cultural rituals. Through interactive projection devices, the audience can gain a deeper understanding of Hakka cultural ceremonies, enhancing their understanding and identification with Hakka culture (Pingtung Hakka Museum Service Plan, 2021). This immersive spatial experience greatly enhances the effectiveness of cultural landscape education.

Overall, digital art exhibitions create diverse and rich spatial experiences that not only enhance the audience's sensory enjoyment but also enrich their emotional experiences and cultural understanding. This exhibition format, which integrates technology and art, is becoming an important method for contemporary art and cultural dissemination, continually innovating to bring audiences unexpected surprises and experiences.

The Impact of Digital Art on Cultural Education

The application of digital art in cultural education has not only brought revolutionary changes to traditional educational methods but also opened a door to entirely new learning experiences. Harvey (2002) emphasized that art, as a special way of human expression, fundamentally aims to convey truth and values. The intervention of digital art allows this tradition to be presented in a more vivid and tangible manner.

In the past, cultural education often relied on static text and images to convey knowledge. Although this method provided basic information, it was difficult to stimulate deep engagement and emotional resonance among learners. Le (2023) mentioned that the integration of digital art has made educational content dynamic. Learners can experience cultural connotations through various senses, such as visual, auditory, and even tactile, greatly enhancing the attractiveness and effectiveness of learning. For example, in history education, digital art can recreate street scenes of ancient civilizations, allowing students to feel as if they are personally experiencing the social and cultural atmosphere of the time. In language learning, digital art can present the pronunciation and expression of different languages through animations and videos, enabling learners to master language skills more quickly through the coordination of visual and auditory senses.

Digital art can also be applied to cultivate creative thinking. Students can use digital tools to create their own artworks, which not only fosters their creativity but also allows them to understand and appreciate cultural elements more deeply during the creation process. This active learning approach is far more effective in stimulating learners' potential than passive knowledge reception (Black & Browning, 2011: 19-34). Additionally, digital art can promote cross-cultural exchange. In the context of globalization, learners can understand artistic expressions and values from different cultural backgrounds through digital art, aiding in the development of international perspectives and cultural literacy.

In summary, the application of digital art in cultural education has enriched the forms and content of education, providing learners with deeper, more diverse, and interactive learning experiences. This revolutionary change has not only altered the way of learning but also expanded the boundaries of learning, making cultural education more vivid, concrete, and meaningful. The digital art exhibitions at the Pingtung Hakka Museum have not only attracted a large number of visitors but also promoted the dissemination and education of cultural knowledge. Through interactive devices, visitors can participate in the exhibitions themselves, which not only increases the fun of learning but also enhances the effectiveness of learning (Pingtung Hakka Museum Service Plan, 2021).

Pingtung Hakka Museum

Overview of the Museum

The Pingtung Hakka Museum is located at the "Pingyan 1936 Cultural Base" (formerly the Pingtung Tobacco Factory). This museum, established by the Pingtung County Government to promote Hakka culture and education, is the first in the nation to use digital technology for artistic presentations of traditional Hakka cultural landscapes. It is also the first immersive museum in the country. Since its official opening on February 25, 2022, the museum has showcased the rich connotations of Hakka culture through digital technology and artistic presentations, receiving widespread acclaim (Pingtung Hakka Museum Service Plan, 2021).

Exhibition Design and Themes

The Pingtung Hakka Museum has designed four major exhibition areas: "Liudui Impressions," "Life Rituals," "Liudui Industries," and "Chronicles." These areas offer visitors a rich cultural experience through immersive multi-sensory exhibitions (Pingtung Hakka Museum Service Plan, 2021). These exhibitions not only enhance the audience's cultural identity but also promote the dissemination of cultural education.

The exhibition design of the Pingtung Hakka Museum includes four thematic areas: "Liudui Impressions," "Life Rituals," "Liudui Industries," and "Chronicles." Each area, through digital technology and immersive experiences, showcases different aspects of Hakka culture (Figure 1).

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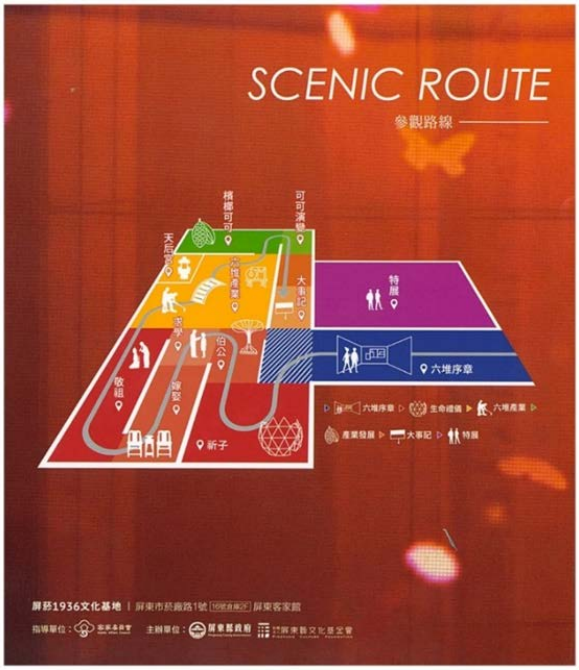

Figure 1. Visitor Route Map of the Pingtung Hakka Museum (Pingtung County Government, 2021).

Liudui Impressions

The "Liudui Impressions" exhibition area uses the corridors on both sides of the entrance space as a time and space passageway. Through digital animation projections, it begins with the rolling waves of the sea, presenting a panoramic view of the journey of the Liudui Hakka ancestors crossing from China to Taiwan, their arduous development, and the establishment of their homes and livelihoods (Figure 2). This chronological display, accompanied by soft background music, features animated demonstrations of the gradual reclamation of virtual landscapes and ecological settlements. This immersive experience allows the audience to be enveloped in the sensory interaction of history and geography, forming an impression of the humanistic landscape of the Liudui Hakka (Pingtung Hakka Museum Service Plan, 2021).

Figure 2. Immersive Digital Projection Entrance Corridor of Liudui Impressions.

Life Rituals

The "Life Rituals" exhibition area centers around a large circular projection device, showcasing the unique life rituals of Hakka culture. The first thing that catches the eye is a projection art installation shaped like a flower, symbolizing the imagery of a mother's womb (Figure 3). This section sequentially introduces cultural practices related to childbirth, such as prayers for children and welcoming newborns, and displays floral projections used by Liudui women during childbirth prayers on the circular projection device. These flowers include Brave Forward, Tabernaemontana pandacaqui Poir, White Champak, Cockscomb, Orchid Tree, Banana Shrub, Cape Jasmine, and Taiwan Cypress.

Next, it introduces the unique Hakka cultural symbols associated with marriage, ancestor worship, and funerary rites, which maintain ancient rituals (Figures 4 and 5). Additionally, interactive experiences are provided through the making of "flower plates" for deity worship and "roofbeam couplets" for ancestral teachings (Figure 6). Other art installations include an audio introduction to the Tumulus-style Shrine of Kaiji Land Deity (Figure 7) and traditional Hakka music known as The Eight Notes (Figure 8). Through sound and animation, these solemn and dignified cultural rituals are transformed into engaging and approachable interactive art forms, leaving a lasting impression of important Hakka cultural customs and allowing visitors to gain a deeper understanding of the significance of these rituals (Pingtung Hakka Museum Service Plan, 2021).

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Figure 3. Projection Art Installation Symbolizing the Mother's Womb.

Figure 4. Traditional Hakka Cultural Symbols for Marriage and Ancestor Worship.

Figure 5. Funerary Rites and Honoring the Deceased.

Figure 6. Interactive Projection Design of Roofbeam Couplets.

Figure 7. Tumulus-style Shrine of Kaiji Land Deity Art Installation Design.

Figure 8. Introduction to The Eight Notes Traditional Hakka Music Folk.

Liudui Industries

This section combines physical installation art with digital projections to showcase the evolving agricultural landscapes of the Hakka people on the Pingtung Plain, reflecting changes in economic demands over different periods. Starting from the Qing Dynasty, it presents the rice cultivation and the "Shuangdong Early Rice" food culture of Taiwan. The Neipu Tianhou Temple light sculpture art displays the bustling rice trade scenes of the time (Figure 9). During the Japanese colonial period, the banana industry in the Liudui Hakka area emerged, with banana merchants forming strong social and business networks (Pingtung Hakka Museum Service Plan, 2021).

Post-war, as land parcels were divided, betel nut trees were planted, becoming the primary choice for older laborers with Taiwan's economic restructuring. However, with increased health awareness, Hakka farmers successfully experimented with planting cocoa trees under betel nut trees, attracting second-generation youth to return to their hometowns for development and gaining prominence in the international market (Pingtung Hakka Museum Service Plan, 2021). This part utilizes a large wall projection interactive device, becoming a popular photo spot (Figure 10). Additionally, black pig farming has become a distinctive feature of the Liudui area, establishing a unique brand.

This exhibition area, through physical models, interactive projection devices, and videos, demonstrates the pioneering spirit of the Liudui ancestors and the process of regional industrial transformation. The transformation of the Liudui landscape from rice fields, banana plantations, and betel nut trees to cocoa trees showcases the development and metamorphosis of Liudui agriculture. This method and technology of presentation differ from traditional picture and text displays, making it simple and easy for the audience to understand and remember the evolution of industries in the Liudui region.

Figure 9. Light Sculpture Art Display of Neipu Tianhou Temple Showing the Bustling Rice Trade.

Figure 10. Interactive Wall Projection Device Showcasing Cocoa Tree Plantations.

Chronicles

The "Chronicles" exhibition area uses video and audio recordings to review significant historical events in the Liudui region. These include acts of righteousness throughout various periods, historical records of the Liudui Games, Hakka language teaching, and cultural revival (Figure 11). These displays not only highlight the historical context of the Liudui Hakka but also encourage visitors to emulate the spirit of their ancestors and carry forward Hakka culture (Pingtung Hakka Museum Service Plan, 2021).

Figure 11. Video and Audio Recordings Displaying Significant Historical Events in the Liudui Region.

Application of Digital Art in the Museum

The Pingtung Hakka Museum extensively employs digital art technologies in its exhibition design, including high-definition videos, animations, music, sound effects, and interactive devices. These technologies not only enrich the exhibition content but also enhance audience engagement and satisfaction. The application of digital art in museums is a broad and multifaceted topic that not only changes the way artworks are displayed but also creates new visitor experiences and educational opportunities (Stogner, 2009). For instance, in the "Liudui Impressions" area, digital animation projections recreate the historical development process of the Hakka ancestors, immersing the audience in a sensory experience that highlights the interaction between history and geography. In the "Life Rituals" area, a circular projection device showcases Hakka cultural rituals, increasing audience participation through interactive design.

Integration of Digital Art and Cultural Education

Digital art exhibitions, as an innovative art form, have successfully combined digital art with cultural education, creating a new model of cultural experience. Through high-tech display methods such as virtual reality, augmented reality, and interactive

projections, audiences can vividly and intuitively appreciate the charm of artworks and interact with them, thereby deepening their understanding and appreciation of art (Bannikova et al., 2023:348-358).

This integration not only enhances the audience's cultural identity, allowing them to enjoy art while appreciating the unique value of their cultural background, but also promotes the dissemination of cultural education. By combining traditional art with modern technology, art education becomes more lively and interesting, attracting more young people to participate (Maruk, Toropova & Antonova, 2022; 92-96).

Furthermore, digital art exhibitions have cross-regional and cross-cultural characteristics, presenting artworks from different regions and cultural backgrounds to a global audience, promoting cultural exchange and integration. Through online platforms, even distant audiences can view and participate in these exhibitions, breaking geographical limitations and expanding the influence of cultural education.

In summary, digital art exhibitions are a highly innovative and influential method of cultural education that enriches people's spiritual lives and provides new possibilities for the inheritance and innovation of traditional art. With continuous technological advancements, it is reasonable to believe that digital art exhibitions will become an important component of future cultural education, contributing significantly to the prosperity and development of human culture.

The digital art exhibitions at the Pingtung Hakka Museum have successfully combined digital art with cultural education, enhancing audience cultural identity and promoting the dissemination of cultural education. Through innovative digital art exhibitions, the museum has attracted a large number of visitors. To better understand audience feelings and feedback, the museum conducted detailed audience feedback surveys, the results of which will be analyzed in detail in the "Issues and Discussions" section.

Issues and Discussions

Observation and Analysis Results of Audience Interaction Experience

In addition to conducting on-site observations, this study also references an audience feedback survey report conducted by the Pingtung Hakka Museum to evaluate the actual effects of digital art exhibitions. This survey was conducted by the museum during the opening exhibition period, collecting audience perceptions and suggestions regarding the interactive design of the digital art in each exhibition area. The key findings of the survey are as follows:

The survey results indicate that the majority of audiences were highly satisfied with the digital animation projections in the "Liudui Impressions" exhibition area. They felt that the animated projections vividly recreated the history of the Hakka ancestors, and the combination of musical background and visual effects enhanced the immersive

experience. Some audience members suggested adding more interactive elements, such as allowing the audience to participate in creating animation scenes to further enhance the sense of involvement (Pingtung Hakka Museum, 2021). However, the lack of interactive elements was noted as a limitation. Although the current digital art exhibitions at the Pingtung Hakka Museum provide a high degree of immersion, incorporating more interactive designs would significantly increase audience engagement. For example, the "Liudui Impressions" exhibition area currently uses the corridors on both sides of the entrance space as a time and space passageway with only digital animation projections. Combining more physical displays with digital projections could offer a more dynamic and participatory experience. Future exhibition designs should consider these technologies to create more interactive and engaging environments, allowing the audience to actively participate in the cultural narrative. This would further enhance the realism and tangibility of the cultural narrative. For instance, displaying real artifacts or replicas of traditional Hakka tools could provide the audience with a more concrete understanding of the historical period being showcased. The combination of digital and physical elements would create a richer and more engaging educational experience, allowing the audience not only to see but also to touch and interact, thereby gaining a deeper understanding of the Hakka cultural heritage.

The circular projection device in the "Life Rituals" exhibition area also received widespread acclaim. Audiences reported that through the combination of projections and sound effects, they gained a deeper understanding of Hakka cultural rituals. However, some audiences suggested increasing the number of physical displays and integrating projection technology to make the presentation of cultural rituals more tangible and realistic. Audiences showed great interest in the physical installation art and digital projections in the "Liudui Industries" exhibition area. The survey indicated that audiences particularly enjoyed the dynamic images and interactive walls showcasing the agricultural development process, which helped them understand the industrial transformation in the Hakka region. Some audience members suggested adding experience areas where they could try traditional agricultural techniques.

The video and audio recordings in the "Chronicles" exhibition area were generally well-received by audiences. They believed this display method allowed them to deeply understand the historical events and cultural context of the Liudui region. However, some audiences expressed a desire to see more multimedia interactive designs, such as experiencing historical event scenes firsthand through AR or VR technology.

Challenges of Digital Art Exhibitions and Cultural Landscape Education

The application of digital art in the Pingtung Hakka Museum demonstrates its immense potential in cultural landscape education. Audience feedback indicates that digital art exhibitions have increased visitor engagement and satisfaction. However, there remains room for improvement, such as incorporating more interactive elements and physical displays to further enhance the immersive experience.

Human experience of physical space and place is a complex phenomenon, encompassing geographical and sensory aspects, as well as social and interpersonal relationships (Stanhope, 2022). From the demonstration and interactive sharing of exhibition objects, the transition from virtual to reality shows that contemporary exhibitions are increasingly designed to attract consumer preferences. From an exhibition design perspective, borrowing Harvey's (2002) viewpoint, digital art uses specific light, images, symbols, meanings, and knowledge to digitally solidify the fluid and changing spatial experience. While this approach might distort what is being expressed, within the flow and change of sound, light, and images, it allows consumers to seek out the eternal truths conveyed through various principles.

However, a notable limitation in this survey report is the limited sample size of audience feedback (only 276 respondents). Since the sample is based on the internal survey report of the Pingtung Hakka Museum, its rigor does not match that of an academic survey. Moreover, the survey was conducted within a month after the opening, which might not fully represent the opinions of all visitors. This limitation affects the generality and robustness of the research results. Future research should consider increasing the sample size and conducting surveys at different times to capture a more comprehensive audience response. Such improvements would provide more reliable and effective conclusions, further evaluating the impact of digital art exhibitions in cultural landscape education.

Additionally, the rapid development and changes in digital art technology may affect exhibition outcomes and audience responses. This study did not fully consider these technological variables. Future research should delve deeper into these variables, analyzing the impact of technological advancements on audience experience. Understanding these dynamic changes will help design more effective and appealing digital art exhibitions that keep pace with technological innovation. For instance, in the "The Eight Notes Traditional Hakka Music Folk" design, adding interactive audio elements alongside the images would better help visitors understand and identify unique Hakka instruments and cultural features, rather than relying solely on projected images. Additionally, some early physical artifacts and agricultural tools could be displayed through digital art to demonstrate their operation or usage steps, without

compromising their original physical appearance. This approach would create a more immersive audiovisual experience, aligning with contemporary art exhibition styles and creativity.

In terms of artistic creation, the expression of space and expressive space involves using different symbols, meanings, codes, and knowledge to create and express different material spaces (Yan Jia, 2016). The physical space where these digital and installation art pieces reside often holds the same significance as the individual art objects themselves. Digital artists consider the entire sensory experience of the consumer, with objects in digital art possessing new contextual significance, determining the interpretation of the works. These artworks often reflect and respond to our living world, creating an interesting fusion of art and life.

It has been proven that traditional physical reality experiences, within the contemporary context of information and audiovisual culture, have become outdated and often interfere with natural sensory experiences. Digital immersive perception allows consumers to experience being in the midst of it, almost as if living a second life, fulfilling their intrinsic desire for cultural consumption by escaping physical reality. This has become a part of the spatial and cultural art experience itself (Lentini & Decortis, 2010). However, artists and designers expressing space, especially culturally significant landscapes, are influenced and constrained by various factors, including public sector positions and political ideologies (Krom, 2009). This is worth reflecting on.

Conclusions and Research Limitations

The application of digital art in the Pingtung Hakka Museum demonstrates its immense potential in cultural landscape education. Through innovative digital art exhibitions, the museum has not only enhanced visitors' cultural landscape experience but also promoted the dissemination of cultural education. Audience feedback indicates that digital art exhibitions have increased visitor engagement and satisfaction. Particularly in the "Liudui Impressions," "Life Rituals," and "Liudui Industries" exhibition areas, digital art has successfully combined visual, auditory, and interactive elements, allowing visitors to gain a deeper understanding and experience of Hakka culture.

However, digital art exhibitions also face challenges and areas for improvement. For instance, in the "Eight Tones" design, adding interactive elements to allow visitors to listen to the sounds of the instruments could better help them understand and identify unique Hakka instruments and cultural features. Additionally, some early physical artifacts and agricultural tools could be displayed through digital art to demonstrate their operation or usage steps, without compromising their original physical appearance, creating a more immersive audiovisual experience that aligns with contemporary art exhibition styles and creativity.

Digital art has not only changed the way museums exhibit but also brought new opportunities for cultural landscape education (Bautista, 2013). By combining virtual and physical spaces, digital art creates immersive experiences that allow visitors to gain a deeper understanding and experience of cultural landscapes. This not only enhances visitors' cultural identity but also promotes the dissemination of cultural education. However, this study has the following limitations:

1. Limited Sample Size: The survey report referenced has a limited sample size and may not fully represent the opinions of all visitors. Additionally, the survey was conducted during a specific period, which may not cover the reactions of visitors at different times, potentially affecting the comprehensiveness of the results.
2. Field Limitations: The study focuses solely on the Pingtung Hakka Museum, and the results may not be applicable to other types of museums or cultural landscape sites.
3. Technological Variables: The rapid development and changes in digital art technology may impact exhibition effects and audience reactions, which this study did not fully consider.

Future research can further explore the application of digital art in other cultural landscape sites and develop more interactive and immersive digital art exhibitions to enhance the effectiveness of cultural landscape education. Additionally, more empirical studies should be conducted, using long-term observation and data analysis to evaluate the long-term impact of digital art in cultural education. For example, similar digital art exhibitions could be implemented in different museums and cultural landscape sites, and audience feedback surveys could be conducted to compare the effects and audience reactions in different settings.

As an innovative and effective method for cultural landscape education, digital art has a wide range of application prospects. With the advancement of technology and continuous improvement in exhibition methods, the role of digital art in cultural landscape education will become more significant. We look forward to more related research and practice in the future, continuously advancing the development of cultural education.

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The Impact of Online Bicycle Shopping Platforms Combined with Chatbots on Consumers Sentiment and Service Quality

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The sudden emergence of the novel coronavirus (COVID-19) in late 2019 led to a sharp decline in global transportation post-outbreak, prompting more people to adopt active transportation modes, such as cycling, to reduce infection risks. This study aims to explore the differences and impacts of chatbots versus traditional online customer service on a bicycle online shopping platform. Equipped with functions like automatic reply, natural language processing, and keyword interpretation through Google Dialogflow, chatbots have become increasingly vital for online shopping demand during the pandemic. The study employs a quasi-experimental approach, with an experimental group using chatbot customer service and a control group using traditional online customer service, totaling 60 participants. Research tools include the System Usability Scale, SERVQUAL Scale, and Positive and Negative Affect Schedule. The chatbot customer service has been found to enhance consumer demand for online shopping and to improve service efficiency and quality, thereby reducing manpower costs. Finally, the study's results offer discussions and suggestions, serving as a reference for brands and online retailers for conducting follow-up research on chatbot customer service.

Keywords – Bicycle, Chatbot, Google Dialogflow, Online shopping platform, PANAS, SERVQUAL, SUS

Relevance to Design Practice – The study's results demonstrate that chatbots enhance user engagement and efficiency in e-commerce, guiding the integration of intelligent customer service into digital retail design to improve user experience and operational effectiveness.

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Introduction

With the rapid advancement of technology, the use of smartphones and internet information has increased year by year. The widespread use of the internet has led to the thriving development of online shopping, and consumption patterns have gradually shifted from only traditional brick-and-mortar store consumption models to online e-commerce platform consumption. With online ordering for internet consumption, there are no time and place restrictions. Together with logistics delivery, consumers can place orders anytime, which may save a lot of time compared to going to physical stores for purchases. The main purpose of this study is to understand the design of chatbot customer service on bicycle online sales platforms, to explore the differences in website usability, service quality and user emotions compared to traditional customer service, in order to bring more convenient consumption models to consumers.

Due to the sudden appearance of the novel coronavirus (COVID-19) in late 2019, global transportation saw a sharp decline after the outbreak. More and more people turned to active transportation, such as cycling, to minimize the risk of infection. The bicycle-related industry is currently experiencing a surge in demand (Irawan et al, 2022). However, the impact of COVID-19 has brought extremely serious effects on all walks of life around the world. Even the inability to go out for shopping makes people feel anxious and panicked. To this end, the automatic reply system of chatbots helps brand companies and consumers maintain normal operations and consumer shopping on online shopping platforms through human-computer interaction, without being unable to provide complete services due to the diversion of corporate manpower (Hassoune, 2016; Tyrväinen & Karjaluoto, 2022).

Brands are currently working to promote the service industry's demand for artificial intelligence. Chatbot customer service systems can bring advantages to brands and improve users' perception of service, developing automated customer service and natural language processing for human-computer interaction, thereby reducing consumers' waiting time and brands' labor costs. Therefore, many companies and major digital platforms make extensive use of chatbots, also known as intelligent conversational agents, to provide consumers with higher quality and personalized services. In software, chatbots with different functions can be developed and applied to different applications. With the advantage of being able to quickly familiarize users like communication software, brands can choose to develop their own chatbots on various communication software, such as the widely used social platforms Facebook and LINE, which are mainly used in medical care, digital learning, financial management, e-commerce platforms, etc. Artificial intelligence creates smart cities to improve people's quality of life in response to changes in living habits. Consumers can browse websites and shorten decision-making purchase times through chatbots, while also enabling brands and customers to establish

good social relationships and strengthen emotional relationships between customers. By understanding consumers' emotions and service quality in use through human-computer interaction (Galvao et al., 2004; Hsu et al., 2017; Wirtz et al., 2018; Ostrom et al., 2019). In traditional customer service, customer service relies on customer service personnel, sending and receiving emails or phones, or only being able to wait for manual replies. Customer service personnel also need to verify customer identities and manually record requirements, and it takes time to search for relevant information and knowledge to resolve customer needs. The traditional methods involve complicated processes and are labor and time consuming. Consumers are unable to get timely responses and feel anxious or disappointed, while service quality depends on the experience of customer service personnel, subject to human factors and labor cost issues.

Therefore, this study adds chatbot services to the FB Messenger of bicycle fan pages on Facebook, using automatic replies for dialogue and understanding consumer needs and giving appropriate responses, to explore system usability, service quality and positive and negative emotions.

Based on the research background and motivation, chatbots have been widely used for commercial purposes. Online customer service uses chatbots as a medium for communicating with consumers. Chatbots can advertise products, recommend products, and solve consumer problems in real time. For the automatic reply dialogue system provided by chatbots on specific shopping websites, changes in web usability, service quality and emotions are studied to achieve real-time response customer service platforms for consumers to save time collecting and analyzing information and create higher-level customer experiences.

Therefore, the following three research questions are to be explored in this study:

1. What is the system usability of chatbot customer service for users?
2. What is the service quality of chatbot customer service for users?
3. Do users have significant emotional and perceptual differences with chatbot customer service?

Literature Review

Related research on chat robots

This study compiles many domestic and foreign articles on the application of chat robots in various industries. In the literature, many scholars have conducted many related studies on various chat robots. The following is a collection of relevant literature in recent years.

Google's Dialogflow technology and uses machine learning mode to accurately analyze the sentences expressed by the user, understand the semantics and vocabulary, and find the best answer as a reply. This research will implement a chat robot to assist teachers in answering basic questions for Java beginners, so that teachers can guide students to solve more complex problems. Chung et al. (2020) aims to analyze whether luxury fashion retail brands can adhere to their core essence, which is to provide personalized agent customer service through electronic services instead of traditional face-to-face interactions, especially through Chatbot to provide convenience, personalization personalized and customized services. Lin et al. (2021) studies the epidemic as the theme, combines web crawler technology with LINE communication software, uses LINE Developers and Messaging API to establish two-

way communication between the machine and the user, and builds a convenient, easy-to-use, humanized A chatbot with functional and emotional aspects. Zhu et al. (2022) studied the use of LINE communication software to build interactive accounting applications, and explored the impact of users on the presentation of interactive feedback, interface usability and technology readiness of accounting applications. According to the experimental results, the information design of the financial status analysis trend chart is better than the dynamic information design in terms of operational performance and ease of use. Through interviews, it was found that users think that dynamic can add interest, so it is recommended to add some dynamics to the static chart. element. Haugeland et al. (2022) studied how a chatbot with a conversational style and changes in human-computer interaction improves user service experience. Research has found that chatbots adjust their responses based on user emotions to make them more human-like and social, resulting in higher satisfaction with the service experience. This study also refers to the use of emotional Chatbot to add interest and interactivity to users, and the use of Google Dialogflow technology to build a customer service dialogue system based on communication software.

Positive and negative emotions

Emotion is the product of inner processes or environmental interactions. It is an abstract and complex psychological phenomenon. Mood is generally summarized into two aspects: "positive emotions" and "negative emotions" (Watson & Tellegen, 1985). Positive Affect refers to positive mental states such as positivity, enthusiasm, excitement, happiness, satisfaction, trust, concentration, glory, relief, gratitude, etc. Negative Affect refers to feeling negativity, fear, anger, helplessness, Negative mental states such as irritability, anxiety, confusion, sadness, depression, etc. Plutchik (1980) believes that the various emotions displayed by human beings are composed of eight main emotions (positive-negative): joy-sadness, fear-anger, surprise-anticipation, acceptance-disgust, and human hearts can have them at the same time. Various complex emotions, emotions are responses caused by stimuli; relevant research results show that positive emotions can help improve life satisfaction (Cohn et al., 2009); Dworetzky (1985) believes that emotions are a complex psychology state, which will be reflected in the experience in consciousness, inner psychology and external physiology; Bradley (2000) and Ellis (1994) believe that emotions will be physiologically affected by personal experience, resulting in confusion or excitement, and then in the nerves and muscles. It affects the body, breathing, heartbeat, etc. On the psychological level, strong feelings will be reflected in emotional expressions. An important front line of communication between enterprises and customers is customer service. Zendesk, an American online customer service system company, once published that research shows that when customers experience good customer service and have positive emotions, up to 42% of consumers will They will be more interested in the product and even have the desire to buy; but at the same time, 52% of consumers will stop purchasing the product due to one disappointing interaction. According to a survey by Harvard Business Review, "E-commerce companies that respond within an hour after customers send inquiries have a seven times higher number of orders than other companies that take longer to respond". Følstad et al. (2018) proposed that

personality less robots only provide professional knowledge and capabilities, but when combined with personality chatbots, they can arouse people's interest more than robots with no novelty. Araujo (2018) believes that anthropomorphic chatbots will generate human-like emotions and have stronger emotional connections with consumers, increasing the probability of beneficial interactions. Sheehan et al. (2020) concluded in their research that when people have high demand for human interaction, anthropomorphic robots may be more likely to be adopted because they are service agents that imitate humans. There is a relationship between anthropomorphic perception and adoption intention. The strength of the relationship will also increase, and a highly anthropomorphic chatbot may be viewed as sufficiently human to satisfy consumers' needs for human interaction. Fernandes & Oliveira (2021) believe that users prefer interactive robots with a personal style that can have more natural conversations with people and show warmth and care.

Bicycle industry and online shopping

The global bicycle trend has been revived during the epidemic, and demand has increased significantly, especially in the European and American markets. Taiwan's bicycle industry chain is a "blessing in disguise". After the outbreak, coupled with the popularity of sports and the influence of green energy concepts, rising health awareness has led to an increasing number of people riding bicycles and electric-assisted bicycles (E-bikes). The world's leading chain manufacturer will benefit from the gradual commissioning of Vietnam's bicycle chain production capacity in 2022. It is expected that bicycle chains will continue to grow by 5%." As can be seen from the above news reports, affordable electric bicycles will become one of the important forms of transportation in the future. With awareness of health and environmental protection rising, the electric bicycle market has expanded rapidly, which has also given the bicycle industry new business opportunities during the epidemic. Bicycle online shopping platforms (for example: Facebook website, Momo shopping network, PChome online shopping, Yahoo shopping, Shopee shopping network, Decathlon online mall, Carrefour online shopping, Giant, Merida and other domestic and foreign brand websites, etc.), which can provide online product catalogs through web pages to display product categories, detailed information, price levels, etc., and can instantly launch new products and update event information. Consumers can purchase by browsing the web and the traditional way of purchasing in physical stores. There is a difference. In terms of purchasing bicycles online, due to the popularity of online shopping and the inconvenience of the epidemic, the demand for purchasing bicycles has increased. The online platform provides consumers with services such as no need to go out to purchase, price transparency, diversity, convenient search, and home delivery. (Irawan et al., 2022).

Online shopping service quality

The Internet has changed people's lifestyles. Companies can use the characteristics of the Internet environment to improve the time and transportation constraints of traditional store shopping environments, creating a more convenient shopping environment that is different from traditional face-to-face service types. Whether it is business-to-business (B2B), business-to-consumer (B2C), consumer-to-business (C2B), or consumer-to-consumer (C2C), changes in new sales methods have

created many business opportunities through the Internet. The environment interacts with customer communication (Strader & Shaw, 1997; Vladimir, 1996). Customer service in an e-commerce platform should help consumers resolve their issues throughout the process. The essence of customer service is to meet the needs of customers at all stages of pre-purchase, purchase and post-purchase (Lemon & Verhoef, 2016). Peterson et al. (1997) mentioned that when consumers shop through websites, they can save time and energy in finding products compared to traditional retailers, and they can also improve service quality. The term service quality was first defined by Levitt (1972), who believed that service quality is the result of serving consumers; Crosby (1979) believed that service is something that consumers can actually feel, whether it is tangible or intangible. It is obtained by the functional quality of goods or the delivery of services; Grönroos (1982) believes that service quality is the result of consumers' overall perception of achieving their expectations after receiving services; Bitner (1992) believes that service quality is the result of enterprises serving consumers, so that consumers will have thoughts and attitudes about purchasing services and goods again based on their overall satisfaction; Olshavsky & Rosen (1985) believe that it is not easy to define service quality. It is a subjective feeling rather than an objective cognition. It is the company's overall attitude evaluation of customers towards services. A review of the literature found that many scholars mentioned that service quality represents the level of satisfaction that a certain service provides to customers, which means that services should be customer-oriented (Farsad & Elshennawy, 1989; Murdick & Russel, 1990). If a company wants to strengthen consumers' purchase intention, it should provide high-level service quality and establish relationship quality, which will help enhance the company's image, gain consumer trust and satisfaction, and play a very important role in corporate profits (Reichheld & Sasser, 1990; Heskett et al., 1994; Ball et al., 2004; Robertson & Gatignon, 1986). Nordheim et al. (2019) believe that factors such as functionality, socio-emotional and interactive relationships promote the acceptance of AI chatbots and trust in chatbots. Parasuraman, Zeithaml and Berry and other scholars proposed the service quality model (referred to as the PZB model) in 1985. PZB service quality was modified from ten aspects to five aspects. Parasuraman et al. (1985) believed that service quality is difficult to comment on compared with products. Therefore, through Tangibles, Reliability, Responsiveness, Assurance and Empathy The five aspects serve as the basis for enterprises to measure service quality, and later developed the famous SERVQUAL service quality measurement scale.

Research Methodology

Research scope

The research population is based on users who have experience in bicycle online shopping and often ride bicycles. Those with online shopping habits are in the age range of 18 to 44 years old (youth, adults, and adults) and will be affected by the testers were divided into two groups on average, divided into the experimental group: 30 people; the control group: 30 people. A total of 60 research subjects were recruited for the experiment. The independent variables of this study are divided into "traditional online customer service" and "chatbot chat robot customer service" through

online shopping customer service. The dependent variables in this study are divided into "SUS usability", "SERVQUAL service", and "positive and negative emotions".

Chatbot Design

The Chatbot of this system uses the Google Dialogflow natural language platform for text training. Dialogflow is a chatbot background built for free on FB Messenger. After training, it is connected (Fulfillment) to Facebook Messenger for open dialogue. Dialogflow supports voice functions and supports up to 14 languages: Chinese, Japanese, English, French, Spanish, etc. It can support multiple social platforms: FB, LINE, Telegram, Hangouts, etc. It is a "personal voice assistant" loved by many companies. The reason for developing the platform. The method of designing questions in Dialogflow is more flexible than the design method of only "questions" and "answers", but it still needs to be designed by developers to actually write examples to design which words in the questions or messages represent "Intents" and "entities". The flow chart for setting up a Dialogflow chatbot that is more difficult to design the first step is to create an Agent. This agent is the agent that interacts with the user. Name it Chatbot Online Shopping Bicycle. The second step is to create Intents, which are the user's intentions. The purpose of establishing intentions in the operating interface is to allow the program to analyze the user's purpose and determine the actions to be performed, and through "training statements" and "settings" "Necessary parameters" to allow the system to determine the meaning of the text. When the keyword hits Training Phrases, the chatbot will randomly select among the Responses, which is closer to a real reply. The third step is to create Entities, which is to add proper nouns that the Agent must understand. Entities allow it to identify words related to the field, such as: (@bicycle) various car models, (@ color) car model color, (@number) purchase quantity, and supplement relevant synonyms in the intention dialogue. With the understanding of the concepts of Entities, the system can more accurately understand and answer questions. After the user inputs text, the Intent first identifies the words that match the Entity in the message, and then uses these words to determine how to reply. After all the special words that may be mentioned by the user are established as entities as much as possible, the chatbot can effectively identify these words, improve its ability to answer questions, and display human-like behavior patterns, mainly in the form of dialogue. Business services have become conversational commerce. Humorous conversations can enrich interactions while reducing the coldness of words.

After Dialogflow completes the establishment of Agents, Intents, and Entities, enter the Web Demo for dialogue testing to simulate design experiments and consumer purchasing situations, such as selecting products, asking about products, purchasing orders, recommending products, return and exchange services, shipping methods, etc. wait. The opening greeting will ask the consumer if they need assistance. When the consumer asks for a bicycle item they want to buy, the chatbot customer service can make recommendations or prompt how to place an order. After the consumer has selected a product, he will also ask whether Other products are also needed so that consumers can continue to purchase and place orders. In addition to being able to distinguish emotional words, the chatbot can adopt appeasing behaviors during conversations. It can

even capture related words such as "joke" and add some emotional words, emoticons, etc. when engaging in joke-telling humor mode. It also cares about consumers, making automated reply interactions closer to real-person conversations.

Tools

SUS usability scale

The questionnaire designed in this study refers to the System Usability Scale SUS (System Usability Scale) designed by Brooke (1986). It is currently widely used in common questionnaires for testing various system interfaces, applications and websites. In order to explore users' perceptions of Conducting usability questionnaires, using usability to evaluate whether users can get used to it and provide a pleasant usage experience, and measure the user's usage during the process to improve shortcomings are the main reasons for integrating chatbot services into shopping platforms (Nielsen & Landauer, 1993; Rubin & Chisnell, 2008).

SERVQUAL service scale

Since the services provided on the Internet are mainly based on the interaction between people and online customer service, rather than the face-to-face interaction between people, Parasuraman et al. (1985) proposed five aspects of PZB service quality: (1) Tangibility (2) Reliability (3) Responsiveness (4) Guarantee (5) Empathy. Online shopping is very different from traditional service quality measurement. Therefore, many scholars and experts focus on information systems and websites. The service quality of the service's network environment has been revised to the measurement model, so that the service quality provided by the "interaction" between online customer service and users can be measured through the scale. The service quality of online stores based on the SERVQUAL service scale, and make adjustments based on the status and characteristics of online stores with reference to scholars' suggestions (Llosa et al., 1998; Zeithaml et al., 2002), the five variables derived from the Internet service quality are "convenience" and "responsiveness" , "customization", "reliability" and "security".

Positive and negative emotion scale

The measurement of positive and negative emotions in this study refers to the Chinese translation version of the Positive Affect and Negative Affect Schedule (PANAS) (Watson et al., 1988). It measures students' emotions for the research questionnaire design. The questions primarily assess emotional responses during interactions with chatbot and traditional customer services, using descriptive words for feelings and emotions. Positive emotions are gauged with terms like interest, enthusiasm, and excited, while negative emotions are identified through words such as fear, distrust, anger, and helplessness, etc.

Experimental Results

This study was divided into an experimental group and a control group of 30 people each, with a total of 60 subjects. A total of 90 questionnaires were distributed to each of the group, and 180 valid questionnaires were actually collected.

Scale reliability

The Cronbach's alpha coefficient for SUS usability in the experimental group is 0.753, above 0.7, indicating high reliability. In the control group, it's 0.807, also above 0.7,

signifying high reliability. The Cronbach's alpha coefficients for SERVQUAL's service quality and convenience are 0.804, surpassing 0.7, making them very credible. The coefficients for positive emotions are 0.868, and for negative emotions, 0.809, both above 0.7, which means it is very credible.

Independent sample t-test analysis

The following table analyzes the impact of all research aspects (SUS usability, SERVQUAL serviceability, and differences in positive and negative emotions). The results of the analysis are shown in Table 1.

Table 1. T-test results of each scale.

Scale	*Groups*	*N*	*Mean*	*t*	*p*
SUS Usability	Experiment Group (Positive)	30	3.91	3.078	.015
	Control Group (Positive)	30	3.37		
	Experiment Group (Negative)	30	2.15	3.158	.013
	Control Group (Negative)	30	2.66		
SERVQUAL	Experiment Group	30	3.15	5.549	.00***
	Control Group	30	2.86		
Positive/Negative Emotions	Experiment Group (Positive)	30	3.23	4.977	.00***
	Control Group (Positive)	30	2.90		
	Experiment Group (Negative)	30	2.63	4.952	.00***
	Control Group (Negative)	30	3.24		

Note: *p<0.05, **p<0.01, ***p<0.001 Data source: Compiled by this study.

Analyze the results of SERVQUAL service scale using independent samples t-test

It was found that the result of "Customer service can provide customized services to cope with various user situations" in the customized quality aspect project is not significant. The possible reason is that the chatbot cannot cover all consumers' problems and is limited to the set range. Q&A; in the security quality aspect items, the results of "Shopping data on the website can ensure data security" and "The payment methods provided by the website are safe and correct" are not significant. The possible reason is that consumers still have concerns about the risks of online shopping.

The independent sample t-test was used to analyze the positive and negative emotion scales and it was found that: on the item "I am worry-free during conversations", the positive emotions were better in the experimental group (M = 3.13, SD = 1.13) and the control group (M = 3.20, SD = 1.60), there was no significant difference, and the t test did not reach a significant difference (t (58) = 0.17, p > 0.05); on the item "I feel at ease during the conversation", the experimental group (M = 3.03, SD = 1.16) and the control group (M = 3.33, SD = 1.06) were not significantly different, and the t test did not reach significant difference (t (58) = 1.85, p > 0.05).

Based on the above positive emotion results, the experimental group's face-to-face chat robot customer service was positive and happy than the control group's face-to-face customer service; the control group's positive emotion performance was poor, and when faced with the lack of enthusiasm and trust in traditional customer service, Therefore, the positive average of the experimental group is greater than that of the control group. The results of the questions "I feel worry-free during the conversation" and "I feel at ease during the conversation" are not significant. The questionnaire scores show that consumers cannot feel reassured by the virtual chat robot customer service. There is no significant difference in negative emotions between the experimental group (M = 3.33, SD = 1.34) and the control group (M = 2.73, SD = 1.41) on the item "I don't trust when talking to online customer service", the t test showed no significant difference (t (58) = 1.15, p > 0.05).

Based on the above negative emotion results, the control group is more hesitant and confused when facing traditional customer service than the experimental group when facing chatbot customer service. Negative emotions such as anxiety and irritability caused by long waiting are less likely to affect the negative emotion control group. The negative averages are all greater than those of the experimental group. The results for the question "I don't trust during conversations" are not significant. The possible reason is that consumers have less trust in virtual online customer service than in real-person services. It can be seen that chat robot customer service is different from traditional Online customer service has yet to make consumers completely worry-free when shopping.

Conclusions and Discussions

Conclusions

This study primarily investigates the impact of integrating chatbot customer service into online bicycle shopping platforms. The experimental group (with chatbot service) and control group (traditional online customer service) were evaluated on web usability, service quality, and emotional responses to address the following research questions:

1. What is the user experience like with chatbot customer service?

Independent sample t-tests revealed that the chatbot in the experimental group performed well in terms of usability and functionality on the website. Users were willing to frequently use the website, and the integration of website functions was effective. Confidence in using the website was significantly high. The System Usability Scale (SUS) score was 72 (rated as 'Good'), and the reliability (Cronbach's Alpha) was 0.753, indicating high credibility. Providing accurate information and expertise increases consumer trust. Brooke (1986) usability scale was used for assessing and understanding the use situation, further corroborating the theoretical and practical evidence.

2. What is the service quality of chatbot customer service?

In the 'SERVQUAL' service quality dimensions of the shopping platform's chatbot customer service, five aspects were evaluated: convenience, responsiveness, customization, reliability, and security. The survey revealed that the average scores of all dimensions in the experimental group exceeded 3, while those in the control group did not. Some items, such as customized service handling various customer scenarios, were not significant, indicating limitations in the chatbot's pre-programmed

range of responses. Additionally, security-related items were also not significant, potentially due to inherent risks in online shopping. Jacoby & Kaplan (1972) highlighted financial risks associated with online insecurity, explaining the non-significant results and reinforcing the theory-practice correlation. This suggests that chatbot customer service outperforms traditional customer service in service quality, with concerns in handling of diverse situations and website security.

3. Are there significant differences in emotions and feelings towards chatbot customer service?

A survey using the Positive and Negative Affect Schedule (PANAS) revealed that participants in the experimental group experienced positive emotions such as interest, enthusiasm, excitement, pleasure, decisiveness, inspiration, satisfaction, and focus, scoring above 3.50. However, scores for worry-free and reassured emotions were low, and distrust scores were high, indicating concerns about chatbots. The reliability (Cronbach's Alpha) for positive (0.868) and negative (0.809) emotions was very high. Sheehan et al. (2020) found that anthropomorphic bots could be more easily accepted, fulfilling interaction goals and user needs, thus supporting the theory-practice correlation.

Discussions

The experimental results indicate that the group with the chatbot (Chatbot) outperformed traditional customer service in 'SUS Usability,' 'SERVQUAL Service Quality,' and 'Positive and Negative Emotions.' The system’s convenience and correct responses in the chatbot enhance online shopping platforms and service efficiency. This echoes Irawan et al. (2022), who mentioned that chatbots enrich the usability and convenience of online shopping, creating a better shopping experience. Chen et al. (2021) also noted that chatbots provide effective and efficient customer service.

The chatbot's friendly and humorous interactive style differs significantly from traditional customer service. Leveraging AI, machine learning, and natural language processing enhances professional knowledge and service quality. The chatbot group showed real-time and accurate conversations, professionally and promptly addressing consumer concerns and building efficient service and interaction. This supports Belanche et al. (2020), who believed that consumer interaction with chatbots affects acceptance and continued use. Peterson et al. (1997) and Tyrväinen et al. (2022) mentioned that online shopping saves time and energy compared to traditional retail, improving service quality.

Previous chatbot designs focused on responding to user intent with little emphasis on emotional feedback. Incorporating emotion-detecting words and responding appropriately to positive and negative emotions can stimulate purchase desire and interaction opportunities. Araujo (2018) and Nordheim et al. (2019) suggested that anthropomorphized chatbots enhance perceived usefulness and emotional connection, increasing interaction likelihood.

Contributions

This study focuses on AI-powered chatbot customer service integrated with online shopping, particularly relevant during the anxiety and panic caused by COVID-19. It aims to assist brand companies and retailers in adopting chatbots on online platforms and explores consumer use of chatbots for online bicycle shopping. The study targets frequent online shoppers aged 18-44 (youth, adults,

middle-aged) and frequent cyclists, investigating chatbot usability, service quality, and emotional impact across age groups. The findings provide insights for bicycle and online retail brands, aiding in marketing strategies tailored to different consumer segments and guiding future chatbot research.

Limitations and Suggestions

The study was limited to a Facebook page and conducted through surveys. The chatbot's responses were constrained to pre-set questions, so results may not represent all online shopping platforms or demographics. The chatbot's inability to understand or respond to questions beyond pre-set topics was a limitation. Interactions were primarily text-based, lacking the option for expressive stickers in Facebook Messengers, which limited interactivity. Future technology advancements should aim for more intuitive, user-understanding chatbots with a wider range of topics. Based on these findings, future research should:

1. Expand the chatbot's pre-set keyword database for more diverse, multi-dimensional, and multi-topic dialogues, creating a more comprehensive chatbot system to assist online shopping platforms.
2. Increase participant numbers, explore different online platforms, or use interviews to uncover genuine consumer feelings and thoughts.
3. Consider trust and security in designing chatbots for online shopping platforms, as safety and privacy are crucial factors.

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Effects of the Taiwan Adaptive Learning Platform (TALP) on Learning Effectiveness and Emotion of Elementary Students with Different Cognitive Styles

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The e-learning era has fostered the rapid development of platforms focusing on adaptive learning, transforming traditional teaching and learning methods. This study explores the impacts of the Taiwan Adaptive Learning Platform (TALP) on the learning effectiveness and emotions of students with different cognitive styles. A total of 19 elementary school students from the same classroom in southern Taiwan participated in this study. They were divided into two groups: the holist students and the serialist students, and a 6-week teaching experiment was conducted. The participants' prior knowledge and post-test scores were collected. The results indicated that the holist students outperformed serialist ones in performance improvement and experienced more positive emotions toward learning. Consequently, TALP has been effective in enhancing learning effectiveness and positive emotional responses among students. However, how to use and improve the platform to cater to the varied learning performances and needs of students with different cognitive styles presents an ongoing challenge.

Keywords – Taiwan Adaptive Learning Platform (TALP), Cognitive Styles, Learning Effectiveness, Elementary Education, Learning Emotion.

Relevance to Design Practice – Using the adaptive learning platform demonstrates that incorporating multimedia materials and adaptive feedback into the design of educational tools can significantly enhance learning effectiveness and positive learning emotions.

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Introduction

Recent years have seen a burgeoning of digital technology and application of that technology to e-learning. With the advent of the e-learning era, there has been a rapid growth of e-learning platforms. The Ministry of Education (MOE) has established the " Taiwan Adaptive Learning Platform (TALP)" to provide digitalized and systematized teaching materials for K-12 in 2016, it is a kind of intelligent tutoring system, as well as a self-regulated learning mode and online adaptive diagnostic tests to help teachers in adaptive teaching. The system is equipped with a self-regulated learning model and online adaptive diagnostic tests to help teachers in adaptive teaching. Therefore, how to encourage students to effectively engage in individualized learning and enhance learning effectiveness on the adaptive learning platform has become a widely discussed issue (Hwang & Wu, 2012; Kuo et al.; 2021; Liu, 2022; Chang et al., 2022).

Cognitive styles are the behavioral tendencies of individuals in terms of how they prefer to receive learning content and process information (Messick, 1984; Sadler-Smith, 2001). In the past decade, various studies have been conducted to discuss the relationship between cognitive styles and learning effectiveness. Researchers have also indicated that using a learning system that matches students' cognitive styles will result in better learning effectiveness (Chen & Tseng, 2021; Bendall, 2019). Additionally, many research findings indicate that students learning in positive emotional states also achieve positive learning outcomes. This suggests that learning emotions play a critical role in enhancing learning effectiveness during the learning process.

Based on the previous discussion, this study was conducted to understand whether the introduction of the adaptive learning platform is effective in enhancing successful learning for students with different cognitive styles whether the manifestation of learning emotions during the learning process affects learning effectiveness, and the result of this study could be useful to teachers and other developers of adaptive learning systems.

This study used the Taiwan Adaptive Learning Platform (TALP) to conduct an experiment has been conducted in an elementary school natural science studies course to evaluate and answer the following research questions: (1) Do students have significantly better learning effectiveness when using the TALP? (2) Which cognitive style of students had significantly better learning effectiveness when using the TALP? (3) When learning with the TALP, do students with different cognitive styles show significantly different emotional expressions? To answer these questions, all participants were divided into two groups of cognitive styles: holist students and serialist students for conducting further comparisons.

Literature Review

E-Learning

E-learning, also referred to as online learning or electronic learning, is the acquisition of knowledge that takes place through electronic technologies and media. E-learning is conducted on the Internet, where students can access their learning materials online at any place and time (Huffaker & Calvert, 2003). E-learning combines multimedia materials with learning content, providing more diversified digital teaching materials and making learning more flexible, so that learners can adjust their progress and learning content according to their personal

needs and explore learning freely (Huffaker & Calvert, 2003; Clark & Mayer, 2023). E-learning has gradually become an important trend in teaching and learning.

In the past 20 years, e-learning systems usually provide a space for information exchange on the Internet (Driscoll, 2002), including Learning Management System (LMS), Course Management System (CMS), and a Learning Content Management System (LCMS). In schools, e-learning systems are created to support various teaching and learning needs such as student-teacher interaction, student-student interaction, reading materials, and online tests. However, students receive the same content and assignments regardless of their learning performance. Therefore, in order to respond to the individual differences of the students, how to help the students achieve adaptive learning has become an important goal in the development of e-learning.

Adaptive Learning & Adaptive Learning Platform

Adaptive learning is a teaching and learning process, teachers or computers adapt the presentation of course content according to students' abilities, interests, characteristics and learning needs, as indicated by their responses to experiences, tasks, and questions.

Scholars believe that "adaptive" includes the learner profile, the learning portfolio or system log, and the data from the learning environment (Kobsa et al., 2001; Ghaban & Hendley, 2019). In recent years, due to the rapid development of e-learning, many studies have shown that personalized learning content is easier to achieve through digital technology than traditional teaching methods, providing personalized learning paths, learning content, and presentation through analysis of student test results or timely interactive question detection (Wang & Lin, 2018; wang et al., 2021; Alharthi et al., 2021; Chang & Lin, 2019). One of the personal characteristics of learners that are valued in adaptive learning is individual cognitive styles, which will be explained later.

The Digital Learning Innovation Trends report identifies the 7 most prominent trends in digital learning. The report was published in 2014 by the Online Learning Consortium (OLC) and National Research Center for Distance Education and Technological Advancement (DETA). The report indicates that "adaptive learning" is one of the trends in digital learning. The e-learning platform is inadequate in terms of detailed knowledge nodes and diagnosing learning weaknesses, and therefore cannot track and evaluate students' learning status and make timely adjustments to teaching content. Therefore, The Ministry of Education (MOE) has launched the Taiwan Adaptive Learning Platform (TALP) to provide digitalized and systematized teaching materials for K-12 in 2016, as well as self-regulated learning mode and online adaptive diagnostic tests to help teachers in adaptive teaching. The system is equipped with a self-regulated learning model and online adaptive diagnostic tests to help teachers in adaptive teaching. This study used the Taiwan Adaptive Learning Platform (TALP) to conduct an experiment at an elementary school.

Cognitive style

Cognitive style is widely recognized as an important determinant of individual behavior, which manifests itself in individual actions, processes, and routines (Sadler-Smith et al., 2000). The cognitive style is also statistically

significant and theoretically significant in relation to other experiences, behaviors, and physical and mental events of individuals (Picard, 2000). In addition, Messick (1984) noted that cognitive style, unlike intelligence, is a behavioral trait that individuals exhibit as a preference for organizing or processing information.

There are different types of cognitive styles according to different classification methods. The concept of the famous VAK cognitive style model, in which cognitive styles are categorized as visual, auditory, and kinesthetic based on the habit of using different sensory receptions for cognitive learning processes (Grinder et al., 1977). In the following years, many studies have proposed different types of cognitive style (Kolb, 1976; Reid, 1984; Ford & Chen, 2001; Fleming, 2001; Felder, 1988; Honey & Mumford, 1989). Understanding students' cognitive styles will help to integrate instruction or learning strategies with other learning methods or materials. A few studies have shown that students who use materials or tools that fit their cognitive styles learn significantly better.

In this study, the learning preference types proposed by scholars Ford & Chen in 2001 were used to classify students into: holist and serialist. Among them, the characteristic of holist students is the adoption of a global approach to problem-solving, considering various parts of the task simultaneously. Serialist students, on the other hand, focus more on details, addressing only one aspect of the problem at any given time (Ford & Chen, 2001).

Learning Emotion

From a psychological perspective, emotions have both positive and negative effects on learning. The positive effect refers to proactive and optimistic emotions that ignite a passion for learning. In contrast, the negative effect refers to emotions such as tension, unease, disgust, and anxiety, which dampen the spirit for learning. Schutz and Lanehart (2002) highlighted a close relationship between students' learning performance and their learning emotions, as emotions can affect brain development and learning outcomes, influencing an individual's physical and mental states and attracting their attention, creating self-worth and forming personal memory channels. The emotions produced during the learning process are closely related to individual behaviors and learning performance outcomes (Liu & Shen, 2015; Pekrun, 2005). Previous literature found that students who experience positive learning emotions during the learning process tend to invest more effort and persistence in their coursework, resulting in better performance. Conversely, individuals experiencing mostly negative learning emotions during their learning journey tend to have reduced concentration and effort, leading to poorer learning outcomes (Wang & Yang, 2015; Lee, 2007; Chang, 2015; Liu & Shen, 2015).

The concept of learning emotions encompasses the full spectrum of affective experiences students encounter within achievement-oriented settings, fundamentally rooted in cognitive appraisal. These emotions are multifaceted, embodying a range of feelings that extend beyond the binary outcomes of success or failure, to include those evoked throughout the instructional and learning process (Pekrun et al., 2005). Past research related to learning emotions has mostly focused on aspects of exam anxiety, while inadvertently overlooking the emotional dynamics inherent in the continuum of coursework engagement. In

reality, learning emotions cover a range of feelings students have about learning success or failure, including those felt during classroom learning, daily homework, and exams (Wang & Yang, 2015; Pekrun et al., 2010); for example: finding the learning process interesting, feeling proud of high exam scores, or feeling anxious, helpless, and ashamed about low scores, as well as emotions related to learning activities, such as enjoyment during learning, boredom when the teacher repeats information, or anger over excessive teacher demands. These emotions have a direct connection to teaching and students' learning outcomes (Jiang, 2013; Frenzel et al., 2009).

In recent years, the classification and types of learning emotions have been numerous, with students experiencing a rich and diverse array of emotions in learning contexts. These include joy, pride, hope, anxiety, anger, shame, hopelessness, and boredom, among eight identified emotions. There has also been an adoption of the traditional bifurcation into positive and negative learning emotions (Lee, 2007; Huang, 2010; Lin & Cheng, 2012). This study integrates these classification schemes, categorizing learning emotions into positive and negative types. Positive emotions include enjoyment, hope, and pride; negative emotions encompass anger, anxiety, shame, hopelessness, and boredom.

Method

In order to explore the proposed research questions, an experiment was conducted in a natural science studies course of an elementary school in southern Taiwan. One of the objectives of the selected course was to help students understand the knowledge and conceptions of the scientific principles and importance of air through the Taiwan Adaptive Learning Platform (TALP).

Participants

A total of 19 third grade elementary school students from the same classroom were divided into two groups: the holist students or the serialist students. All students used the Taiwan Adaptive Learning Platform (TALP) to learn the "Wonderful Air" course. All students had not studied this topic before the experiment.

Instrument

This study adopted a modified version of the Study Preference Questionnaire (SPQ) proposed by Reid in 1984, which consists of 18 questions, each containing about 2 pairs of descriptive questions. The questionnaire items were scored on a Likert-type five-point scale, where 1, 2, 3, 4 and 5 represented “I agree with the statement on the left”, “I agree (with reservations) with the statement on the left”, “No preferences for either statement”, “ I agree (with reservations) with the statement on the right ”, and “ I agree with the statement on the right”. Those who chose more questions on the left side belonged to holist cognitive learners, while those who chose the opposite belonged to serialist cognitive learners.

The learning effectiveness test consists of a pre-test and a post-test, using an online diagnostic test provided by the Taiwan Adaptive Learning Platform (TALP). The questions were developed by a team of experts and reviewed by a team of current teachers convened by the Ministry of Education (MOE). The pre-test is a 13-question multiple-choice test designed to evaluate students' basic knowledge of natural sciences. The post-test consists of eight multiple-choice questions to evaluate students' concepts after learning the "Wonderful Air"

course, also with a perfect score of 100.

In addition, this study also used the learning-related emotions scale modified from the Achievement Emotions Questionnaire (AEQ) introduced by Pekrun et al., (2005). The learning-related emotion scales include 75 items and measure the following eight emotions: enjoyment, hope, pride, anger, anxiety, shame, hopelessness, and boredom. The items are ordered in three blocks assessing emotional experiences before, during, and after being in the learning process.

Adaptive Learning Platform

During the learning activities, both groups of students used the Taiwan Adaptive Learning Platform (TALP) to learn and complete learning tasks. The teacher used the self-regulated learning model provided by Platform to conduct the teaching activities through precise diagnosis, real-time feedback, discussion and sharing functions, teacher-guided learning, and remedial assistance.

After logging in, students can click the “Course Learning” area at the top right of the screen according to the learning topic specified by the teacher, and click on the “My Tasks” area to view and perform the assigned learning tasks, as shown in Figure 1.

On the other hand, teachers can use the relevant statistical reports to understand whether students have completed the learning content, progress of learning, and answer the questions, etc., to grasp students' learning situation and provide feedback accordingly to help students correct any possible misunderstanding, as shown in Figure 2.

Figure 1. The main interface of the “My Tasks”.

Figure 2. The main interface of the "Learning Process".

Experimental procedure

Figure 3 shows the experimental procedure of this study. Before the learning activities commenced, students were divided based on their learning cognitive styles into holist and serialist groups. After that, a 6-week teaching experiment was conducted. In the first week, the Taiwan Adaptive Learning Platform (TALP) was used for operational instruction and pre-test of learning units to evaluate whether the prior knowledge of the two groups could be perceived as equivalent. The students were given a self-recognized learning module in week 2 to week 5 using the Taiwan Adaptive Learning Platform (TALP) and a post-test in week 6.

During the learning activities, both groups of students use the Taiwan Adaptive Learning Platform (TALP) to learn and complete the learning tasks. After each task, the teacher provides feedback to both groups of students to help them correct any misconceptions they may have, and then conducts the science experiment. At the end of the learning activities, the students took a post-test of the learning unit, so that three learning tasks were administered.

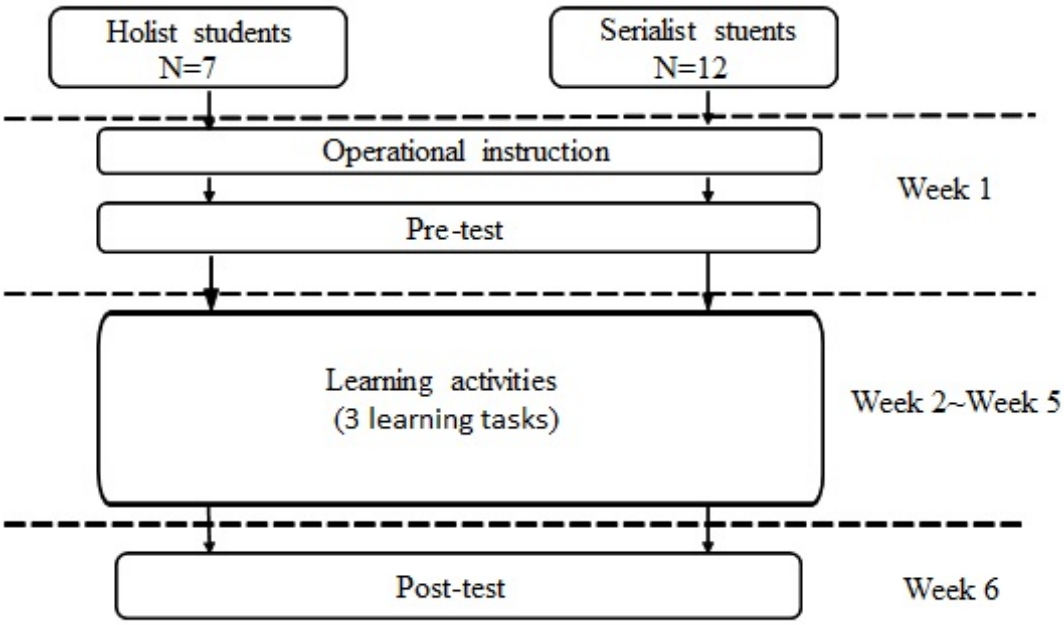

Figure 3. Experimental procedure of the study.

Results and Discussion

Analysis of learning performance

Evaluate the prior knowledge of the two groups

Table 1 shows the analysis of homogeneity of intra-group regression coefficient showed that the two groups had no difference with F=4.402（p>0.05）, implying that the homogeneity test was passed. The two groups did not reach a significant level, indicating that the prior natural science studies knowledge of the two groups is equivalent before the learning activity.

Table 1. Regression homogeneity test of prior knowledge

Variance	*SS*	*df*	*MS*	*F*	*P*
Groups	442.488	1	442.488	3.864	.068
Pre-test	922.824	1	922.824	8.058	.012
Interaction (group*pre-test)	504.193	1	504.193	4.402	.053
Error(B)	1717.938	15	114.529		

Analysis of learning effectiveness

In order to exclude the effect of the pre-test scores. Analysis of covariance (ANCOVA) was employed to analyze the post-test scores of the two groups. Table 2 shows the ANCOVA result. The post-test scores of the two groups reached a significant level with F=23.496(p<0.05). This indicates that there are significant differences in the learning effectiveness of the two groups after the learning activity. Table 3 shows the analysis of the learning effectiveness. The mean score was 53.71 with a standard deviation of 11.78 on the pre-test and 84.14 with a standard deviation of 13.82 on the post-test. The results revealed that a significant improvement in academic performance (p=0.000<0.05). Table 4 shows the analysis of the learning effectiveness of serialist students. The mean score was 69.25 with a standard deviation of 16.32 on the pre-test and 87.75 with a standard deviation of 11.82 on the post-test, with an increase of 18.5 scores. This indicates that the academic performance has also improved significantly(p=0.002<0.05).

In summary, the average score of serialist students increased from 69.25 to 87.75 after the learning activity, an improvement of 18.5 scores; the average score of holist students increased from 53.71 to 84.14, an improvement of 30.43 scores, and the paired sample t-test analysis indicates a significant improvement in the learning effectiveness of the two groups.

Table 2. ANCOVA of the post-test for the two groups' learning effectiveness

Variance	*SS*	*df*	*MS*	*F*	*P*
Between groups	7073.684	1	7073.684	23.496	0.001**
Within groups	5118.000	17	301.059		
Total	12191.684	18			

**P<0.05

Table 3. Results of the t-test for the pre-test and post-test scores of the holist students (N=7)

	Mean (SD)		df	t	p
	Pre-test	Post-test			
scores	53.71 (11.78)	84.14 (13.82)	6	-12.429	0.000**

**P<0.05

Table 4. Results of the t-test for the pre-test and post-test scores of the serialist students (N=12)

	Mean(SD)		df	t	p
	Pre-test	Post-test			
scores	69.25 (16.32)	87.75 (11.82)	11	-3.564	0.002**

**P<0.05

According to the results of this study, learning through the Taiwan Adaptive Learning Platform (TALP) significantly improved students' learning effectiveness for students with different cognitive styles, with holist students making more progress than serialist students and reaching significant differences, indicating that the effectiveness of this learning activity was better for holist students than serialist students. The holist students improved more than the serialist students, and the difference was significant, indicating that the effectiveness of this learning activity was better for the holist students than the serialist students. The results of this study were consistent with the research of many scholars, who suggested that combining multimedia materials with learning content is effective in enhancing motivation and achievement (Huffaker & Calvert, 2003; Clark & Mayer, 2023; Hwang & Wu, 2012).

Analysis of learning emotion

According to Table 5, serialists had a pre-learning emotion score of M=3.23, SD=0.552, and holists had a pre-learning emotion score of M=3.14, SD=0.380. The independent sample t-test showed t(17)=-0.381, p=0.412 > 0.05, indicating no significant difference in emotional performance before learning between the two groups. However, the independent sample t-test conducted during and after learning showed significant differences in emotional performance between the two groups, with t(17)=-0.558, p=0.002 < 0.05; and t(17)=-1.766, p=0.002 < 0.05, respectively.

To investigate the changes in learning emotions of the two groups of students after the teaching activities, a further analysis was conducted on the following eight emotions: enjoyment, hope, pride, anger, anxiety, shame, hopelessness, and boredom, as shown in Table 6. There were significant differences in the positive emotions of enjoyment, hope, and pride between the two groups, especially with holist students showing higher average values than serialist students. In the case of the only negative emotion with a significant difference - boredom, holist students had lower average values compared to serialist students.

Table 5. Results of the t-test for the pre-test, mid-test and post-test scores of the two groups

	Mean (SD)		df	t	p
	serialist (N=12)	holist (N=7)			
pre-test	3.23 (0.552)	3.14 (0.380)	17	-0.381	0.412
mid-test	2.65 (0.333)	2.58 (0.056)		-0.558	0.002**
post-test	3.01 (0.400)	2.74 (0.077)		-1.766	0.002**

**p<0.05

Table 6. Results of the t-test for the two groups' learning emotion

	Mean (SD)		df	t	p
	Serialist(N=12)	Holist (N=7)			
enjoyment	4.42(0.669)	4.86(0.378)	17	1.589	0.019**
pride	3.50(1.100)	4.07(0.189)		1.338	0.002**
hope	3.54(1.096)	4.07(0.189)		1.253	0.004**
anger	2.17(0.937)	1.43(0.535)		-1.897	0.293
anxiety	2.85(1.027)	2.50(0.529)		-0.852	0.053
shame	2.65(0.664)	2.52(0.621)		-0.420	0.844
hopelessness	2.41(0.733)	1.35(0.378)		-3.529	0.080
boredom	2.58(1.165)	1.14(0.378)		-3.144	0.004**

**p<0.05

According to the analysis of learning emotions before, during, and after the tests for the two groups of students in this study, it can be determined that there were no significant differences in emotional performance before learning between students of different cognitive styles. However, significant differences emerged during and after learning. Further analysis of eight types of learning emotions revealed significant differences in positive emotions such as enjoyment, pride, and hope between holist and serialist cognitive style students when learning through the Taiwan Adaptive Learning Platform (TALP). Additionally, from the analysis of learning effectiveness, it was found that holist students made greater progress than serialist students, implying a positive correlation between positive emotions and learning effectiveness.

The results of this study were consistent with the research of many scholars, who suggested that learners who experience positive learning emotions during the learning process tend to perform better, and positive learning emotions have a positive impact on learning effectiveness. (Wang & Yang, 2015; Lee, 2007; Chang, 2015; Liu & Shen, 2015).

Conclusions

In this study, the adaptive learning platform developed by the Ministry of Education (MOE) was used to evaluate the learning effectiveness of students with different cognitive styles. The results are consistent with previous studies that have reported the effectiveness of combining multimedia materials with learning content to enhance students' learning effectiveness and emotion. The results also showed that the holist students made more progress than the serialist students (Huffaker & Calvert, 2003; Clark & Mayer, 2023; Ghaban & Hendley, 2019; Alharthi et al., 2021).

Although the post-test questions do not directly translate learning content into test questions, the test questions are extended from the scientific principles of the knowledge learned and the living environment. This may be the reason why the Taiwan Adaptive Learning Platform (TALP) helps students to improve their academic performance (Wang & Lin, 2018; wang et al., 2021; Chang & Lin, 2019; Picard, 2000; Messick, 1984; Grinder et al., 1977). Additionally, after each unit, teachers use the Taiwan Adaptive Learning Platform (TALP) to provide summative feedback on students' learning performance, helping students gain affirmation, a sense of achievement, or resolve learning issues. Therefore, this might be why the Taiwan Adaptive Learning Platform (TALP) helps to enhance students' positive learning emotions. The experimental results also showed that holist students made greater progress than serialist students, and holist students experienced higher levels of positive learning emotions compared to serialist students. This indicates that although this teaching model is suitable for most students, it works best for students with a holist cognitive style in terms of the learning process and outcomes.

An interesting outcome was observed in the analysis of the eight types of emotional responses after learning for both groups of students. Both groups exhibited a significant emergence of boredom after learning. This phenomenon reflects that although most students could accept the learning mode and content, achieving better learning outcomes and self-affirmation, they still experienced negative emotions, which, however, did not conflict with positive learning emotions and learning effectiveness. Therefore, utilizing an appropriate platform for teaching can maintain students' boredom at a level that does not affect learning effectiveness and positive learning emotions, with holist students performing better in this regard compared to serialist students.

In summary, this study has two contributions. First, we verified that using the adaptive learning Platform can improve students' learning effectiveness and gain positive learning emotions. Second, it was found that students with different cognitive styles did not necessarily have the same magnitude of learning effectiveness.

Based on the results of this study, it can be concluded that using the adaptive learning Platform appears to be an effective learning support for most students, but there are differences for students with different cognitive styles. Therefore, while the adaptive learning Platform continues to add new resources of various types of teaching materials, it is still a question worthy of continued research in practice as to how teachers can appropriately change their teaching strategies and methods through this supplementary platform.

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The Perceived Effect of Celebrity Endorsers for the Brand Image of the Volvo Car Company in Taiwan

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The purpose of the study was to explore the perceived effectiveness of celebrity endorsers for Volvo Cars Company in Taiwan. Four research questions were proposed to guide the study: (1) What were the consumer's images toward Volvo Cars Company? (2) What were the possible reasons that make consumers buy Volvo cars? (3) What were the features of celebrity endorsers attracted consumers to buy Volvo cars? (4) What kind of brand images did celebrity endorsers have for Volvo Cars Company? Fifty participants were invited to participate in the study with a convenient sampling method. Data were collected through a questionnaire designed and developed by the researchers. The results of the study indicated that (1) the participants' images towards Volvo Cars Company were safety equipment, higher prices and trustworthiness, (2) the participants' attitudes toward the purchase intention were associated with brand reputation, advertisement and cars' functions rather than specific celebrity endorsers, (3) the participants felt that the celebrity endorsers should be famous people with positive image, (4) among the three endorsers, Jeremy Lin's personal characters seemed to better fit the brand image of Volvo Cars in Taiwan.

Keywords – Celebrity endorsers, Brand image, Purchase intention, Volvo Cars Company

Relevance to Design Practice – The influence of the celebrity endorsers to the brand image.

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Introduction

Celebrity endorsement is one of marketing strategies often employed in the advertising industry. Its purpose is to use famous, professional and attractive endorsers to catch consumers' attention and increase brand awareness. A trustworthy celebrity endorser can increase consumers' purchase intention, improve brand awareness and brand image. In addition, advertisement can attract consumers' attention, raise brand awareness, and build unique brand image. If a business can select product endorsers carefully to match product attributes, it can produce a model effect for a brand.

The employment of celebrity endorsers in advertisements has gained popularity, as it is believed to contribute positive financial returns for the companies that use them. Approximately 25 percent of American commercials in 2000 used celebrity endorsers (Shimp, 2000), in other words, one out of four commercials feature a celebrity. Because of its importance, it is imperative for managers to be able to determine what impact a particular celebrity endorsement will have on different aspects of a brand's performance such as brand preference, brand loyalty, and ultimately, sales and profitability (Aaker, 1991; Keller, 2008).

In the highly-competitive market, many corporations invite different advertising endorsers for their products. They must make sure that the advertising money invested generates the highest possible sales. Previous research has found that the use of famous people as spokespersons or endorsers in advertisements was an important contribution to an individual's attitude toward an ad as well as to advertising effectiveness (Lafferty et al., 2002; Ohanian, 1990). Moreover, it is necessary for customers to have brand recognition based on corporations. Therefore, the need for this study is to discuss the connection between Volvo Cars Company and its advertising endorsers.

The purpose of the current study focused on the perceived effectiveness of celebrity endorsers on the brand image of and purchase intention for Volvo Cars Company in Taiwan, by investigating the factors influencing consumers to make purchase intention and by exploring the use of celebrity endorsers in advertising industry. The research questions in this study were examined as follows:

1. What were the consumer's images toward Volvo Cars Company?
2. What were the possible reasons that make consumers buy Volvo cars?
3. What were the factors of celebrity endorsers attract consumers to buy Volvo cars?
4. What kind of brand images did celebrity endorsers have for Volvo Cars Company?

Literature Review

Nowadays, in order to support corporate and brand image, using celebrities as part of marketing strategy is a fairly common practice for major firms in supporting corporate and brand images because they consider that celebrities are effective endorsers for their products or brands and further influence consumer purchase

decisions. People all believe that the selection of an appropriate endorser for a product is an important, yet difficult, decision. Thus, companies invest large amount of money to align their brands and themselves with endorsers. Furthermore, because of their fame, celebrities serve not only to create and maintain attention, but also to achieve high recall rates for products.

Many researchers regard the attitude-toward-the-ad construct as an important influence on advertising effectiveness, brand attitudes and purchase intentions (Lutz, 1985). Before the researchers conducted the current research, the researchers investigated the history of Volvo Cars Company, including its changes of brand image, the new design of all line of cars. Then the researchers analyzed its advertisement and investigated three celebrity endorsers, Ms. Chun-Ning Chang, Mr. Yu-Yen Peng and Mr. Jeremy Lin. The first two are young celebrities from entertainment industry, Jeremy Lin is a famous NBA star. Finally, the researchers conducted a survey to illustrate the growth of sales and the impact on brand recognition.

McCracken's (1989) definition provides a clear description of a celebrity endorser as an "any individual who enjoys public recognition and who uses the recognition on behalf of a consumer good by appearing with it in an advertisement". He also defines celebrity endorsers as a "ubiquitous feature of modern marketing". Therefore, how to choose a suitable and money-making endorser are all companies concerned. Friedman and Friedman (1979) suggest that a celebrity endorser is someone known to the public for his or her achievements in areas other than that of the product class endorsed. According to their studies, there are three factors believed to influence the effectiveness of advertisements and they indicated that how the celebrity endorsement strategy create the images of products. These three factors are attitude towards the advertisement, attitude towards the brand, and purchase intention. Attitude towards the advertisement is defined as "a predisposition to respond in a favorable or unfavorable manner to a particular advertising stimulus during a particular exposure occasion" (McKenzie, Lutz, & Belch, 1986). While Shimp and Gresham (1985) describe the term as "the attempt to influence consumer choice through creating a favorable attitude that may transfer to the advertised brand and influence choice behavior". Attitude towards the brand is defined as "an individual's internal evaluation of the brand" (Mitchell & Olson, 1981). Spears and Singh (2004) define the purchase intention as "an individual's conscious plan to make an effort to purchase a brand". In other words, purchase intention can measure the possibility of a consumer to buy a product, and the higher the purchase intention is, the higher a consumer's willingness is to buy a product (Dodds, et al., 1991; Schiffman & Kanuk, 2000). In addition, purchase intention indicates that consumers will follow their experience, preference and external environment to collect information, evaluate alternatives, and make purchase decision (Dodds et al., 1991; Schiffman & Kanuk, 2000; Yang, 2009; Zeithaml, 1988;).

Excellent and suitable endorsers can make products in one company have positive image and tremendous profit. However, once

endorsers have negative news stories, the products they endorsed will also be affected. Therefore, source credibility is an important factor that everyone focuses in the advertising industry. Ohanian (1990) defined source credibility as “a term commonly used to imply a communicator’s positive characteristics that affect the receiver’s acceptance of a message”. According to the research of Aligarh Muslim University in India, over the past 30 years the research conducted by psychologists demonstrate that a source which is distinguished as highly credible is likely to be more persuasive than a low credibility sender. In turn, the researchers attempt to bring about the developments of scales and each of them includes a different set of dimensions for measuring source credibility. Table 1 presents different researchers’ studies about the scaling of source credibility.

Although there are various measurements for scaling source credibility, the research focused on three dimensions: attractiveness, trustworthiness and expertise (Ohanian, 1990). Joseph (1982) concluded that attractive endorsers were consistently liked more and had a positive impact on products with which they are associated. His findings were consistent with others that increasing the endorser's attractiveness enhances positive attitude change (Kahle and Homer 1985; Simon et al., 1970). In modern society, people tend to emphasize attractiveness that makes advertisements feature attractive models. Freiden (1984) suggested that celebrity attractiveness should be best suitable to appeal consumer awareness.

Trustworthiness is generally considered the major dimension underlying source credibility (Friedman Friedman, 1979). It refers to the consumer's confidence in the source for providing information in an objective and honest manner (Ohanian, 1991). Ohanian also stated that message will be more effective and the receiver more integrated, when the celebrity is perceived to be more trustworthy. Because consumers are not familiar with endorsers, it is difficult for consumers to have confidence to buy products.

Expertise is that endorsers perceived to be a source of valid assertions with knowledge, special experience and skills. When an endorser possesses expertise, they have knowledge about the product, which in turn supports the claims made in the advertisement (Ohanian, 1991). Therefore, if celebrities endorse products or services related to them, they will be regarded as having the most expertise.

Methodology

Participants

The participants consist of convenient sample from the researchers’ relatives, the faculty of National Formosa University, passengers on the street. The participants were mainly adults because they had their own cars or bought cars before. The characteristics of participants were stated as follows: 31 participants were male (62%) and 19 were female (38%). Thirty-six percent of them aged between 21 and 30, 24% aged between 41 and 50, 20% aged between 51 to 60-year-old, 14% were aged between 31 to 40, and only 6% were aged under 20. Fifty-four

percent of the participants were college educated, 22% had graduated diploma, 14% people were high school or vocational high school educated, 8% had associate degree and 2% graduated from junior high school.

Data Collection & Analysis

The researchers developed a questionnaire as the research instrument, consisting of two categories. There were 42 questions listed in the questionnaire. The study adopts a 5-point Likert scale from 5 to 1 representing strongly agree, agree, neutral, disagree, and strongly disagree.

Section one contained 4 items to collect participants' demographic data, including their genders, ages, education levels and occupations. The second section contained 4 parts, and they aimed to measure the impact of advertising endorsers on consumers' purchase intention, their likeness, dislikness and their views about celebrity endorsement.

In the second section, the first part included 12 questions related to the recognition of brand image, produced to survey consumers' awareness towards Volvo Cars Company. The second part was purchase factors with 7 questions and aimed to investigate what were the possible reasons to attract consumers to buy Volvo cars. The third part had 11 questions related to advertising endorsers, produced to explore how celebrities' reputation influence products' purchase rate. The fourth part had 12 questions, which were designed to analyze advertising endorsers, and to explore how three endorsers, Ms. Chun-Ning Chang, Mr. Yu-Yen Peng and Mr. Jeremy Lin, their impact on brand images based on attractiveness, trustworthiness, expertise, and uniqueness.

The questionnaires were distributed to the participants and they took 20-30 minutes to complete them. After collecting all the questionnaires, the researchers used SPSS version 17.0 software to analyze the data.

Data Analysis

There were 50 copies of questionnaires distributed and all copies were returned right after the participants finished them. In a pilot study, researchers took 10 copies of questionnaires to test the internal consistency of the survey. Note that a reliability coefficient of 0.70 or higher is considered "acceptable" in most social science research situations. In the pilot study, the result of α was 0.914. In the formal study, the α was 0.890, suggesting that the study had relatively high internal consistency.

Results and Discussion

The researchers analyzed the results based on the information gathered before and divided the survey into two parts. The first part is the demographic information of participants, and the second part had four sections, including the perceptions of brand image, purchase intention, endorsers, and the analysis of endorsers. Therefore, the aims of this study were to explore whether advertising endorsers had a positive effect on perceived value and purchase intention. Based on the survey, there were some findings as follows. The survey used a Likert scale from 1 to 5, 1 represents strongly disagree, 2 represents disagree, 3 represents neutral, 4 represents agree and 5 represents strongly agree.

Table 1. The perceptions of Volvo's brand image

Item	*SA/A*	*Neutral*	*SD/D*	*Mean*
1. I think Volvo Cars has high quality.	28(56%)	19(38%)	3(6%)	3.56
2. I think Volvo Cars has higher price.	30(60%)	15(30%)	5(10%)	3.60
3. I think Volvo Cars is a leading brand.	12(24%)	24(48%)	14(28%)	2.96
4. I think Volvo Cars is trustworthy.	29(58%)	18(36%)	3(6%)	3.56
5. I think the design of Volvo Cars is very unique.	24(48%)	21(42%)	5(10%)	3.30
6. I think Volvo Cars has better safety equipment.	32(64%)	16(32%)	1(2%)	3.76
7. I think Volvo Cars continues improving quality.	23(46%)	27(54%)	0(0%)	3.60
8. I think Volvo Cars is even more persuasive with celebrity endorsement.	17(34%)	19(38%)	14(28%)	3.30
9. I think Volvo Cars can show personal style and image.	19(38%)	19(38%)	12(24%)	3.23
10. I think the design of Volvo Cars is consistent with the fashion trend.	18(36%)	27(54%)	5(10%)	3.20
11. I think Volvo Cars owns a good reputation.	28(56%)	20(40%)	2(4%)	3.66
12. I think Volvo Cars can show the symbols of wealth.	24(48%)	15(30%)	11(22%)	3.40

In Table 1 there were more than half of the participants (56%) agreed that Volvo's cars had high quality. Moreover, 30 participants (60%) also agreed that Volvo's cars had higher price. It seemed that the results showed Volvo's cars were expensive products in the market. For item 3, 24 participants (48%) held neutral opinion that Volvo Cars Company was a leading brand. On this item, it seemed that the other participants still had other leading brands of vehicles. However, 29 participants (58%) agreed with the trustworthy brand of Volvo Cars company. Only 3 participants (6%) disagreed with that, so the results indicated that Volvo Cars was trustworthy in the market. There were 24 participants (48%) agreeing that the design of Volvo's cars was very unique and 21 participants (42%) tended to have neutral opinion. For the safety equipment, the results showed Volvo Cars had a great reputation because 32 participants (64%) strongly agreed and only 1 participant (2%) disagreed.

Furthermore, 23 participants (46%) agreed that Volvo Cars continued improving quality, while 27 participants (54%) had neutral opinion. Item 8 indicated 17 participants (34%) agreed that Volvo Cars was even more persuasive with celebrity endorsement which was more than disagreements (28%). As the researchers mentioned before, while celebrity endorsers supported Volvo Cars company, the market share increased for a short time. The results of item 9 indicated that 19 participants (38%) agreed that Volvo's cars can show personal style and image and 19 participants (38%) held neutral opinion. The results of item 10 showed that 27 participants (54%) had neutral opinion but 18 participants (36%) agreed that the design of Volvo Cars was

consistent with the fashion trend which was more than disagreement (10%) since Volvo Cars company invited famous celebrities to endorse their products. More than half (56%) of the participants agreed that Volvo Cars company had a good reputation. The last item displayed 24 participants (48%) agreed that Volvo Cars can show the symbol of wealth.

Table 2. The purchase intention of the participants

Item	*SA/A*	*Neutral*	*SD/D*	*Mean*
1. Without considering about personal finance, I am willing to buy Volvo cars.	21(42%)	15(30%)	14(28%)	3.33
2. If I plan to buy a car, Volvo car is my first choice.	10(20%)	16(32%)	24(48%)	2.80
3. I think the message of advertisement will affect my decision of buying a car.	25(50%)	7(14%)	18(36%)	3.40
4. I will buy Volvo cars because of specific celebrities.	2(4%)	18(36%)	30(60%)	2.56
5. I will buy Volvo's cars because of Volvo's brand reputation.	32(64%)	12(24%)	6(12%)	3.73
6. I will buy Volvo car because Volvo cars has stylish appearance.	20(40%)	19(38%)	11(22%)	3.36
7. I will buy Volvo car because Volvo has strong horsepower.	25(50%)	13(26%)	12(24%)	3.43

For item 13, 21 participants (42%) agreed that without considering about personal finance, I am willing to buy Volvo Cars. It indicated that customers would buy Volvo Cars without considering their financial ability. However, 24 participants (48%) disagreed if they planned to buy a car, the Volvo cars was their first choice. It seemed consumers would not choose Volvo cars as their first choice because of the price. On item 15 and 16, 25 participants (50%) agreed that the message of advertisement would affect their decision to buy a car and 30 participants (60%) disagreed that they would buy Volvo Cars because of specific celebrity. These results indicated that consumers' attitudes towards the advertising was associated with the message of advertisement instead of specific celebrity endorsers. Based on the results of item 17, 32 participants (64%) agreed that they would buy Volvo cars because of Volvo's brand reputation. It showed that brand reputation had a positive influence on purchase intention. Furthermore, according to item 18 and item 19, 20 participants (40%) agreed that they would buy Volvo cars because Volvo cars had stylish appearance and 25 participants (50%) agreed that they would buy Volvo cars because Volvo had strong horsepower. It showed that consumers also had better attitudes towards Volvo cars' design with stylish appearance and strong horsepower.

The results showed that the purchase intentions of Volvo Cars were strongly associated with the brand reputation; subsequently purchase intention was highly related with strong horsepower, and advertisement was also highly associated with purchase intention (see Table 2).

Table 3. The recognition of advertising celebrities

Item	*SA/A*	*Neutral*	*SD/D*	*Mean*
8. I think the advertising endorsers of Volvo Cars company will affect my purchase intention.	10(20%)	18(36%)	22(44%)	2.93
9. I think there is a positive image on Volvo Cars' advertising endorsers.	19(38%)	27(54%)	4(8%)	3.46
10. I think Volvo cars' advertising endorsers should be very popular.	19(38%)	27(54%)	4(8%)	3.36
11. I think Volvo cars' advertising endorsers should be personable.	16(32%)	33(66%)	1(2%)	3.53
12. I still choose to purchase cars endorsed by the Volvo cars' advertising endorsers even though the cars prices are higher than other brands.	5(10%)	25(50%)	20(40%)	2.73
13. I think using famous celebrities to endorse products makes me notice them.	24(48%)	15(30%)	11(22%)	3.43
14. I think using famous celebrities to endorse products boosts my confidence in products and brand.	12(24%)	22(44%)	16(32%)	3.06
15. I think using famous celebrities to endorse products increase trustworthiness of contents advertisement.	14(28%)	20(40%)	16(32%)	3.16
16. I think it is worthy of buying cars endorsed by famous celebrities.	7(14%)	18(36%)	25(50%)	2.73
17. I think inviting celebrities as endorsers increases the market share.	21(42%)	22(44%)	7(14%)	3.53
18. I think inviting celebrities as endorsers increases sales.	24(48%)	20(40%)	6(12%)	3.56

As shown in Table 3 there were 11 questions in this section, which aimed to explore the participant's perceptions towards Volvo Cars and the celebrities' images associated with Volvo Cars. Based on the results of item 20, 44% of participants disagreed that the advertising endorsers of Volvo Cars Company affected their purchase intention, while 36% of them held the neutral opinion. Item 21 indicated that most people

had neutral opinion (54%) about Volvo cars' advertising endorsers with positive images, but 38% of participants agreed. The results of item 22, accounted for 38% supporting their high popularity. Item 23, their personable quality, 66% of participants had neutral opinion because they thought personal quality was nothing to do with advertising endorsers, while 32% agreed. Item 24 indicated that 50% of participants had neutral opinion that they would purchase the cars endorsed by the Volvo Cars' advertising endorsers even though the price was higher than other brands. However, 40% of them disagreed that they would buy higher price Volvo cars supported by endorsers. Then item 25 to 27 showed the advantage of using famous celebrities, and 48% of participants indicated that they would notice products which were endorsed by famous celebrities. However, it seemed that they held the neutral about boosting confidence in product (44%) and increasing trustworthiness of contents in advertisement (40%). At the same time, for item 28, 44% of them disagreed that it worthy of buying cars endorsed by famous celebrities. There were 44% of participants holding the neutral opinion that advertising endorsers could increase the market share, while 42% agreed. Finally, 48% of participants supported that inviting celebrities as endorsers increased sales, which showed that the Volvo Cars Company succeeded in inviting endorsers and building its excellent image. If customers had good impression on its endorsers, the Volvo Cars Company had the chance to make more profits.

Table 4. Volvo's celebrities: Ms. Chun-Ning Chang, Mr. Yu-Yen Pong and Mr. Jeremy Lin's endorsement

Item	*SA/A*	*Neutral*	*SD/D*	*Mean*
1. I think Ms. Chun-Ning Chang's endorsement will increase attractiveness of Volvo's cars for consumers.	14(28%)	28(56%)	8(16%)	3.26
2. I think Ms. Chun-Ning Chang's endorsement will increase trustworthiness of Volvo's cars for consumers.	17(33%)	30(60%)	3(7%)	2.83
3. I think Ms. Chun-Ning Chang's endorsement will improve professional image of Volvo's cars for consumers.	14(29%)	21(52%)	10(19%)	3.00
4. I think Ms. Chun-Ning Chang's endorsement is unique.	13(26%)	25(50%)	12(24%)	2.96
5. I think Mr. Yu-Yen Pong's endorsement will increase attractiveness of Volvo's cars for consumers.	19(38%)	25(50%)	6(12%)	3.33
6. I think Mr. Yu-Yen Pong's endorsement will	13(26%)	27(54%)	10(20%)	3.06

	increase trustworthiness of Volvo's cars for consumers.				
7.	I think Mr. Yu-Yen Pong's endorsement will improve professional image of Volvo's cars for consumers.	12(24%)	27(54%)	11(22%)	3.03
8.	I think Mr. Yu-Yen Pong's endorsement is unique.	20(39%)	22(44%)	8(17%)	3.00
9.	I think Mr. Jeremy Lin's endorsement will increase attractiveness of Volvo's cars for consumers.	27(44%)	20(40%)	8(16%)	3.53
10.	I think Mr. Jeremy Lin's endorsement will increase trustworthiness of Volvo's cars for consumers.	16(32%)	23(46%)	11(22%)	3.23
11.	I think Mr. Jeremy Lin's endorsement will improve professional image of Volvo's cars for consumers.	15(30%)	26(52%)	9(18%)	3.23
12.	I think Mr. Jeremy Lin's endorsement is unique.	20(40%)	21(42%)	9(18%)	3.33

Volvo Cars Company has changed its marketing strategies in Taiwan in recent years to attract younger target consumers. Volvo Cars has invited Ms. Chun-Ning Chang, Mr. Yu-Yen Pong and Mr. Jeremy Lin as their advertising endorsers. Ms. Chun-Ning Chang endorsed Volvo S40 model to aim at female market. It is a medium-sized metropolitan station wagon. Table 4 shows that 60% of participants were neutral about increasing trustworthiness of Volvo's cars for consumers, while 33% agreed that Ms. Chun-Ning Chang was successful for her endorsement.

On the other hand, Mr. Yu-Yen Pong endorses S60 D4 model by using ironic lines:" The heart is satisfied, but present arrogant and not worthy of having a glance." to reflect mindsets of modern young generation. In the Table 4, 39% of the respondents agreed that Mr. Yu-Yen Pong's endorsement was unique. In contrast to these statistics, only 17% of people disagreed that his endorsement was unique. Mr. Yu-Yen Pong increased not only attractiveness and trustworthiness of Volvo Cars for its customers, but also enhanced professional image of Volvo Cars successfully.

The third celebrity is Mr. Jeremy Lin. He is a famous NBA basketball player. He has created sports fever in Asia. Forty-two percent of the participants had the neutral opinion that his endorsement was unique, while 40% agreed that Jeremy Lin is successful to catch the customers' attention.

Conclusions

In this study, the researchers found that how Volvo Cars Company has changed their marketing strategy by using young celebrity endorsers in recent years. Since these changes have been made, the corporation has

boosted sales reflected on their business revenues. Moreover, the participants tended to agree that the changes of products and brand images had a great impact on the company based on the findings of the study.

Research question 1: What are the consumers' images towards Volvo Cars Company? The results indicated that 64% of the participants (Mean=3.76) believed that Volvo Cars Company had better safety features. The second highest percentage of the results showed that 60% of the participants (Mean=3.60) felt that Volvo's cars were more expensive. Moreover, 58% of the participants (Mean=3.56) felt that Volvo's cars were trustworthy. For the disagreements, 28% of the participants (Mean=2.96) considered that Volvo Cars was not a leading brand. 28% of the participants (Mean=3.30) felt that Volvo Cars was even less persuasive with its celebrity endorsement. The results indicated that the participants' images towards Volvo Cars Company were safety equipment, higher prices and trustworthiness.

Research question 2: What are the possible reasons that make consumers buy Volvo's cars? The results showed that 64% of the participants (Mean= 3.73) felt that the purchase intention was associated with the brand reputation; 50% of the participants (Mean=3.40) felt that was related to strong horsepower and 50% participants (Mean=3.43) felt that the message of advertisement was also associated with purchase intention. Furthermore, the findings showed that 60% participants (Mean=2.56) considered specific celebrity endorsers for Volvo Cars Company did not play significant roles in influencing consumers' purchase intentions, and 48% participants (Mean= 2.80) felt that Volvo's cars were not their first choice; it seemed that the participants would not choose Volvo's cars as their first choice because of the higher prices. The findings indicated that the participants' attitudes toward the purchase intention were associated with brand reputation, advertisement and cars' functions rather than specific celebrity endorser.

Research question 3: What are the features of advertising endorsers which will attract consumers to buy Volvo's cars? According to the results, 48% of the participants (Mean=3.43) considered celebrity endorsement to be noticeable in their daily life. Just like Friedman and Friedman (1979) suggest that a celebrity endorser is someone known to the public for his or her achievements in areas other than that of the products endorsed. In other words, celebrity endorsements are successful and effective ways to make consumers see the products in the competitive market. Besides, 42% of the participants (Mean=3.53) supported that by inviting celebrities as endorsers would increase the market share and 48% of the participants (Mean=3.56) felt that would increase sales, too.

Research question 4: What kind of brand images did advertising endorsers have for Volvo Cars Company? Volvo Cars Company invested significant amount of money to improve their brand image. Forty percent of the participants (Mean=3.33) considered that Jeremy Lin's endorsement was unique. And even 44% of the participants (Mean=3.53) felt that Jeremy Lin was successful to increase attractiveness.

Based on the findings, the researchers suggest that Volvo Cars Company should continue to improve their safety equipment. Besides, maintaining the Volvo's trustworthiness for the consumers is necessary. However, Volve Cars Company can consider lowering their cars' prices. In this way, the researchers believed that Volvo Cars Company can build up good reputation in consumers' mind and then boost sales. Moreover, the researchers felt that Volvo Cars Company can invite more celebrity endorsers who are popular with positive image to attract different age groups.

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