

**CONTEMPORARY SILK SCARF DESIGN FRAMEWORK FROM
DUNHUANG MURAL ELEMENTS BASED ON COGNITIVE
ERGONOMICS FOR WOMEN IN CHINA**

By

LIU FEI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Doctor of Philosophy**

December 2024

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Abstract of thesis presented to the senate of Universiti Putra Malaysia in fulfilment
of the requirement for the degree of Doctor of Philosophy

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This thesis develops a Contemporary Silk Scarf Design Framework (CSSDF) that integrates Dunhuang mural elements with cognitive ergonomics (CE) to enhance the innovation and market appeal of cultural creative products for young Chinese women. Dunhuang murals, as a significant representation of traditional Chinese heritage, hold immense artistic and historical value. However, their application in contemporary silk scarf design lacks originality and market competitiveness, necessitating further research and refinement. To address this gap, this study employs a mixed-methods approach, including expert interviews, literature review, and user surveys, to comprehensively investigate the role of Dunhuang mural elements in modern silk scarf design. The data collected were analyzed using SPSS, focusing on descriptive statistics and correlation analysis to evaluate the significance of mural elements from a cognitive ergonomics perspective. The findings indicate that among the primary mural elements, patterns, lines, and colors, color plays the most influential role in evoking emotional responses, particularly joy, healing, and relaxation. Additionally, decorative patterns

are the most preferred, and blue is the dominant color choice among users. The proposed CSSDF framework outlines a systematic process for selecting and integrating Dunhuang mural elements, considering user preferences, emotional engagement, and design ergonomics to enhance both aesthetic appeal and usability. The framework serves as a practical guideline for designers, ensuring the harmonization of tradition and modernity in silk scarf products. This study contributes to the field of cultural and creative industries, textile design, and cognitive ergonomics, offering new strategies for the preservation and innovation of Chinese cultural heritage in contemporary fashion. Future research should focus on cross-cultural comparisons, interdisciplinary collaborations, and digital marketing strategies to further optimize the application of Dunhuang mural elements in global markets.

Keywords: Cognitive Ergonomics, Contemporary Silk Scarf Design, Cultural and Creative Products, Dunhuang Mural Elements, Textile Innovation, User Preferences

SDG: GOAL 9: Industry, Innovation, Technology and Infrastructure, GOAL 12: Responsible consumption and production, GOAL 17: Partnerships for the goals

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

**RANGKA KERJA REKABENTUK SCARF SUTERA KONTEMPORARI
DARIPADA ELEMEN MURAL DUNHUANG BERDASARKAN ERGONOMI
KOGNITIF UNTUK WANITA DI CHINA**

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Tesis ini membangunkan Kerangka Reka Bentuk Skarf Sutera Kontemporari (CSSDF) yang mengintegrasikan elemen mural Dunhuang dengan ergonomik kognitif (CE) untuk meningkatkan inovasi dan daya tarikan pasaran produk kreatif budaya bagi golongan wanita muda di China. Mural Dunhuang, sebagai representasi penting warisan tradisional China, mempunyai nilai artistik dan sejarah yang tinggi. Namun, aplikasinya dalam reka bentuk skarf sutera kontemporari masih kurang keaslian dan daya saing di pasaran, yang memerlukan kajian dan penambahbaikan lanjut. Bagi menangani jurang ini, kajian ini menggunakan pendekatan kaedah campuran, termasuk temu bual pakar, kajian literatur, dan tinjauan pengguna, bagi menyelidiki secara menyeluruh peranan elemen mural Dunhuang dalam reka bentuk skarf sutera moden. Data yang dikumpulkan dianalisis menggunakan SPSS, dengan tumpuan kepada statistik deskriptif dan analisis korelasi untuk menilai kepentingan elemen mural dari perspektif ergonomik kognitif. Dapatan kajian menunjukkan bahawa daripada tiga elemen utama mural, corak, garisan, dan warna, warna memainkan

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LIST OF ABBREVIATIONS

CACP	Cultural and Creative Products
CE	Cognitive Ergonomics
CEP	Cognitive Ergonomics Perspective
CSSD	Contemporary Silk Scarf Design
CSSDF	Contemporary Silk Scarf Design Framework
CTC	Chinese Traditional Culture
DME	Dunhuang Mural Elements
ESMR	exploratory sequential mixed-method research
IBM	International Business Machines Corporation
RO	Research Objective
RQ	Research Question
SPSS	Statistical Package for the Social Sciences
SPSS	Statistical Product and Service Solutions
UNESCO	United Nations Educational, Scientific and Cultural Organization

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter introduces the research background, the research problems and the significance of the research. It describes the purpose of the study and the research question and objectives. The content includes the following sections: (1.1) Introduction; (1.2) Research Background; (1.3) Research Problem; (1.4) Research Questions; (1.5) Research Objectives; (1.6) Scope and Area of Research; (1.7) Significance of Research; (1.8) Definition of Terminology; (1.9) Research Conceptual Framework; (1.10) Outline of the Thesis; (1.11) Summary.



Figure 1.1: Grotto 305 flowers flying sky
[Source by Zhao (2019)]

1.2 Research Background

Chinese traditional culture is comprised of a diverse range of traditional cultural elements, which gradually came into being in the past five thousand years. These elements, colorful and profound, are unique, valuable, and irreplaceable treasures of Eastern culture (Dai, 2021). The term "Chinese traditional culture" refers to the tangible and intangible cultural heritage shared by all ethnic groups in a country, fully embodying the cultural characteristics. Only by absorbing the nutrients of national culture can art design be unique and stand out (Dong, 2016). With the increasing national influence and wider dissemination of national culture, product design incorporating Chinese traditional cultural elements has become a popular trend. Therefore, integrating cultural elements into products will become essential in product design (Gao et al., 2018).

As a comprehensive product of literature, art, lifestyle, standard concepts, geography, so on and so forth, Chinese traditional culture manifests itself in music, painting, folk opera, prose and poetry, calligraphy couplets, drinking and tea, and traditional festivals (Hu, 2020). Culture is the foundation of cultural and creative products, and creativity is the soul of artistic and innovative products. According to the different ways of conceiving cultural and creative products, these products can fall into the following categories: cultural tourism products, museum cultural and creative product design, and cultural and creative products based on traditional culture. Creativity is also the leading force that adds value to culture in artistic and innovative products. Depending on the level of creativity and the degree of integration with the culture, cultural and creative products can be divided into three types: the highest level signifies the

transmission of the artistic conception of traditional culture, the middle level can be represented by the transformation and extension of cultural symbols, and the lowest level is the uncreative repetition (Hou et al.2022).

Among the traditional Chinese cultural elements, the Dunhuang Mogao Grottoes have been believed to constitute a significant source of inspiration for cultural and creative products. These grottoes, also known as the Thousand Buddha Caves, are a renowned world cultural heritage site in Dunhuang, at the western end of the Hexi Corridor in China. It is over 1,600 years old and has 735 caves, 492 of which are decorated with frescoes, with a mural area of about 45,000 square meters (Chen et al., 2021). Dunhuang is an essential window for the spread of Buddhism and the meeting point of three major religions. Dunhuang culture has characteristics including diversity, inclusiveness, three-dimensionality and depth (Zhao & Xing, 2022). Dunhuang murals, the most exquisite murals created in the ancient dynasties, can be found in West Thousand Buddha Caves, Anxi Yulin Grottoes, and Dunhuang Mogao Grottoes in particular. These murals were painted with marvelous skills and in breathtaking colors. Many characters, animals, plants, and buddhist stories are expressed vividly by unparalleled craftsmanship. Even now these murals are still considered classical (Zhou, 2021). According to Ying Shao, a famous scholar living during the Eastern Han Dynasty, "Dunhuang" means "Dun, Daye, Huang, and Shengye" (Dun is a great cause, and Huang is a sacred one) (Liang & Wang, 2023).

Dunhuang culture embodies romantic imagination and poetic longing for the distant past (Wang, 2019). The Dunhuang murals manifest national wisdom and possess unparalleled artistic value and charm. Therefore, studying them is of excellent

academic and cultural significance. Inspired by these murals, designers could better create contemporary works of art by incorporating the elements of cultural heritage (Chen & Li, 2021).



Figure 1.2: The extraordinary beauty of the cave paintings illustrated in Cave 285
[Source by Demas et al. (2015)]

Although Dunhuang is located in the remote area of northwestern China, its culture has been found to be closely related to some local cultures, Shandong culture in particular. In fact, there are many materials and texts about the spirit of Confucianism in the Dunhuang Testament, which reflects the significant influence of Shandong Qilu culture on Dunhuang culture (Liu & Wu, 2022). For instance, in Dunhuang relics the Buddhist scriptures were discovered, which illuminate such ethics and morality as “Eight Virtues” (“filial piety,” “fraternal duty,” “loyalty,” “faithfulness,” “propriety,” “righteousness,” “honesty,” and “shame”) that are emphasised by Confucianism, highlighting the convergence of Confucian and Buddhist concepts. The fusion of

Confucianism and Buddhism in Dunhuang has laid a solid theoretical foundation for cultural integration in this region (Han & Li, 2012).



Figure 1.3: The location of Shandong Province
[Source by Sun et al.(2022)]

In the early 20th century, cultural exchanges and diffusion have become increasingly frequent and unrestricted by geography, thanks to the advancement of digital technology and the emergence of the "global village." China ranked third globally in terms of exporting cultural and creative items. However, in terms of further development of these products, it lagged significantly behind other countries (Liu & Lin, 2010). Commodities in different areas tend to be homogeneous, resulting in the loss of their distinctive regional features.

What's more, Chinese traditional culture is imbued with a wide range of connotations. Cultural symbols in China, for example, typically represent something auspicious with unique characteristics. In order to gain a deeper insight into these symbols, designers must possess the capacity for reflection, an acute aesthetic sense and careful observation (Hu, 2020). Nevertheless, the absence of distinctiveness in the realm of Chinese art and design persists, and it has yet to attain the authentic essence of "Chinese design" with unique Chinese attributes. Consequently, the status quo of art design is stuck in awkwardness (Fan, 2018). Thus, it becomes more necessary for the brand's local identity to be acknowledged (Liu & Bao, 2019). Meanwhile, the development of superior cultural and creative items has become an unavoidable trend. (Liu & Lin, 2010). In recent years, China's cultural and creative industries have undergone some changes. With the country's emphasis on regional cultural products, artistic and innovative products on the market are becoming increasingly diversified.

1.3 Research Problem

In 2017, the Chinese government issued the Opinions on Implementing the Project for the Inheritance and Development of Excellent Traditional Chinese Culture, emphasizing the integration of traditional culture into national education (Xie, 2022). Traditional culture, as an essential part of China's heritage, requires continuous innovation and development to ensure its preservation and dissemination in the modern era (Ke, 2020; Wu, 2015). One significant approach to achieving this is through cultural and creative products, which serve as embodiments of traditional culture and provide a tangible connection between heritage and contemporary consumer experiences (Liu & Lin, 2010).

Contemporary creative cultural product design has evolved beyond mere functionality and aesthetics to address deeper emotional and cultural needs. Designers have extensively explored the integration of cultural symbols—such as traditional Chinese decorative patterns, color symbolism, and philosophical motifs—into modern products (Qian, 2016). However, while these elements have enriched contemporary design, there is a growing concern that many designers simply replicate traditional motifs without modification, leading to homogenization and a lack of true innovation in cultural products (Liu & Bao, 2019). Without meaningful adaptation, cultural products risk becoming mere commercial commodities, devoid of their historical and artistic essence (Zhou et al., 2018).

Among cultural and creative products, those inspired by Dunhuang murals have garnered increasing attention due to their intricate patterns and vibrant colors, which offer immense potential for contemporary design (Zhou et al., 2018). Dunhuang murals represent a highly esteemed embodiment of traditional Chinese art, making them a valuable resource for cultural product development. Research has shown that integrating regional cultural elements into product design enhances both quality and economic impact (Gao et al., 2018). However, despite successful cases, such as the Hess-Sunfed brand's Dunhuang series, many designers continue to directly replicate mural patterns without adapting them to modern aesthetic preferences or exploring innovative material applications (Fu & Xing, 2020). This results in monotonous designs that fail to maximize the potential of traditional cultural elements in contemporary creative industries (Zhou et al., 2018).

What remains unclear is how traditional elements like Dunhuang murals can be effectively transformed to align with modern aesthetics, consumer preferences, and ergonomic principles. While there is general agreement on the value of integrating traditional culture into creative products, there is still a lack of a systematic framework that guides designers in applying these elements innovatively while maintaining cultural authenticity. Current research has yet to establish clear methodologies for the creative adaptation of traditional symbols, forward-thinking applications of color and materials, and strategies for balancing cultural heritage with contemporary design demands. Addressing this gap is essential to prevent cultural and creative products from becoming superficial reproductions lacking artistic depth and cultural significance.

This research aims to bridge this gap by developing a unique framework for the innovative design of modern silk scarves inspired by Dunhuang murals, incorporating a cognitive ergonomic perspective. By focusing on the creative adaptation of traditional symbols, optimizing color and material applications, and aligning design principles with contemporary consumer expectations, this study seeks to guide designers in creating products that are not only culturally rich but also commercially viable. Establishing such a framework will elevate the quality of cultural and creative products, enhance the preservation of traditional culture, and contribute to the sustainable development of cultural industries in the modern era.

1.4 Research Questions

This study attempts to answer the following questions:

- RQ1 What are the elements of the Dunhuang mural silk scarf designed to represent young women in China?
- RQ2 What are the cognitive ergonomics (CE) perspectives of Dunhuang mural elements (DME) for innovative contemporary silk scarf designs for young women in China?
- RQ3 What is the significance of Dunhuang mural elements with CE perspective for innovative contemporary silk scarf design for young women in China?
- RQ4 How to develop a new framework that integrates Dunhuang mural elements and CE perspective for innovative contemporary silk scarf design for young women in China?

1.5 Research Objectives

This research aims to combine elements of Dunhuang murals with a cognitive ergonomic perspective to develop a unique framework for the innovative design of modern silk scarf products. This framework is expected to serve as guidelines for product designers to create ingenious silk scarf designs specifically targeted at young Chinese ladies.

The specific objectives of the study are:

- RO1 To identify Dunhuang mural elements in silk scarf design for young women in China.
- RO2 To evaluate the cognitive ergonomics (CE) perspective of Dunhuang mural elements for innovative contemporary silk scarf design for young women in China.

- RO3 To analyse the significance of Dunhuang mural elements with CE perspective for innovative contemporary silk scarf designed for young women in China.
- RO4 To develop a new framework that integrates Dunhuang mural elements with a CE perspective for innovative contemporary silk scarf design for young women in China.

1.6 Scope and Area of Research

This research focuses on the integration of Dunhuang mural elements in contemporary silk scarf design through the lens of cognitive ergonomics. It aims to bridge the gap between traditional cultural elements and modern product innovation, addressing the lack of originality and market competitiveness in contemporary cultural and creative products. The study investigates how perception, emotional response, and user cognition influence the effectiveness of Dunhuang mural elements in silk scarf design. It specifically examines the impact of color, pattern, and composition on user experience, considering factors such as visual comfort, aesthetic appeal, and emotional resonance. Furthermore, the study explores the historical, artistic, and symbolic significance of Dunhuang murals and evaluates their adaptability in contemporary fashion. By analyzing consumer preferences, it identifies the most preferred elements, such as decorative patterns and colors, and assesses their psychological effects. The study also examines the current status and challenges in cultural and creative product design, identifying key issues like repetitive designs and lack of innovation. Additionally, it explores the role of digital marketing platforms (e.g., TikTok, Xiaohongshu) in promoting silk scarves embedded with Dunhuang aesthetics.

The research primarily targets young Chinese consumers aged 18 to 45 years, as they represent the main market for cultural and creative fashion products and are highly

engaged with contemporary design trends. Foreign consumers are excluded from this study due to differences in cultural cognition and aesthetic perception, which may affect their interpretation of Dunhuang mural elements. This study is specifically focused on silk scarves and does not extend to other fashion items or accessories. While cognitive ergonomics plays a crucial role, the study does not cover other ergonomic perspectives, such as physical ergonomics. Additionally, the research is limited to the Chinese market, with no comparative analysis of international consumer preferences. By defining this scope, the study provides a structured and focused investigation into the practical application of Dunhuang mural elements in contemporary silk scarf design, contributing to the preservation and innovation of Chinese cultural heritage in the fashion industry.

1.7 Significance of Research

The significance of this research lies in its development of a new design framework that integrates Dunhuang mural elements with cognitive ergonomics to enhance innovation, cultural preservation, and market appeal in contemporary silk scarf design. By addressing the lack of originality and market competitiveness in cultural creative products, this study provides a structured approach for designers, ensuring that heritage-inspired fashion remains relevant in modern markets. The proposed Contemporary Silk Scarf Design Framework serves as a practical guideline, helping designers create products that are not only visually appealing but also evoke positive emotional responses, such as joy, healing, and relaxation. Additionally, it offers aesthetic and perceptual recommendations for consumers, particularly young women, in selecting scarves that align with their preferences and psychological well-being.

Beyond design applications, this study reinforces the preservation and innovation of Dunhuang culture by integrating its artistic elements into modern fashion, ensuring that traditional aesthetics continue to evolve. By incorporating findings on color psychology, emotional engagement, and user preferences, this research contributes to improving the market competitiveness of local silk scarf products. The study also fills a gap in knowledge by exploring the intersection of cognitive ergonomics, cultural heritage, and contemporary fashion, an area that remains underexplored in both academic research and industry practices. Furthermore, with the growing role of social media platforms like TikTok and Xiaohongshu in promoting cultural products, this research highlights opportunities for digital marketing and cross-cultural expansion, ensuring that Dunhuang-inspired designs can gain global recognition.

Overall, this research not only contributes to sustainable cultural innovation in the textile and fashion industries but also provides valuable insights for designers, marketers, and cultural heritage advocates. By bridging the gap between tradition and modernity, it ensures that Chinese cultural heritage continues to thrive in contemporary fashion while meeting the evolving needs of consumers.

1.8 Definition of Terminology

This study mainly includes the following aspects:

1.8.1 Cognitive Ergonomics (CE)

Cognitive ergonomics studies the cognitive processes that people go through when diagnosing, dealing with workloads, perceiving situations, and making decisions and

plans (Hollnagel & Woods, 1983; Jones, 1995). At the same time, cognitive psychology focuses on the cognitive processes of reasoning, understanding, and using relevant knowledge, reflecting the interaction between the tool and the user. Cognitive ergonomics is neither a single discipline nor a simple combination of different interests; it includes the connecting points of multiple knowledge forces tightly woven together like a web (Green & Hoc, 1991). CE theory suggests that the environment and the user should be viewed as an interactive, tightly integrated cognitive system. This process should include workload decisions, skill representations, and human-system interactions. The application of this process can improve product performance while increasing human comfort. In summary, CE is closely related to mental processes, including rational reasoning, perceptual memory, motor responses and other relationships (Christy & Duraisamy, 2020).

1.8.2 Chinese Traditional Culture (CTC)

Chinese traditional culture, acronymized as CTC, encompasses a wide range of subjects, including but not limited to Chinese civilisation, history, religion, Confucianism, Buddhism, and various other aspects. The world-famous items of Chinese cultural heritage, such as Chinese archaeology, porcelain, Kung Fu, Tai Chi, Chinese medicine, and so on, are also integral constituents of CTC. These elements amalgamate harmoniously with one another, constituting the multifaceted essence and diverse attributes of Chinese culture. As far as CTC is concerned, Confucianism assumes an unparalleled influence, permeating the entire spectrum of education, social customs, and moral and ethical principles, thereby emerging as a pivotal and indispensable theoretical foundation for perpetuating Chinese cultural heritage (Konior, 2018).

1.8.3 Cultural and Creative Products (CACP)

According to UNESCO (United Nations Educational, Scientific and Cultural Organization), it is widely acknowledged that cultural products, cultural services, and intellectual property rights all fall under the encompassing umbrella of the cultural and creative industries. These industries are marked by their ability to produce creative products with deep-rooted cultural connotations and symbolic meanings. Furthermore, these innovative products are created to emphasise individuality and distinctiveness. To achieve this, designers resort to the principles of aesthetics to interpret and analyse concepts from cultural perspectives. The ultimate goal is to produce CACP that not only possess practical functions but can also cater to the needs of modern society's. Throughout this intricate and thoughtful process, traditional culture plays a significant role in infusing new values and connotations into cultural and creative products. Consequently, this conventional culture infusion catalyses the expansion and growth of the creative industry, offering promising and extensive possibilities for its future development (Zhang, 2021).

1.8.4 Dunhuang Mural Elements (DME)



Figure 1.4: Pattern Source: China Art Gallery 314 Mogao Grottoes four Buddha lotus (Sui)

[Source by Cao et al. (2015)]

Dunhuang Mogao Grottoes are most famous for Dunhuang murals. Moretti et al. (2021) observes that Mogao grottoes, after having weathered so many natural and man-made troubles for thousands of years, survive as one of the world's best-preserved trove of culture and art. The subjects of Dunhuang murals are manifold, but they are mainly represented by paintings of Buddhist Dharma, Buddhist legends, mythological stories, and other religious or legendary figures and things. Among these subjects, the most notable ones concern Feitian, Buddhas and Bodhisattvas in the heavenly world. Meanwhile, landscape buildings and animal patterns appear frequently in the paintings. Beside, it is obvious that countless decorative patterns of caissons are used (Wei, 2021).

1.8.5 Research Framework

A research framework represents a comprehensive understanding of the relevant problems in a given field, and it can help researchers better solve research problems in the field. In addition, the research framework can guide researchers to better conduct literature reviews, select and determine research methods, and better interpret research findings (Imenda, 2014).

1.8.6 Silk Scarf Design

From a global perspective, the history of silk scarves can be traced back to about 3,000 years ago. The original function of silk scarves was nothing but to keep warm. Primitive traces of silk scarves can be seen in the garments of ancient Greeks and the loincloths used by the Egyptians (Hope, 2013; Liu et al., 2020). With the development of the times and the progress of society, practicality of silk scarves gradually began to

give way to decorativeness. However, the origins of the silk scarf can be found in ancient dress, for example, in the famous women's dresses of the Tang Dynasty, which can be found in correlation with modern silk scarves. (Liu et al. 2020). So far, the themes and contents in the design of contemporary silk scarf products have greatly transformed. For example, the theme is no longer in hot pursuit of symbolism but rather appears to be decorative (Wang, 2013).

1.9 Outline of the Thesis

This paper is divided into six chapters. The framework of each chapter is shown in Figure 1.6.

Chapter 1: Introduction - The background of the study is included, and issues related to cognitive ergonomics, Dunhuang mural elements, and silk scarf product design are identified. In addition, the aim of the study are presented, and the research questions and research objectives of the study are determined. Finally, the significances are introduced.

Chapter 2: Literature Review - This chapter reviews and discusses the literature on cognitive ergonomics, Dunhuang mural elements, and product design of silk scarf. It also discusses the influence of Chinese traditional culture, Dunhuang mural elements in particular, on innovative designs of cultural products, which are represented by silk scarf in this study.

Chapter 3: Research Method - This chapter introduces the research methods used in this study and explains the research scope, methodology, and implementation steps. Additionally, there are steps and tools for data collection and analysis.

Chapter 4: Data Analysis and Results - This chapter will conduct a detailed analysis and results of the data.

Chapter 5: Discussion and Findings - This chapter will deal with the questions and findings of the paper, answer specific research questions, and finally arrive at a framework for the design of contemporary silk scarf.

Chapter 6: Conclusions and Recommendations - This chapter summarises the main findings of this study and presents conclusions and implications. The limitations of this study are summarised, and recommendations for future research are provided.

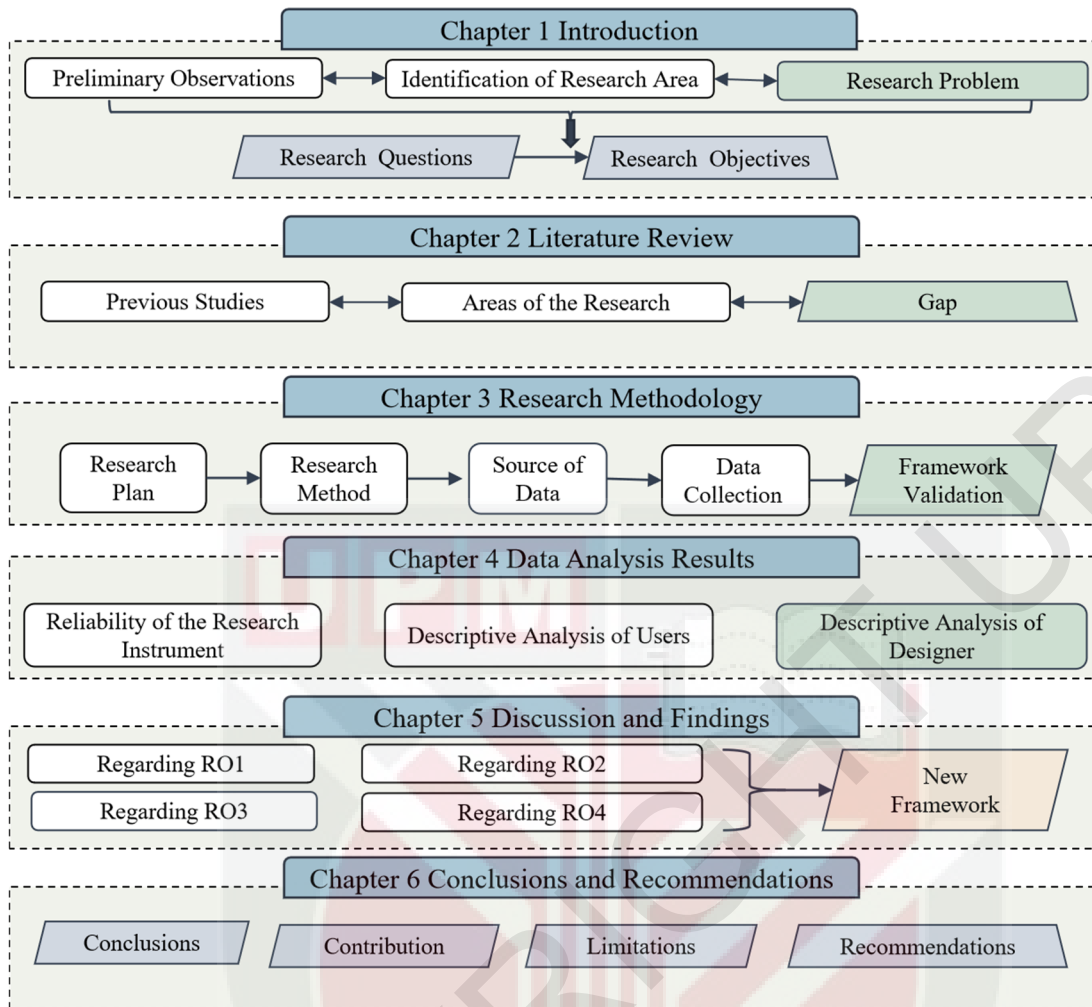


Figure 1.5: Research process associated with thesis chapters
(Source by author)

1.10 Summary

This chapter provides an overview of the study that aims to develop a framework for the design of contemporary silk scarf. The goal is to incorporate into the design the elements of Dunhuang mural paintings from a perspective of cognitive ergonomics. The necessity and urgency of the study are clarified through an in-depth analysis of the research context. The problem statement defines the critical issue of the study, which is how to effectively integrate the artistic elements of Dunhuang frescoes with

cognitive ergonomics principles. The ultimate aim is to create silk scarf products that are aesthetically pleasing and consistent with users' cognitive choices.

The research questions and objectives are closely linked, and both aim to explore and address how Dunhuang mural elements can be incorporated into contemporary silk scarf design. The scope and domain of the research clarify that this study will focus on the younger age group of 18-45 years old. The significance of the study is that it not only promotes the integration of traditional culture and art with modern design but also innovates silk scarf product design, thus having a positive and profound impact on the design field and cultural heritage. The study provides clear definitions of key terms to ensure accuracy and professionalism in the exposition. The thesis structure outlines the overall framework of the study and guides the reader through the logical flow and structural layout of the study.

In conclusion, this thesis will provide new perspectives and far-reaching implications for research and practice in related fields. The following section will examine a literature review of the relevant content.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the following keywords: cognitive ergonomics, Chinese traditional culture, Dunhuang mural elements, and silk scarf product design. A literature review was conducted to analyse the previous research and to find a literature base for this study. The chapter is divided into seven main sections: (2.1) Introduction; (2.2) Cognitive Ergonomics; (2.3) Cultural and Creative Products Design; (2.4) Dunhuang Mural Elements; (2.5) Contemporary Silk Scarf Design; (2.6) Summary.

All assertions and arguments in a thesis need to be supported by sound reasoning, and such support is also a strong guarantee of the thesis' credibility (Jervis & Drake, 2014). Therefore, a literature search and review is an indispensable starting point for research. This study focuses on integrating Dunhuang mural elements into contemporary silk scarf design based on an ergonomic perspective, but the relevant literature is rather limited. Therefore, this study resorts to some interdisciplinary literature concerning cognitive ergonomics and cognitive emotion, thus examining Chinese traditional culture, Dunhuang mural art and contemporary product design from a fresh perspective.

2.2 Cognitive Ergonomics (CE)

CE is a comprehensive field of study encompassing perception, reasoning, memory, movement, response, and other aspects that examine human interactions and various

elements of different systems. Consequently, CE significantly emphasises human-computer interaction and human physio-emotional responses (Rocha et al., 2019).

Cognitive engineering and cognitive ergonomics are closely related but have different emphases, focusing on human-computer systems and human-computer interaction, respectively, and Green and Hoc (1991) noted that for the two fields to work better together, they must shift their focus from purely technical implementations to integration at the functional level. The emergence of Human-Computer Interaction (HCI) and Cognitive Engineering has provided the theoretical basis for exploring design concepts in greater depth. Satisfying user needs has become an integral core element (Dittmar, 2021). These needs are deeply rooted in users' perceptions and emotions, and cognitive ergonomics provides a solid theoretical framework for the product design process, which is closely related to user perception.

Correia et al. (2012) have discovered a new approach to better comprehend user needs and product design by examining the emotional responses of individuals to specific stimuli. Emotional design is a powerful technique that connects particular product features with user experience, and it has become a critical aspect of product design practice. Gao et al, (2018) supports this idea by emphasising that emotional design plays a vital role in product development and enhances the user experience. According to Gao et al, (2018), products that go beyond basic needs and evoke emotional resonance can be particularly impactful.

Thus, as Sun et al. (2018) highlight, there is a growing emphasis on understanding that a product should offer an experience beyond utility. It is essential to conduct extensive

research on users' emotional responses, as it signifies an advanced methodological strategy for the creation of user-centric products. In this regard, research on users' emotional responses should be thoroughly considered while doing cultural undertakings (Correia et al., 2012).

2.2.1 Cognitive Ergonomics Perspectives (CEP)

The perspectives of cognitive ergonomics applicable to this study include the following factors.

Vision: Vision is the primary human sense associated with our perception. The viewing angle can be extended to about 170 degrees. The same object does not look the same to different people, and the brain processes this different visual information as essential cues (Solso, R. L., 1994). The receptors for light in the eye are divided into cones and rods. Rods are numerous, but they cannot distinguish colours. Only cones can distinguish shapes and colours, but good light is required (Berlin & Adams, 2017). The visual channel is used to control the display characteristics of the marker, which include the position, size, shape, orientation, hue, saturation, brightness, etc. There are three types of data: categorical, sequential, and numeric. Most contemporary theories of perception suggest that the visual system's function is to provide people with internal and external surface features of objects (Goodale, 2011).

Attention: Attention is the cognitive capacity of humans to direct and concentrate their mental activities towards a certain object or task. The concept of "attention" has been a subject of interest since ancient times and continues to be relevant now. Attention is

the cognitive process by which humans focus their mental operations on external stimuli. Attention is the act of directing one's cognitive resources towards a certain event or task. Single attention allows us to concentrate our cognitive powers on a single task or object. Dividing attention between various pieces of information and stimuli reduces an individual's capacity to focus on or process information (Berlin & Adams, 2017). When events occur with a high frequency or regularity, people's attention becomes concentrated. When occurrences are infrequent or irregular, people's attention becomes diverted, causing them to overlook minor changes and information (Bohgard, 2009).

Perception: Perception represents the manifestation of cognitive processes at a more advanced level. Perception is the cognitive capacity of individuals to acquire information from their surroundings and cognitively establish connections and structure its significance. Perception relies on individuals' knowledge, experience, and previous comprehension, and serves as the foundation for choosing interpretative and category data. Perception enhances our understanding of several dimensions. It establishes the cognitive framework through which we anticipate and interpret phenomena. Nevertheless, it is equally effortless to deceive them by creating a false perception. Hallucinations arise when individuals' perception of sensory inputs diverges from objective reality (Berlin & Adams, 2017). Perception is the initial step in our comprehension of the universe and an inherent mechanism by which we actively gather information about reality (Brewer, 1999).

2.2.2 Cognitive Ergonomics and Product Design

Cultural experience plays a significant role in shaping cognitive emotions, a concept widely acknowledged in artistic and creative product design. A notable framework by Gao et al. (2018) provides a comprehensive model for cultural product design, grounded in the theoretical underpinnings of cultural experience. This framework is specifically designed to support the creation of artistic products through interactive cultural experiences. Gao et al. (2018) not only present this model theoretically but also demonstrate its practical applications in the design of Taiwanese aboriginal cultural objects, showcasing its relevance in real-world product design. Cultural experience, as a method for fostering human-cultural interaction, is an invaluable tool in the design and evaluation of everyday products. Empirical studies have shown that emotional factors are crucial in guiding designers' decision-making processes. Moreover, in product design, dynamic cultural factors often outweigh cognitive ones. By exploring the aesthetic experience and understanding the complex relationship between the subject (designer) and object (product), designers can acquire valuable insights that lead to the development of superior designs (Correia et al., 2012).

2.2.3 The Significance and Challenges of Cognitive Ergonomics (CE)

Building on the concept of cognitive emotions in product design, the significance of these emotions in the domain of cultural product design becomes increasingly apparent. For creative cultural product design, emotional components take precedence, as emphasized by Gao et al. (2018). While many product designs prioritize functionality and practicality, they often overlook the emotional needs of users yet

these emotional elements are critical to a product's success. Therefore, focusing on emotional design is essential for enhancing product competitiveness (Khalid & Helander, 2006). Despite this recognition, the fields of human-computer interaction (HCI) and cognitive ergonomics (CE) have traditionally placed a disproportionate emphasis on technological and functional aspects. This focus has been criticized by Cooper and Bowers (1995), as discussed by Dittmar (2021). In conclusion, product design must not only focus on technological advancements and practical utility but also integrate emotional considerations to improve the overall user experience and satisfaction.

2.3 Cultural and Creative Products Design

2.3.1 Interpretation of Chinese Traditional Culture

Chinese traditional culture (CTC) is a realm of diversity, including national culture, literature and art, lifestyle, customs, geography, history, music, poetry, theatre, calligraphy, couplets and traditional festivals (Hu, 2020). Designers can use these conventional cultural elements for creative design (Ling, 2018). Integrating traditional cultural aspects into contemporary creative cultural product design is a crucial means of safeguarding and disseminating traditional culture. Contemporary product design may develop and preserve Chinese traditional culture by incorporating it into the design process using appropriate technical methods. The methods for assimilating new design components from national culture can constantly enhancing and refining art design theory and expressive forms (Zhang, 2016). Thus, traditional culture will progressively acquire greater value and significance in contemporary times (Lu et al.,

2022). Besides, as culture plays a significant role in both global and local design domains, the process of designing cultural and creative products should involve a comprehensive approach that takes into consideration user feedback, physical items, and the emotional experiences of users in light of traditional cultural attributes (Gao et al., 2018). In the 21st century, it is crucial to establish a design culture in China that reflects its national features and prevents the loss of its unique artistic design. This would enable China to be better understood and recognized by the world (Dong, 2016).

As is mentioned above, traditional culture is a necessary ingredient in product innovation in a globalized world. With that in mind, designers can create innovative products with distinctive cultural features that may cater to tastes of modern people (Wu, 2016). Therefore, it has become increasingly essential to protect traditional culture. In recent years, academic attention has focused on the sustainable development of cultural preservation (Yang et al., 2021). In modern times, digital technologies play an indispensable role in both the preservation of cultural heritage and the design of cultural and creative products. Studies show that the network and digital technologies have effectively contributed to the preservation and presentation of culture. (Cao et al., 2018). Meanwhile, digital analysis technology has been widely adopted in the design of cultural and creative products. For example, artists have found digital media art very helpful in improving traditional cultural and creative products (Lv & Fu, 2020; Dai, 2021). To promote the development of cultural and innovative products, experts have summarised many rules for digital technology to better combine technology and design innovation (Zhang et al., 2020; Liu & Xia, 2021).

2.3.2 The Source of Cultural and Creative Products

This study has examined relevant literature to identify the source for cultural and creative products.

According to Chen (2017), cultural and creative products are intended to derive inspiration from cultural themes in order to raise their value in the market. In these products, all three factors, generally culture, creativity, and product, must be harmoniously combined. The most prominent feature of such products is the cultural heritage and cultural characteristics implicit in them (Li, 2022). Currently, traditional culture displayed by Chinese cultural and creative products consists of mainly two aspects: form and connotation. The designs that focus on form apply Chinese cultural elements directly but rather rigidly to the products. In contrast, the designs that focus on connotation involve a multi-angle dissection and re-organization of the spiritual connotation of national cultural elements and a clever creative combination with the product (Yang & Yang, 2019).

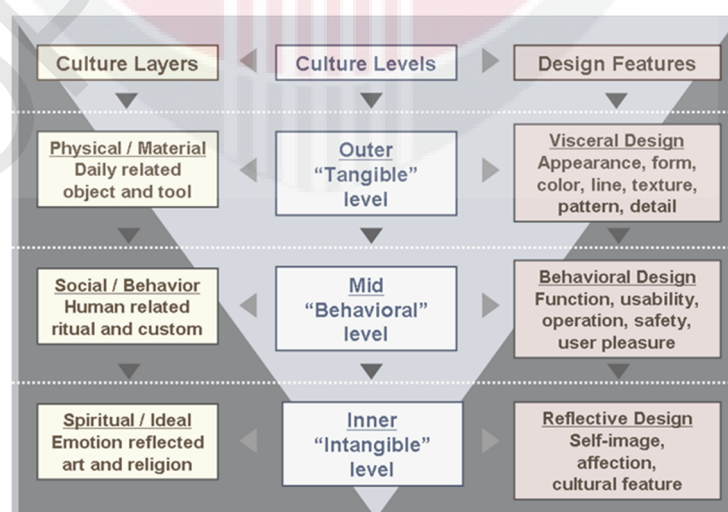


Figure 2.1: Transforming Taiwan Aboriginal Cultural Features into Modern Product Design

[Source by Lin (2007)]

In terms of categorising culture, Lin (2007) stated that culture layers is divided into physical, social and spiritual as shown in Figure 2.1. Design can be derived from story and emotion, functionality and safety, as well as colour and shape.

Applying traditional Chinese culture in art design has become a popular research area (Fan, 2018). For instance, Chinese characters, a unique graphic language, are of significant importance in traditional Chinese culture. Designers adopt Chinese characters to make their designs appear more creative (Gao, 2015). Combining traditional culture with modern aesthetics is also helpful in promoting design innovation and development. The conventional Chinese cloisonné craft, for example, is famous for its exquisite copper wire patterns, and by incorporating contemporary elements, designers rejuvenate the ancient culture (Zhang et al., 2015).

Additionally, designers have integrated traditional Chinese handicraft, Han embroidery, into modern product design, creating products with regional cultural characteristics that appeal to fashion-conscious consumers who value individuality (Chen & Zhang, 2018). Another example is the art of traditional Chinese opera, whose artistic elements are applied to various modelling arts, such as sculpture, ancient murals, printmaking and folk art (Zhang, 2021).

Ye Lang, an esthete, believes that researchers can draw inspiration from Chinese Traditional Culture to solve the problems of the current era (Li, 2017). China has a wealth of traditional cultural resources that can be used for contemporary culture and creative products. Cultural product design necessitates an in-depth comprehension of cultural adaptation in the interaction between people and cultures in order to optimise

the user's interactive experience and make more effective use of cultural elements (Gao, et al., 2018).

2.3.3 Cultural and Creative Products

The "Opinions on the Implementation of the Project for the Inheritance and Development of Chinese Excellent Traditional Culture," issued by the Chinese government, highlights the importance of promoting the growth and progress of the country's cultural and creative industries (Ji, 2017). These efforts are essential not only for showcasing the richness of Chinese culture but also for preserving its invaluable heritage, stimulating the harmonious development of the national economy and society, and enhancing the country's soft power globally (Zhou & Zhao, 2022).

In the context of this development, cultural and creative product design plays a pivotal role in preserving and promoting traditional culture. Designers are increasingly integrating science and technology into their creative processes, allowing them to refine and evolve traditional culture while ensuring its continued relevance in contemporary society (Du et al., 2019). This process forms an intricate bridge between traditional practices and modern design methodologies, enhancing cultural continuity and innovation.

The cultural industry encompasses numerous subcategories, such as artistic products and creative knowledge industries, where creativity serves as a vital force for the evolution of traditional culture (Zhou & Zhao, 2022). For designers, understanding and exploring local traditional culture is paramount, as it allows them to infuse this

rich cultural heritage into local product designs, thereby enhancing the competitiveness and cultural identity of these products (Cai & Zhai, 2020). As the market demands grow, the challenge for designers becomes incorporating cultural meaning alongside functionality. This dual focus on emotional appeal and practicality is essential for the success of cultural and creative products, which combine decorative features, cultural symbols, and contemporary design concepts (Zhou & Zhao, 2022).

The integration of traditional culture into product design not only appeals to the aesthetic and emotional needs of consumers but also responds to their growing spiritual and cultural demands (Du et al., 2019). As consumers increasingly seek products that resonate with their cultural identity, designers must navigate the balance between maintaining traditional elements and adapting them to modern needs. This blending of the old and new is vital for positioning products effectively in the market and for enriching the cultural dialogue between past and present (Yang & Yang, 2019). Through innovative design, traditional culture can be transformed into economic advantages, while fostering a positive feedback loop that enhances the quality and cultural value of the products (Du et al., 2019).

The incorporation of traditional Chinese cultural elements into product design can stimulate economic growth, underscore regional attributes, and enhance the distinctiveness of products. This approach is increasingly recognized as a promising design methodology (Gao et al., 2018).

2.4 Dunhuang Mural Elements (DME)

2.4.1 The Value of Dunhuang Murals

The Dunhuang murals, housed in the Mogao Grottoes also known as the Thousand Buddha Caves stand as one of China's most significant artistic and cultural treasures. As a vital hub for cultural exchange, the Mogao Grottoes showcase the fusion of Buddhist art with foreign cultural influences, demonstrating China's historical openness and adaptability (Cao et al., 2015). With a rich legacy spanning over centuries, these murals hold an essential place in the history of Chinese art and serve as a critical resource for understanding the diverse cultures along the Silk Road (Liang & Guo, 2017). Recognized as a UNESCO World Heritage site in 1987, the Mogao Grottoes' artistic and historical value has been acknowledged globally (Shi & Li, 2024).

Dunhuang murals represent the intellectual and artistic achievements of the Chinese people, incorporating elements from various cultures while maintaining distinct national characteristics (Borg et al., 2020). The murals are celebrated for their bold use of color, intricate patterns, and profound symbolic meanings. This vibrant heritage of Dunhuang art offers valuable insights for contemporary design, particularly in how to blend cultural depth with aesthetic appeal (Liang & Guo, 2017). For example, the application of color theory from Dunhuang murals can provide essential guidance in modern design practices, contributing to the vibrancy and visual impact of contemporary products (Wu & Liu, 2023).



Figure 2.2: The Cave 85 from the Late Tang dynasty
[Source by Chen et al. (2021)]

These murals' richness and diversity, combining various artistic expressions such as sculpture, painting, and decorative motifs, reflect the enduring significance of Dunhuang art in the broader context of Chinese civilization (Chen & Li, 2021). Dunhuang murals are not only significant for their aesthetic qualities but also for their role in communicating cultural and spiritual values, such as compassion and moral teachings, which remain integral to Chinese culture today (Leng, 2019).

The Dunhuang murals hold immense cultural value, offering historical documentation and artistic insights into China's ancient past (Zheng, 2018). The incorporation of Dunhuang mural elements into modern design has the potential to enhance cultural heritage, providing new avenues for creative innovation and the preservation of traditional art forms (Lu, 2016).

2.4.2 Classification of Dunhuang Mural Images and Elements

Building on the significance of Dunhuang murals, Fu and Xing (2020) classified these murals into four primary categories: figures, buildings, decorative motifs, and animals. Figures, including the iconic Feitian (flying fairies), are one of the most striking elements of Dunhuang murals. Originating from India, these figures symbolize the fusion of Chinese and foreign cultures and hold profound religious and cultural significance. The presence of these figures, particularly those of the donors, speaks to the spiritual ideals of the time.

Additionally, architectural elements featured prominently in Dunhuang murals, particularly those reflecting the architecture of the early Tang Dynasty. These buildings offer rich historical context, providing insight into the cultural and architectural development of that era. Decorative motifs, such as the lotus caisson, are also central to the murals, signifying sanctity and spiritual illumination. Lastly, animals, especially deer, hold symbolic importance, representing health, beauty, and power within the murals (Fu & Xing, 2020).



Figure 2.3: Dunhuang Cave 320 Feitian
[Source by Xu et al. (2022)]

Furthermore, the three most distinctive artistic elements of Dunhuang murals, lines, patterns, and colors, serve as defining characteristics of their aesthetic appeal. The refined lines, drawn in traditional Chinese styles, bring life to the murals, while the intricate patterns of flora, fauna, and decorative symbols add depth and meaning. The use of vivid, natural mineral pigments is perhaps the most striking feature, with the color palette reflecting the pinnacle of ancient Chinese color art and continuing to inspire contemporary design (Zhang, 1952).

Dunhuang murals stand as a cultural and artistic treasure trove, offering invaluable inspiration for modern design. Their unique blend of color, line, and pattern continues to resonate in the development of new design concepts, highlighting the enduring relevance of these ancient artistic forms (Lu, 2016).

2.4.3 Artistic Characteristics of Dunhuang Mural Elements

The Dunhuang murals, originating from the Mogao Grottoes, are a testament to a rich fusion of cultural influences and artistic innovation. These murals, particularly those dating back to the Northern Liang period, exemplify the earliest expressions of cave architecture and mural design in China (Wang & Qiu, 2014). At the time, artists in Dunhuang developed a unique approach to blending local Buddhist art with broader cultural influences, promoting the spread of Buddhist art while adapting it to the local context (Fanost et al., 2020). The evolution of the Dunhuang murals represents the intersection of Chinese and Western artistic traditions, with a distinct focus on contouring and the lines that define these figures.

The use of lines, especially in figures like Feitian (celestial beings), holds great significance in these murals. Feitian, frequently depicted as soaring through the air, showcases dynamic lines that emphasize the flowing movement of their robes and postures, distinguishing them from Western depictions of similar figures, such as Cupid (Chen, 2021). The shape of Feitian, especially the shawl adorning their body, conveys a sense of fluidity and grace, characteristic of the Tang Dynasty's artistic zenith (Zhou, 2022). This portrayal of flight, as seen in Figure 2.3, becomes a key example of how contour lines enhance the aesthetic depth of the murals and reflect an ideal of beauty and perfection. The Tang Dynasty's portrayal of Feitian also embodies the cultural aspiration to depict aesthetic ideals, as poet Li Bai eloquently expressed: "Grasp the hibiscus with your hands and venture into the cosmos. Neon garments trail a broad sash as they ascend into the heavens."



Figure 2.4: Buddhas in Dunhuang murals
[Source by Tian (2021)]

In addition to lines, the use of color plays a pivotal role in defining the Dunhuang murals. These murals are renowned for their vibrant color palettes, where shades of red, yellow, and blue are frequently used to highlight the figures' skin tones and garments, creating a striking contrast that draws attention to both the mystical and religious aspects of the artwork (Fu & Xing, 2020). Color in the Dunhuang murals does more than add visual appeal; it carries cultural significance. For instance, yellow symbolizes wealth and power, while red conveys festivity and auspiciousness: values deeply rooted in Chinese cultural traditions (Wu, 2016). These colors are not just ornamental but serve to enhance the symbolic meaning behind the murals, reflecting both the divine and earthly realms.



Figure 2.5: Part of Cave 112 of Mogao Grottoes
Source by Li & Zhang (2023)

The evolution of color techniques in the murals is evident through the historical progression from the early Dunhuang murals, characterized by the use of red clay backgrounds and black ink outlines, to the later Tang Dynasty works, which employed lighter, more ethereal shades such as green and yellow (Lei et al., 2021). Figure 2.3, for example, exemplifies the vibrant use of these hues in a scene from a fairy dance in Cave 112, where the harmonious blend of colors and elegant outlines creates a lively, ephemeral moment that resonates with viewers.



Figure 2.6: Cave 29 of Mogao Grottoes, Song Dynasty
[Source by Wang (2020)]

The intricate patterns found in Dunhuang murals further enrich the visual narrative. Among these, the caisson pattern, commonly found in the ceilings of the Grottoes, stands as a hallmark of Dunhuang's artistic ingenuity. These patterns, which include the honeysuckle, water vortex, flying, and lotus motifs, represent the cosmos and the spiritual realm (Gil et al., 2021). The caisson patterns evolve in style, from the simpler designs of the Northern Wei period to the more elaborate motifs seen in the Tang Dynasty (Chen et al., 2021). These patterns, often centered around lotus flowers or

swirling water motifs, create an atmosphere of celestial harmony, a quality that modern designers can draw from to evoke a sense of grandeur and transcendence in contemporary works.

2.4.4 The Value and Significance of Dunhuang Mural Elements for Design

In contemporary design, integrating elements from the Dunhuang murals offers a unique opportunity to revitalize traditional Chinese art, bringing cultural richness and creative expression into modern product design (Chen & Li, 2021). By examining the artistic characteristics of Dunhuang murals, designers can infuse their creations with a sense of cultural heritage while also contributing to the development of the cultural and creative industries. The ability to adapt these elements into modern design allows for the continuation of cultural narratives in a way that resonates with contemporary audiences.

Although modern design methods differ from those of traditional Chinese art, they share common emotional expressions and aesthetic goals. Modern design benefits from the rich visual vocabulary of Dunhuang murals, enabling designers to create products that are not only innovative but also deeply rooted in cultural symbolism (Du et al., 2019). Dunhuang murals, with their dynamic use of lines, color, and pattern, provide a reservoir of artistic resources that can inspire fresh interpretations in areas like textile design, home decor, and even tourism products (Lu et al., 2022).

In particular, research on integrating Dunhuang mural elements into cultural products has shown that such designs can enhance the appeal and marketability of items like

carpets, silk scarves, and paintings, which are becoming increasingly popular in China's cultural tourism industry (Wu, 2021). However, while these products often borrow aesthetic elements from Dunhuang murals, they can benefit from more creativity and innovation to fully capture the essence of these traditional designs in new contexts (Liu, 2021). Cutting-edge technology and new design methodologies can breathe new life into these ancient patterns, ensuring that they continue to inspire and innovate in modern design (Chen & Li, 2021).

2.4.5 Protection and Communication of Dunhuang Murals

Dunhuang culture boasts a long history and remains an important part of Chinese cultural heritage and preservation. Although the world has witnessed unprecedented advancements in science and technology, Dunhuang murals—renowned for their significant artistic and historical value—are universally recognized as precious assets to global culture and art. As a part of the world's cultural heritage, Dunhuang murals have garnered increasing attention from scholars and tourists. However, due to a combination of natural and anthropogenic forces, these murals are gradually deteriorating. Recent statistics show that various types of damage, such as peeling, hollowing, discoloration, etc., have affected a majority of the painted sculptures and 492 murals in the Mogao Grottoes (Liu et al., 2018). In light of the alarming deterioration and the unparalleled historical and artistic value of these works, the protection of Dunhuang murals has become an urgent priority. Artists and designers from state institutions have significantly contributed to the systematic excavation, conservation, and cataloging of Dunhuang mural art (Du et al., 2021; Lv & Fu, 2020). At the same time, it is necessary to utilize advanced technical methods and promotional platforms to preserve this invaluable legacy more effectively.

2.4.5.1 Protection of Dunhuang Murals

Several experts have initiated discussions about the challenges encountered in preserving Dunhuang murals and have proposed feasible solutions. Among these, digital conservation and restoration technologies have made significant strides (Cao et al., 2021; Nabais et al., 2021). A group of scholars has developed a digital enhancement technique known as the Pal-King algorithm, specifically designed for researching Dunhuang ornaments. This algorithm, also referred to as the Dunhuang ornament digital enhancement algorithm, enables the improvement of color and restoration of images in murals. Thanks to this technique, the colors of Dunhuang murals can be enhanced, and the paintings can be restored as closely as possible to their original state. These methods offer great potential for the examination of Dunhuang ornamentation and the preservation of Dunhuang murals, providing a satisfactory solution for investigating Dunhuang patterns (Liu et al., 2018).

Artificial intelligence (AI) is evolving rapidly, and this technology plays a critical role in the virtual restoration of mural colors. The model of Chinese cultural relics has been optimized through the classification, retrieval, and splicing of cultural relics. The optimization strategy includes denoising, filling, smoothing, and simplifying, as well as digital reconstruction and other processes for fragment models of cultural relics. This technology has also designed a digital mural color restoration system based on the traditional Chinese five-element color, which enables the virtual restoration of ancient mural paintings' colors (Lei et al., 2021).

The restoration of Dunhuang paintings can be achieved using texture similarity and structural continuity modeling techniques. The system gathers data on internet patterns and creates a novel restoration algorithm to repair damaged murals in the Mogao Grottoes. Researchers can use human-computer interaction technology to assess the absence of structural information in the affected area and capture photographs of damaged murals using artificial markers. Through alignment analysis, textured and structural patches can be generated to repair the mural and restore it to its original appearance (Wang et al., 2019). Furthermore, in order to protect Dunhuang art, it is crucial to control the biological hazards to Dunhuang manuscripts. Studies have shown that cold storage can prevent paper artifacts from harmful microorganisms, inhibiting the germination rate of *Penicillium* and helping preserve the Dunhuang manuscripts (Zhang et al., 2021).

2.4.5.2 Communication of Dunhuang Murals

Developed countries and regions hold significant influence in cultural dissemination, with their “central discourses” accounting for over 80% of the world’s information (Zhang, 2016). Therefore, the dissemination of culture in different countries is a crucial issue for fostering global cultural pluralism (Wei & Li, 2017). For a long time, those in charge of Dunhuang Heritage have made significant contributions to the protection of Dunhuang culture by utilizing strategies such as digitization, monitoring, and tourism management to elevate the art of Dunhuang murals among the world’s cultural treasures. However, there are still many areas that need improvement in the communication of Dunhuang culture.

The way we communicate is undergoing transformation, creating several challenges in the cross-cultural transmission of Dunhuang culture. These challenges include differences, limitations, and difficulties in understanding foreign cultures, which have contributed to the marginalization of Dunhuang culture. It is essential to take steps to ensure the transmission of this cultural heritage. Preserving and disseminating Dunhuang culture requires cultivating a larger international audience and expanding communication channels (Zhang, 2016). According to Wang et al. (2020), numerous study programs utilize efficient digital technologies to document, monitor, and evaluate information regarding China's cultural heritage to safeguard it. Several projects focus on creating visual retrieval service platforms aimed at advancing the research, teaching, and diffusion of Dunhuang culture. Virtual reality (VR) technology has been extensively utilized in the distribution and promotion of cultural assets. The VR documentary *Dunhuang* uses Mingsha Mountain in Dunhuang as its subject, showcasing pioneering VR design. Li et al. (2019) demonstrate that virtual reality technology offers superior benefits compared to other digital restoration technologies in preserving cultural assets.

The Dunhuang Cultural Treasures Digital Library is the first all-encompassing digital library dedicated to preserving and disseminating the cultural treasures of Dunhuang. The e-Dunhuang Library effectively showcases the extensive cultural legacy of human civilization throughout history in a vivid and intuitive manner. Simultaneously, users can immerse themselves in the captivating essence of Chinese cultural heritage (Gao et al., 2018).

To address the challenges of protecting and inheriting Dunhuang culture in cross-cultural communication, cultural gaps must be considered. Researchers can explore new methods for spreading Dunhuang culture by both studying its inheritance and promotion and analyzing its current status from the perspective of world cultural exchanges. At the same time, joint efforts from the state, new media technology, and society are essential to disseminate and inherit Dunhuang culture. Additionally, people have come to realize the importance of marketing in spreading Dunhuang culture worldwide (Li, 2017). Therefore, designers of cultural products must abandon the rigid strategy of localization and approach Dunhuang mural art from the perspectives of modernization, technology, and globalization. In short, effective strategies, up-to-date digital technologies, and fresh perspectives will contribute to the better protection and dissemination of extraordinary traditional Chinese culture, such as Dunhuang murals (Zhang, 2016).

2.5 Contemporary Silk Scarf Design

2.5.1 Development of Silk Scarves

Scarves originally were just pieces of cloth of various shapes to improve a person's appearance and attract attention. Scarves often cover any part of the neck, head, or body (Halder et al., 2023). Silk scarves appeared during the Qin and Han dynasties in China. They were similar in shape to contemporary silk scarves and often made of light and thin materials like silk. During the Tang and Song dynasties in China, many poems and lyrics depicted women wearing silk scarves (Wang, 2013). In ancient times, people used to wear scarves mainly to keep warm, but with the development of human

civilization, silk scarves have gradually changed from something practical to items which are both practical and ornamental (Li, 2023). There are other roles scarves may play in people's daily life. Egyptian women, for instance, often cover their heads and upper body with different silk scarves to show social status (Halder et al., 2023).

Silk scarves have been very popular among people, because they are so diversified that it would be, easy for people to use them to match all kinds of clothes (Halder et al., 2023). As the first country in the world to breed silkworms, China boasts a long history of silk weaving. In the history of traditional Chinese costume, silk scarves played an important part. For example, experts have noted traces of silk scarves in the costumes of the Tang dynasty, such as the half sleeves, short shirts, and garments made of silk or other fabrics. Nowadays, designers value many traditional patterns as design sources and apply them to home textiles, clothing, and other items, but it seems that they should be more innovative in the application of traditional culture (Liu et al., 2020). In addition, with the development of the society and economy, people's tastes of fashion begin to change, so how to match traditional styles of silk scarves with contemporary clothes has emerged as an increasingly important subject, and how to improve the innovativeness of design has become the focus for the development of silk scarves (Wang, 2013).

2.5.2 Silk Scarf Design

Silk scarves are a suitable medium for plane patterns. The design of the silk scarf pattern is very flexible, and it can be printed in a complete picture conforming to the rules and principles of composition, and it can also be freely laid out (Du et al., 2019).

Pattern design significantly impacts fashion and adds value to silk scarf products (Liu, 2003). Besides, the silk scarf pattern will form an internal connection with the silk scarf consumers. Silk scarf patterns that are designed ingeniously can look pleasant to the viewers and form an unspoken bond between consumers and designers, thus producing a sense of identity in consumers who resonate emotionally (Li, 2023). Therefore, patterns constitute an essential element of silk scarf design and whether the silk scarf pattern can attract consumers is often the key to the success of a silk scarf design (Liu et al., 2020). The colours and patterns of the silk scarf may change when consumers wear it in different ways to reflect their taste and temperament. Hence, designers often pay more attention to the coordination and integrity between silk scarves and patterns (Wang, 2013). Skillful designers can construct the graphics to ensure that the pattern reflects the overall aesthetic effect in a layered and rhythmic manner and integrate the decorative elements into the plane of the silk scarf (Li, 2008).

Contemporary silk scarf design has undergone significant changes in theme and content. Its theme not only pursues traditional symbolism but also expresses more decorative and aesthetic intentions of contemporary design. At the same time, designers also borrow artistic elements such as geometric figures, figures, and abstract patterns from traditional culture and apply them to the contemporary silk scarf products (Wang, 2013). The younger generation of consumers prefer fashionable and dynamic patterns, which will create a sense of psychological resonance and pleasure for them. For example, the silk scarf which has a playful pattern holds much appeal for young people (Liu et al., 2020).

Colour is also one of the most critical aspects of scarf design. Designers can derive inspiration from traditional culture and bring uniqueness to silk scarves through harmonious combination of colours in order to meet consumers' emotional needs (Chen et al., 2020). The same combination of colours, however, may arouse different emotions and feelings in people. For example, cool tones are often associated with the sky and the sea. In this regard, some consumers will feel calm while some will feel depressed. Therefore, if silk scarves are expected to be better accepted by the public, the diversity and harmony of silk scarf design are essential issues (Liu et al., 2020). In the past, silk scarves were more commonly influenced by traditional Chinese patterns, and complementary and contrasting colours were more widely used. By comparison, in contemporary silk scarf designs, colour combinations such as neutrals and similar colours are more frequently used (Wang, 2013).

In short, Contemporary silk scarf design strives to reflect the fashion, decoration and commerciality of the product through design solutions such as patterns and colours (Wang, 2013). The design of silk scarves needs to enhance its connotation and adapt to the changes of the times. The basic strategy is the design concept with innovation as the core (Lin, 2003).

2.5.3 Silk Scarf and Traditional Culture

Traditional culture provides an essential resource for the design of silk scarf (Li, 2023). Many silk scarf patterns are designed on the basis of traditional Chinese auspicious symbols and animal and plant images, which are endowed with special symbolic meanings (Wang, 2013). In this regard, consumer behaviour will be a good way to

promote the dissemination of traditional culture. With the purchase of silk scarves with traditional cultural patterns, the related ancient culture can be reintegrated into contemporary life (Yu et al., 2022).

According to Das (2022), people nowadays become more enthusiastic about artistic aesthetics and more devoted to their spiritual life. When silk scarves play an indispensable part in decorating people's lives, it has gradually become a trend in fashion to integrate traditional Chinese cultural elements into silk scarf product design (Malletzidou, 2021). China's traditional decorative patterns are diverse in forms and have a long history. The decorative patterns appeared first in the primitive society of the prehistoric era. With the development and change of society, decorative patterns with different characteristics came into being in different eras. The changes of decorative patterns can reflect the status of human society and development of economy (Li, 2022). Generally, traditional decorative patterns are dominated by warm colours, with high colour contrast and saturation (Liu et al., 2020). With distinctive and unique aesthetic characteristics as well as multiple styles, traditional Chinese decorative patterns naturally win popularity among people in the modern society. (Li, 2022). While the contemporary design of silk scarves inherits the heritage of traditional patterns, it has also achieved development by making some changes (Wang, 2013).

Some researchers observe that contemporary designers should not mechanically copy traditional cultural elements but deeply explore the connotations of traditional culture and flexibly apply them to product design (Yang & Yang, 2019). That is to say, designers should have a thorough understanding of trends as to promote the

integration of traditional culture in modern product design, mainly by deeply absorbing the essence of culture and creating fashionable products with Chinese characteristics (Liu et al., 2020). Meanwhile, as an important driving force of creating innovative products, creativity must be valued (Du et al., 2019).

The designs of modern silk scarves are becoming more and more diverse. New technology platforms and novel design concepts are constantly emerging and improving, and in the future there will appear more creative and personalized silk scarves that are in line with the current popular aesthetic and design trends (Wang, 2013). The cultural connotation of silk scarf design is an important value embodiment of silk scarf products (Liu et al., 2020).

2.6 Research Conceptual Framework

The Figure 2.7 shows the research conceptual framework in this study. Contemporary silk scarf designs can be divided into two main categories: those that incorporate elements of Dunhuang mural elements and those that do not. From the perspective of cognitive ergonomics, the process of designing silk scarves incorporating Dunhuang mural elements can be divided into several key stages.

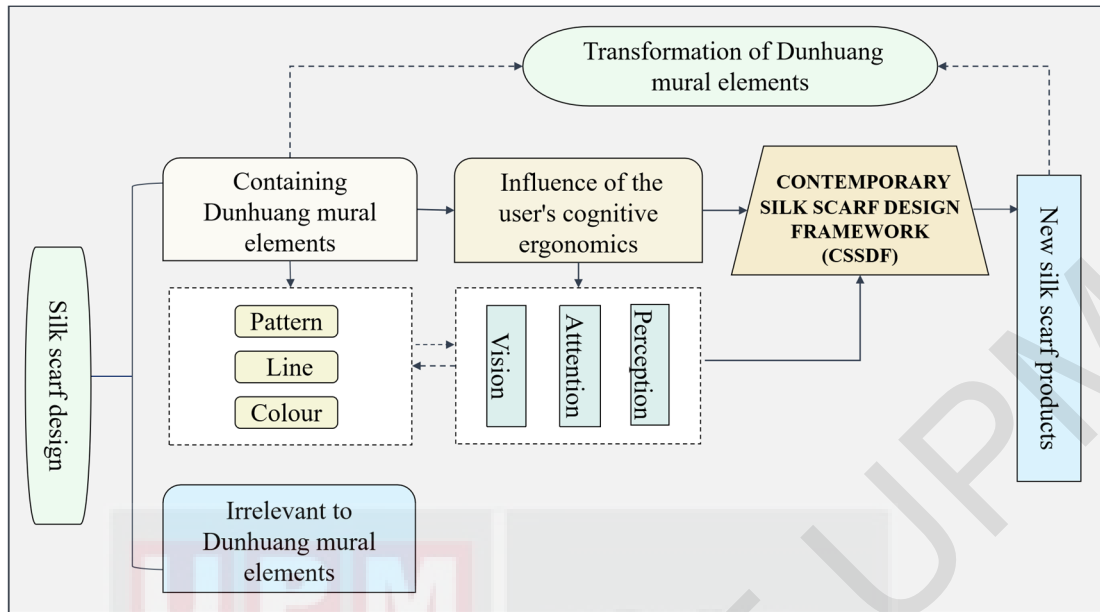


Figure 2.7: Research conceptual framework
(Source by author)

Firstly, the preliminary stage of the design involves the selection and innovative reconstruction of colours, patterns and lines from Dunhuang mural elements. This step requires a high degree of artistic sensitivity and the ability to balance tradition and modernity. The aim is to capture the essence of Dunhuang art and present it in a new and contemporary way.

The following process is an evaluation phase of design based on cognitive ergonomics, focusing on the users' vision, attention, and perception response. A new framework for silk scarf design was developed by collecting large sets of data on purchase preferences from the target consumers, taking into consideration both the innovative use of Dunhuang mural elements and consumers' cognitive-emotional preferences. The key to this phase was understanding and anticipating how the users would react to specific design elements and how these elements would affect the users' emotional and cognitive experience.

Ultimately, the design framework aims to provide designers with a systematic methodology that enables them to design creative silk scarf products that visually appeal to users' emotions. The development of this framework reflects an interdisciplinary approach to design thinking, combining traditional cultural elements with modern design concepts, which not only offers insight into cultural heritage but also brings new innovative impetus to industrial design.

2.7 Summary

Chapter 2 provides an overview of the literature on cognitive ergonomics, Chinese traditional culture, cultural and creative products, and the artistic and cultural significance of Dunhuang murals. Modern society benefits from the introduction of new methods and technologies that offer improved safety and convenience in the dissemination and preservation of Chinese traditional culture. These approaches also provide intuitive aesthetic resources for the integration of both traditional and creative product design. The importance of incorporating Chinese traditional cultural themes into local product design was elucidated through literature research. Consequently, from the standpoint of cognitive ergonomics, it is imperative that we thoroughly investigate new avenues for disseminating the creative form of Dunhuang murals.

A substantial body of research has proved that Dunhuang culture possesses exceptional advantages for design. Therefore, the development of a silk scarf product design framework that is based on cognitive ergonomics (CE) and the incorporation of Dunhuang mural elements can open up a new avenue for the inheritance of Dunhuang mural art.

CHAPTER 3

RESEARCH METHOD

3.1 Introduction

This chapter discusses a mixed-method study of integrating Dunhuang mural elements (DME) into contemporary silk scarf design from a cognitive ergonomics perspective. The study was conducted through interviews with art and design experts to identify Dunhuang mural elements that can be incorporated into silk scarf product design. Data on respondents' preferences and perceptions of silk scarf design were then collected through a questionnaire. The data were analysed using Statistical Products and Services Solution (SPSS), also known as Statistical Package for the Social Sciences to complete the Contemporary Silk Scarf Design Framework (CSSDF). Finally, the framework was validated using a questionnaire. The details include the following sections: (3.1) Introduction; (3.2) Research Plan; (3.3) Research Method; (3.4) Source of Data; (3.5) Data Collection; (3.6) Reliability and Validity Analysis; (3.7) Data Analysis and Results; (3.8) Summary. An overview of the research methodology is presented in Table 3.1.

Table 3.1: Overview of research method

Research Methodology and Components								
Component1. Research Question		Component2. Theoretical Proposition					Component3. Unit of Analysis	
How to develop a contemporary silk scarf design framework based on cognitive ergonomics for young Chinese women with Dunhuang mural elements?		The study develops a contemporary silk scarf design framework for young Chinese women by intergrating Dunhuang mural elements based on cognitive ergonomics					Contemporary silk scarf design framework	
Component4. Linking data to preposition	Theoretical Construct	Source of Data	What data to collect	What to measure	How to collect	How to analyze	How to validate	Expected Outputs
	Dunhuang mural elements(DME)	-Literature Reviewe(LR) -Experts	-Identifying DME -Significance of DME -Artistic Characteristics of DME	The The significance and elements of DME	-Web query -Documentary information -Literature review -Expert interview	-Descriptive nalysis(SPS S) -Correlation analysis(SPS S)	Rliability and validity	-Classification and review of elements of DME -Explore DME elements; -DME for scarf design needs
	Cognitive Ergonomics. Perspective(CEP)	-Literature Reviewe(LR) -User -Experts	-Significance of CEP -Importance of CEP -CEP on integrating DME into contemporary silk scarf design	-user's CEP -The The significance and Perspective of Cognitive Ergonomics	-Expert interview -Literature review -Survey		Reliability and validity	-Literature review The significance of CE to product design -Analyze CEPs applicable to the study
	Contemporary Silk Scarf Design Framework(CS SDF)	-Experts	The applicability of DME into the CSSDF	-Attitude towards using new design frameworks -Assess the suitability of new product design frameworks	-Expert interview -Literature review -Survey		Reliability and validity	-Customized CSSDF elements; -Customized product design framework

(Source by author)

3.2 Research Plan

This study explores the feasibility and effectiveness of developing a novel silk scarf design framework using Dunhuang mural elements from a cognitive ergonomics perspective. The research plan was divided into several key steps to ensure methodological rigour and innovative findings.

As shown in the Figure 3.1:

Step 1: Literature review and theoretical foundation identification

The first step in this study was to identify the cognitive ergonomics theories and perspectives applicable to this study through an extensive literature review. This step includes an in-depth analysis of the principles and methodologies of cognitive

ergonomics and its application to the field of design to establish a theoretical framework for the study.

Step 2: Research and screening of Dunhuang mural elements

Following this, the Dunhuang mural elements were studied to identify and confirm which visual elements of Dunhuang mural paintings could be adopted for modern silk scarf design. This step aims to gain a deeper understanding of the characteristics of Dunhuang art and its cultural values to ensure that the selected elements are representative and applicable.

Step 3: Cognitive ergonomics assessment

The third step is a cognitive ergonomics-based evaluation by both users and designers concerning the selected Dunhuang mural elements for use in silk scarf design. It is intended to understand designers' and users' reactions to the design elements from a cognitive and emotional perspective.

Step 4: Development of the design framework

Finally, based on the results of the first three steps, a new design framework for silk scarves will be developed. The framework will combine the essence of Dunhuang mural elements with the needs for innovating modern design to provide designers with a systematic approach to silk scarf design.

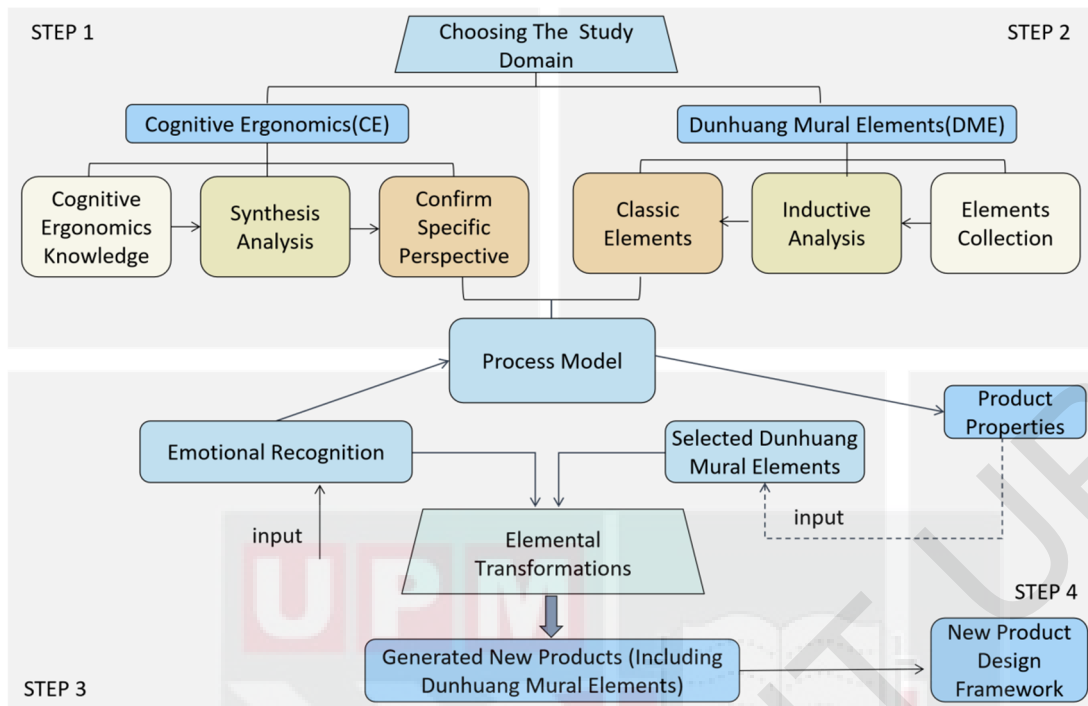


Figure 3.2: Research Plan
(Source by author)

3.3 Research Philosophy

The selection of suitable research technique is not subjected to the advantages and disadvantages of that strategy. Fundamentally, no universal rule of thumb can confirm the rationality of any research techniques under inclined circumstances. It is broadly accepted in the literature that the research blueprint might be designed by way of the research problem and the path through which it looks for answers (Crotty, 1998). Further, Kaplan and Duchon (1988) stated that one research technique does not need to be better than others or all research techniques. However, the selection of a research technique is based on the observed gap and the composite nature of the research issue.

Mainly there are two research approaches used in conducting research in the domain of methodology: positivist and interpretivism (Collins & Hussey, 2014). The positivist

approach is quantitative and known as a scientific approach. In contrast, the interpretivist approach is qualitative. Bell et al. (2022) believed that both positivist and interpretivist approaches in one way or another have positive and negative impacts on the different context of research while the primary concern is the same. Furthermore, Chua (1986) assumed that positivist research evaluates the fundamental relationships that then form the basis of generalized knowledge. He further argued that the positivist research attempts so uses objective facts, statistical and mathematical analysis to explain causal relationships, which would be well suited to answering the research questions.

Regarding interpretive research, Orlikowski and Baroudi (1991) summarized that it is used to investigate and identify the social processes in a social group. This process is used to understand how the beliefs, meanings, and intentions of the members assist in constituting their social action. On the other hand, Carson et al. (2001) offered a more profound definition of both positivist and interpretive paradigms and summarized their differences. According to them, the first difference is that the positivist paradigm is independent of the researchers and their instruments and assumes that reality is objective. Second, compared to interpretive research, positivist research paradigm requires a large sample size. Third, in positivist research, the researcher usually focuses on testing a theory, while the interpretive research paradigm concentrates on building a new theory. According to Collins and Hussey (2014), in positivist research, the researchers require using quantitative, mathematical methods and scientific logic to manipulate pre-defined variables. Orlikowski and Baroudi (1991) who declared that quantitative research is capable of determining the correlation between organizational, technological, and individual variables. The interpretive paradigm emerged in

response to examining the social phenomena and from the belief by a large body of researchers who argue that the world must understand about the subjective interpretations rather than only by the objective of human experiences and behavior (Becker et al., 2012).

This study adopts both positivist and interpretivist approaches to ensure a comprehensive understanding of the integration of Dunhuang mural elements into contemporary silk scarf design from a cognitive ergonomics perspective. The combination of these philosophical paradigms allows for a balanced exploration of both objective data and subjective experiences, aligning with the study's mixed-methods approach.

The positivist approach is suitable for the quantitative aspect of the study, where structured surveys and statistical analyses are used to measure cognitive ergonomics, design preferences, and user perceptions among young women in China. This approach ensures objectivity, reliability, and generalizability by using numerical data to evaluate how Dunhuang mural elements influence user experience and design effectiveness. By applying positivism, the study can establish measurable patterns and validate the proposed design framework based on empirical evidence.

On the other hand, the interpretivist approach is essential for the qualitative aspect, particularly in expert interviews, where deep insights into the cultural, artistic, and cognitive significance of Dunhuang mural elements are explored. This paradigm recognizes that human perceptions, emotions, and cultural interpretations play a critical role in design. Through thematic analysis of expert narratives, interpretivism

helps uncover the symbolic meanings, aesthetic values, and cognitive responses associated with Dunhuang-inspired scarf designs, which cannot be captured through purely quantitative means.

By integrating both positivist and interpretivist approaches, this study ensures a holistic examination of the research problem. The positivist perspective provides objective, data-driven validation of cognitive ergonomics and consumer preferences, while the interpretivist perspective captures the nuanced, contextual, and culturally embedded insights needed for innovative scarf design. This dual approach strengthens the study's ability to develop a well-founded design framework that is both empirically validated and culturally meaningful for young women in China.

3.4 Research Method

3.4.1 Mixed Method Research

The literature on combining cognitive ergonomic methods and integrating Dunhuang mural elements into the design of silk scarves has yet to be retrieved, which is also the difficulty and innovation point of this study. Due to the limitation of references in this study, there is a need for an in-depth exploration of the nature of some of the studies, an accurate and precise description of the research design and the procedures used to collect and analyse the data, and a further justification of the selection of each set of data for the study. Therefore, this study will use a mixed research approach combining qualitative and quantitative research methods.

Many researchers have applied mixed research methods to their research practice. Mixed method research has been recognised as a research method and paradigm as crucial as qualitative and quantitative research (Johnson et al., 2007). It is popular because of its inherent flexibility and comprehensiveness. A mixed research approach uses qualitative and quantitative research to answer complex questions (Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Leech, 2005).

A mixed research method allows researchers to look at the object from different perspectives, resulting in a more comprehensive finding. The keyword of the mixed research method is "mixed," and an essential step is the correlation of research data. Therefore, mixed research methods can be used purposefully and flexibly in data collection, analysis, and interpretation (Shorten & Smith, 2017). In specific research, the issues of social science are usually more complex and thus often addressed by research teams or individuals in different methods. Therefore, combining qualitative and quantitative is more promising than using either of them alone. With the continuous evolution of qualitative and quantitative research methods, mixed research methods have become increasingly popular among researchers because they can be flexibly used to combine the advantages of qualitative and quantitative research (Creswell, 2003).

A mixed-methods approach, integrating both qualitative and quantitative research, is suitable for this study as it provides a comprehensive understanding of Dunhuang mural elements in contemporary silk scarf design. Qualitative methods, such as expert interviews, offer deep insights into the cultural significance, aesthetic values, and cognitive ergonomics (CE) aspects of these elements, while quantitative methods,

including structured surveys, allow for measurable analysis of young women's preferences and cognitive responses. This combination ensures a balanced perspective, where expert opinions guide design principles, and consumer data validates their practical application. Additionally, mixed methods enhance research rigor through triangulation, reducing bias and ensuring the reliability of findings. By employing both exploratory and confirmatory approaches, this study effectively bridges cultural heritage, design innovation, and user experience, leading to the development of a validated framework for integrating Dunhuang mural elements with CE principles in silk scarf design for young women in China.

3.4.2 Exploratory Sequentially Mixed Methods Research

Exploratory research provides insights into problem development, leading to effective solution strategies. Exploratory research methods have significant theoretical and practical value and are particularly suitable for exploring complex social science issues (Nind & Lewthwaite, 2018). Qualitative research explores why or how a phenomenon occurs, develops a theory, or describes the nature of an individual's experience. In contrast, quantitative methods address questions about causality, generalisability, or levels of influence (Fetters et al., 2013). Mixed-methods research approaches use the strengths of both methods to advance academic dialogue research rather than using a binary perspective to approach the research question (Berman, 2017). Mixed methods research draws on the strengths of both qualitative and quantitative research, with the core feature that qualitative and quantitative data strands are collected and analysed separately in a single study and integrated simultaneously or sequentially to address the research question (Creswell & Clark, 2017). For example, a sequential mixed-

method design using a combination of the two is appropriate for a study focusing on how to manage, share, and preserve research data (Berman, 2017).

The specific application content and sequence of qualitative and quantitative methods are shown in Table 3.2. First, through the literature research method, the study systematically reviewed theories related to cognitive ergonomics, Dunhuang mural studies and their application in modern design to establish a solid theoretical foundation for the study. The literature study ensured that the research direction was scientific and forward-looking and provided a theoretical orientation for the expert interviews and questionnaire survey, making the research process and results more comprehensive and profound. At this stage, special attention was paid to the literature after 2017 to ensure the timeliness and innovation of the research content. Then, through the expert interview method, the study collected opinions and suggestions from experts in practice and academia on applying Dunhuang mural elements in contemporary silk scarf design, and these insights provided practical and theoretical guidance for the study. Next, through the questionnaire survey method, the study collected data from a wide range of designers and consumers to validate and extend the findings of the first two phases of the study. The applicability and innovativeness of the design framework were then explored and validated in depth through the expert questionnaire method.

In summary, this study efficiently integrates the strengths of the literature study, expert interviews and questionnaire survey through the exploratory sequential mixed-method research (ESMR) strategy to construct a comprehensive and innovative framework for contemporary silk scarf design with Dunhuang mural elements. At the same time, the

exploratory sequential mixed-method research (ESMR) is conducive to in-depth exploration of complex and diverse research issues. It can provide new theoretical support and practical guidance for studying Dunhuang mural elements and silk scarf design practice.

Table 3.2: Application of Quantitative and Qualitative Data

Research Problem	Research Type	Data Collection	Data Collection Tools
RQ1 What are the elements of the Dunhuang mural silk scarf designed to represent young women in China?	Quantitative and Qualitative Research	-Literature review -Expert interview -Survey	Questionnaire (Closed-ended)
RQ2 What are the CE perspectives of Dunhuang mural elements for innovative contemporary silk scarf designs for young women in China?	Quantitative Research	-Survey	Questionnaire (Closed-ended)
RQ3 What is the significance of Dunhuang mural elements with CE perspective for innovative contemporary silk scarf design for young women in China?	Quantitative Research	-Survey	Questionnaire (Closed-ended)
RQ4 How to develop a new framework that integrates the Dunhuang mural elements and CE perspective for innovative contemporary silk scarf design for young women in China?	Quantitative Research	-Survey	Questionnaire (Closed-ended)

3.5 Source of Data

Dunhuang culture has a very close relationship with Shandong culture. Confucianism's "Eight Virtues" are Confucian concepts formed in the Song Dynasty, significantly impacting Dunhuang mural culture. (Liu and Wu, 2022). As the home to Confucius and birthplace of Qilu culture, Shandong Province is a place of a long history, profound cultural heritage, and cultural inclusiveness (Lu & Gu, 2023). Shandong has a large population. According to public information in March 2024 on the website of the

Shandong People's Government, the permanent residents of Shandong Province at the end of 2023 amount to 101.2297 million. At the same time, Shandong Province is also an area with economic significance, with all major economic indicators ranking among the top in the country (Guo, 2019). Therefore, from a nationwide perspective, the Shandong sample will be more representative.



3.6 Data Collection

3.6.1 Data Collection Process

This study will use CE to integrate DME into CSSD. It will ultimately recommend a design framework for Chinese designers to improve the quality of cultural and creative products. There is not much literature the study can refer to and it requires much descriptive and explanatory work. Specific methods include literature searches, questionnaires, and expert interviews. This study first reviews the previous literature, and formulates arguments on the basis of it. This study will use a questionnaire survey to study the effect of silk scarves on people's cognition.

This study employed a two-stage data collection procedure to ensure the breadth and representativeness of the data collected. First, within Shandong Normal University, a group of teachers and students who met the research criteria were deliberately selected for a questionnaire survey through purposive sampling to obtain unique insights about the study. The selection criteria cover age, gender, academic background, etc., aiming to ensure sample diversity. In the second phase, the research scope expanded beyond the campus to obtain broader data by distributing questionnaires to eligible respondents through students and teachers at Shandong Normal University. Purposive sampling was also used to ensure that the information collected would contribute to a deeper understanding of the research question.

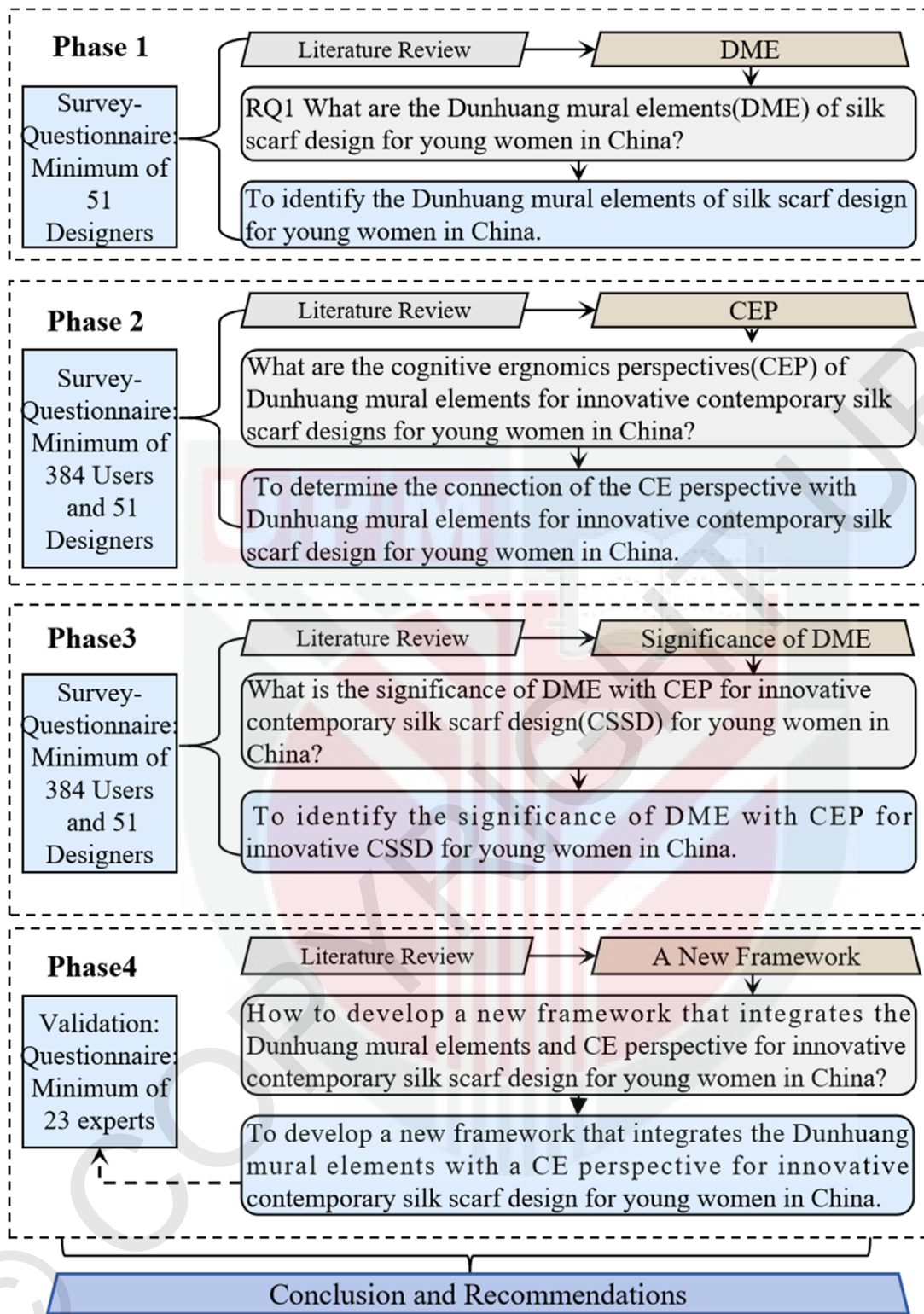


Figure 3.2: Data collection and analysis process

Throughout the process, this study followed strict criteria to ensure the consistency of the questionnaire and the standardisation of the survey, as well as to ensure the

information security and anonymity of the participants. Through this rigorous and carefully designed process, the research effectively combines some insights with a broad perspectives, providing a rich database for analysis and enhancing the reliability and scientific nature of the study.

3.6.2 Questionnaire Survey Process

The implementation process of the questionnaire is a crucial step to ensure the validity, reliability and applicability of the questionnaire content. In this study, this questionnaire workflow is shown in Figure 3.3.

First draft of the questionnaire: The first draft was designed based on the research objectives and questions. This step requires extensively reading relevant literature to ensure the questionnaire covers all research points.

Selection of experts: Select a group of experts with professional knowledge and experience in relevant fields. These experts should have advanced academic backgrounds or make significant contributions to relevant fields to ensure they can provide insightful and accurate feedback.

Initial expert review: Submit the first draft of the questionnaire to selected experts for review. Experts will evaluate the questionnaire in terms of its completeness, relevance of content, clarity of presentation and any possible bias or misleading questions.

Feedback collection and questionnaire revision: Collect feedback from experts and make necessary changes to the questionnaire based on their suggestions. This may include adjusting the wording of questionnaire items, adding or deleting specific questions, and modifying the structure of the questionnaire.

Pilot testing: According to Calitz (2009) before executing full-phase research, a pilot study was conducted as a mini-version of study for pre-testing of study instruments done in preparation of the whole research. As per the definition of Porta (2008), it is a small-scale study of the procedures and methods that were applied to full-scale research. A pilot study can give significant understanding about the subject of study, aid in the improvement of suitable methods, assess the logical necessities for the conceptual framework, allow the preparation of a clear theoretical basis to analyse the data, and permit investigation of relevant inquiries (Yin, 1992). According to Van Teijlingen and Hundley (2002) a pilot test is also accompanied to regulate whether the questions are valid, answerable, and understandable, which enhances the validity and reliability of the research. Conduct a pilot test on a small sample to assess the understandability and operability of the questionnaire. This step helps identify and correct any problems that may be encountered in the actual application.

Final expert review: Based on the pilot test results, the questionnaire is revised again and submitted to the expert panel for final review. At this point, experts will focus on the final suitability and validity of the questionnaire.

Final questionnaire development: All feedback and suggestions were taken into consideration to formulate the final version, which ensures that this version's content, structure, and presentation meet the research objective.

Finally, the conclusion is drawn through questionnaire distribution, data collection and analysis, discussion and summary.

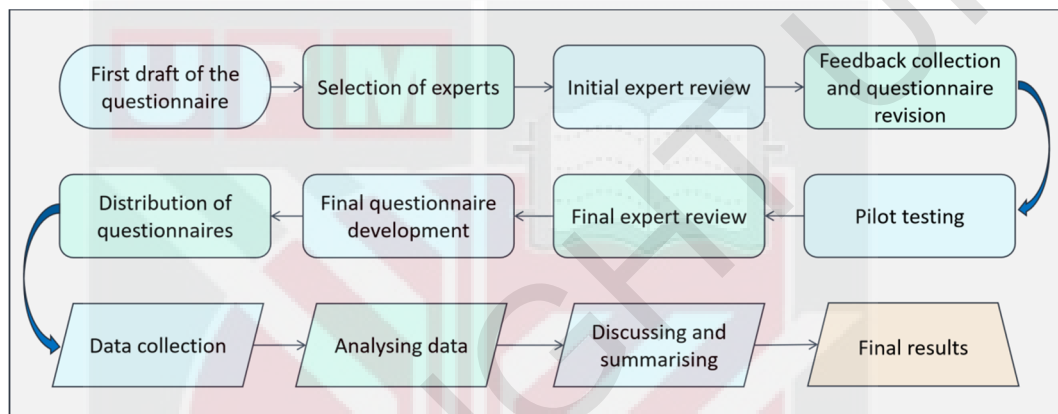


Figure 3.3: Questionnaire Workflow

3.6.3 Questionnaire Design

Questionnaire, which was first invented by British anthropologist and statistician Sir Francis Galton as a data collection method in the late 19th century, consists of questions that can provide valuable empirical insights when used alongside additional sources and survey data (Roopa & Rani, 2012). Questionnaires are a perfect tool for primary data and are a better data collection technique able to provide more detailed quantitative data (Resnik et al., 2019). Hence, they can be adopted as an effective method for studying cultural and creative product design (Yu et al., 2022; Gong et al., 2022).

The user and expert questionnaires were divided into Part A, which provides basic information about the respondents, and Part B, which contains respondents' perceptions of the answers. The designer questionnaire was divided into three parts: Part A: respondents' basic information; Part B: respondents' professional knowledge and opinion; and Part C: respondents' opinion of the answers. The measurement part of the user, designer questionnaire and expert validation questionnaire is based on a seven-point Likert scale, where 1=Strongly disagrees. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7= Strongly agree, as shown in Table 3.3.

Table 3.3: Seven-point Likert scale

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

As shown in Table 3.4, the research data source is divided into three parts: user survey, designer survey, and expert survey. The table shows the definition, data source, collection method, and number of questions.

Table 3.4: Source of data

No.	Item	Respondent Definition	Data Source	Collection Method	No. of Questions
1	User Survey	Silk scarves buyers and wearers	Questionnaire	Methods: Offline collection	23
2	Designer Survey	Professionals with knowledge of art and design	Questionnaire	Methods: Offline collection	30
3	Expert Survey	-Postgraduate students of art and design -Professors or associate professors of art and design -Designers who have been practising for more than five years	Questionnaire	Methods: Offline collection	14

Selection of the product pictures: The selection process of the pictures in the questionnaire is as follows: a large number of silk scarf pictures were collected through literature review, research and other methods, and five experts in the field of art and design were invited to screen the pictures by removing pictures of homogeneous silk scarves, to guarantee a large variety of the products. Finally, according to the three dimensions of CE: vision, attention, and feeling, three groups of pictures were screened out, each group consisted of 12 comparison pictures, and there were 36 pictures of silk scarf products in total.



Figure 3.4: Photo of expert interview
{Source by author}

According to the classification of Dunhuang murals, 18 pictures of Dunhuang mural silk scarves designed with DME were screened out through expert interviews and provided to the questionnaire respondents for scoring, as shown in the figure below. In addition, through expert interviews, 18 pictures of silk scarves without mural elements were selected for comparison with the above images, as shown below.

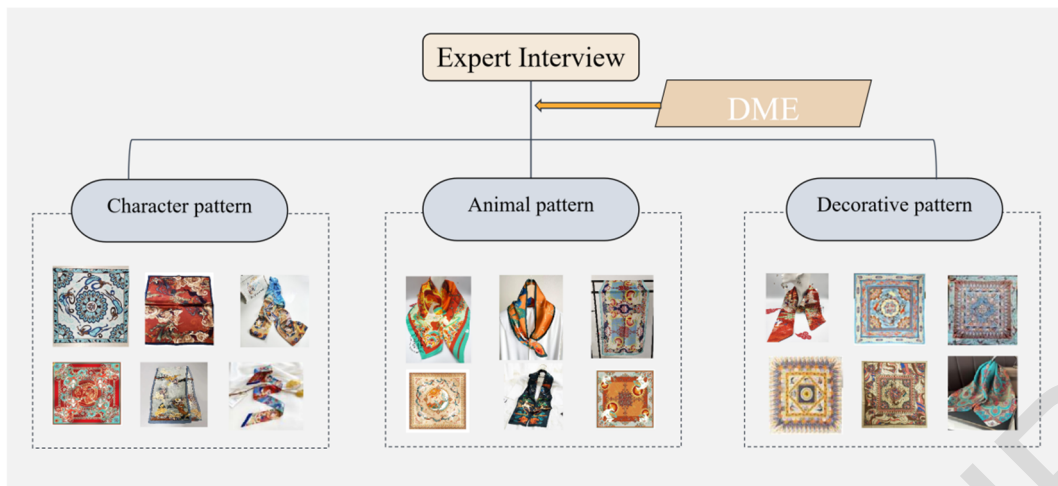


Figure 3.5: Questionnaire product picture selection (with DME)
(Source by author)

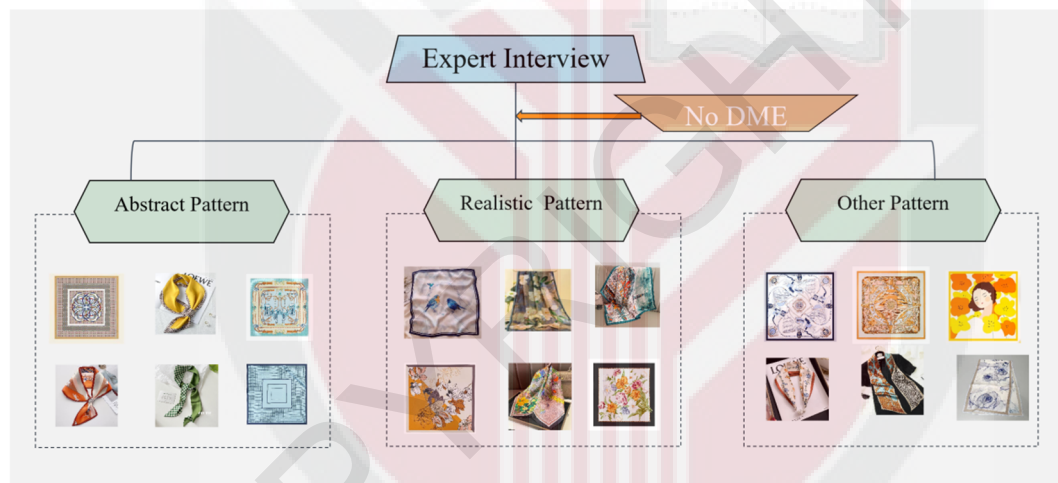


Figure 3.6: Questionnaire product picture selection (no DME)
(Source by author)

Content validity: Content validity is typically assessed before conducting the pilot study to ensure that the instrument accurately represents the concept being measured. This process involves expert reviews to evaluate whether the instrument includes all necessary components, is clear, and aligns with the research objectives. Conducting content validity checks beforehand helps identify ambiguities, missing elements, or irrelevant items, allowing for necessary revisions before testing the instrument on

participants. This approach saves time and resources by reducing the need for major modifications after the pilot study. Once content validity is confirmed and revisions are made, the pilot study is conducted to assess feasibility, reliability, and respondent understanding, ensuring that the instrument is well-prepared for full-scale data collection. The designed questionnaires were submitted to three experts. Two are university associate professors; One is a designer who has been in the industry for over five years. They were asked to discuss and screen these questionnaire questions. Since the study involves human participants, An ethical approval was collected from Jawatankuasa Etika Universiti Untuk Penyelidikan Melibatkan Manusia (JKEUPM), Universiti Putra Malaysia before starting the study to review and approve the instrument to ensure compliance with ethical research standards. The questionnaires were revised repeatedly to ensure the content and presentation were accurate. The questionnaires consisted of single-choice questions, multiple-choice questions, and seven-point Likert scales. It was used to test respondents' perceptions of the Dunhuang elements in silk scarves regarding vision, attention, and perception, as well as their views on contemporary silk scarf design and purchase.

User questionnaire design: The user version of the questionnaire consisted of two parts with 23 questions. The first part encompasses ten questions concerning the respondents' background. The second part is about silk scarf preference from a CE perspective. This part requires respondents to judge the impact of Dunhuang elements on silk scarves from aspects such as vision, attention, and perception, as well as the impact of traditional Chinese cultural elements on silk scarves. There are 13 questions of single choice or multiple choice based on a seven-point Likert scale.

Designer questionnaire design: Designer respondents will be asked to answer a three-part questionnaire. There are 30 questions, including a survey of respondents' background and their professional knowledge, and evaluation of silk scarf preference. These single-choice questions and multiple-choice questions are evaluated based on five-point Likert scales and seven-point Likert scale.

Expert validation for questionnaire design: A total of 23 experts participated in this questionnaire validation. The expert population includes: graduate students (majoring in art and design), college teachers with the title of associate professor or above (majoring in art and design) and full-time designers who have been in the field for more than five years. The verification questionnaire contains the following two parts: the first includes four questions from the population survey, and the second includes ten questions from expert opinions. The second part of the questionnaire was conducted using seven-point Likert scales to verify the value and innovativeness of the contemporary silk scarf design framework (CSSDF).

All of the respondents were asked to write down their answers or select numbers to express their opinions. Each respondent was at liberty to withdraw from the questionnaire at any time. Respondents agreed to accept this questionnaire and they submitted the results when completing it.

3.6.4 Sample Selection

This study was developed to address the design framework of silk scarves for young Chinese women. Therefore, the survey sample's target population consists mainly of

young women. At the same time, the study focuses on young people, the more active consumers. According to a 2008 report of *Chongqing Evening News*, the United Nations 1985 International Youth Year, for the first time, set the age of young people at 15-24 years old; UNESCO (United Nations Educational, Scientific and Cultural Organization) limited young people to 16-45 years old, but a 16-year-old in China is a minor without strong purchasing power. Hence, combining the definition of UNESCO and the country's reality, the age range of the population in this study is set at 18-45 years old.

Since Shandong Province is characterized by a large population and an emphasis on traditional culture, using it as a central location for investigation can help researchers better understand and analyse representative social phenomena in China. This study will use purposive sampling method. Purposive sampling is a non-probability sampling technique that allows the sample to be selected based on the purpose of the study and is suitable for exploratory research and case studies. Purposive sampling requires the sampling criteria to be determined in advance, and it can provide in-depth insights when studying a specific social phenomenon or group (Palinkas et al., 2015; Sharma, 2017). Purposive sampling is suitable for cases where samples are difficult to obtain and when there are few. This method can help researchers fully tap limited resources and ensure that sample selection meets the research objectives to the greatest extent (Acharya, 2013). The flexibility of this approach allows researchers to drill down into specific research (Etikan, 2017).

Purposive sampling was chosen for this study because it ensures the deliberate selection of participants who possess relevant knowledge, experience, and engagement

with Dunhuang mural elements and contemporary silk scarf design. Unlike random sampling, which may include individuals with little or no expertise, purposive sampling allows for the inclusion of key informants such as art and design professionals, postgraduate students, professors, and practicing designers, as well as young women who wear and purchase silk scarves. This method aligns with the study's objectives by enabling the identification of Dunhuang mural elements in contemporary silk scarf design (RO1) through expert insights, while also evaluating these elements from a cognitive ergonomics (CE) perspective (RO2) by selecting individuals with design expertise. Additionally, purposive sampling helps analyze the significance of Dunhuang mural elements (RO3) by incorporating consumer perspectives from young women who are potential users of these designs. Finally, by integrating expert and consumer insights, this method provides a well-rounded foundation for developing a framework that aligns Dunhuang mural elements with CE principles in contemporary silk scarf design (RO4). Other sampling methods, such as random sampling, would not ensure the inclusion of participants with sufficient expertise, while convenience or snowball sampling could introduce bias or limit diversity in perspectives. Therefore, purposive sampling is the most appropriate method for ensuring depth, relevance, and alignment with the study's objectives, ultimately supporting a culturally and ergonomically meaningful design framework.

Inclusion criteria:

1. Individuals aged 18 to 45 years old who actively purchase and wear silk scarves.
2. Individuals aged 18 to 45 years old with formal knowledge or experience in art and design.
3. Students aged 22 to 45 years old currently pursuing a postgraduate degree in art and design.

4. Academics aged 22 to 45 years old with expertise in art and design.
5. Professionals aged 22 to 45 years old who have been actively working in the design field for more than five years.

Exclusion criteria:

1. Individuals under 18 or over 45 years old, as they fall outside the target demographic.
2. Individuals with no interest or experience in silk scarves, as they may lack relevant insights for the study.
3. Those with no formal education or professional background in art and design, except for silk scarf buyers and wearers.
4. Designers with less than five years of professional experience, as they may not have sufficient industry expertise.
5. Professors, students, or professionals who do not specialize in art or design, as their insights may not align with the study's objectives.

Table 3.5: Sampling method and number of required respondents based on survey

	Sampling Method	No. of Respondents
User Survey (buyer and wearer)	Purposive Sampling	384
Designer Survey		
Professional	Purposive Sampling	51
Post graduate	Purposive Sampling	
Expert Survey		23

3.6.5 Sample Size

Cochran (1977) emphasizes the importance of adequate sample size for representative and statistically significant results. The correct sample size is critical to obtaining accurate and reliable results. Cochran (1977) elaborates on sample size considerations and multiple sampling techniques for different research scenarios that are consistent with Krejcie and Morgan's approach. Israel (1992) supports structured sample size

determination methods like Krejcie and Morgan, emphasizing the balance between statistical power and practicality. This study followed their theory and used the Table 3.6 that considers confidence levels and margins of error to ensure the most precise results. This research aims to design products for Chinese women with a population of more than 100,000. According to public information in March 2024 on the website of the Shandong People's Government, the permanent residents of Shandong Province at the end of 2023 amount to 101.2297 million. Therefore, the sample size of 384 participants is adequate and this selection of 384 respondents in the study is further justified through the discussions by Krejcie & Morgan (1970) and Cochran (1977) and Israel (1992).

Table 3.6: Determining sample size from a given population for categorical data (Margin of error = .05 and P = .05)

N	s	N	S	N	s
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

[Source by Krejcie & Morgan (1970)]

3.6.6 Validation of the New Framework

This study used questionnaires to validate the proposed contemporary silk scarf design framework (CSSDF) incorporating Dunhuang mural elements for young Chinese women. The survey was conducted among 23 experts to assess the framework's practicality and effectiveness. Respondents participating in this survey must have

adequate expertise. Experts include art and design teachers with the title of associate professor or above, professional designers with more than five years of experience and graduate students in art and design.

The choice of 23 experts is grounded in established research methodologies. Flyvbjerg (2006) supports case studies for their depth and the significance of expert evaluations in framework assessment. Jarvinen (2000) affirms that targeted expert samples are adequate for validating specific frameworks within specific fields. Then, the validation questionnaire selected 23 experts and used a case study that was methodologically sound and aligned with academic standards. This approach ensures rigorous validation, leveraging expert insights to evaluate the new design framework effectively.

3.7 Data Analysis and Results

This study used SPSS tools for data analysis. SPSS includes a variety of analysis methods, such as descriptive statistics, correlation analysis, etc., and it may provide support for complex data analysis. In addition, the scalability of SPSS can adapt to more specialised analysis needs (Pallant, 2020). The robust performance of SPSS in processing quantitative data, the diversity of methods, and the wide range of applications make SPSS an indispensable tool in social sciences (Bryman & Cramer, 2012). By utilising the powerful data processing and analysis capabilities of SPSS, researchers can more effectively identify and correct outliers and errors in the data, thereby ensuring the quality of research results (Warner, 2012).

3.8 Ethical Consideration

An ethical approval was collected from Jawatankuasa Etika Universiti Untuk Penyelidikan Melibatkan Manusia (JKEUPM), Universiti Putra Malaysia before starting the study. The mixed (quantitative and qualitative) method was used in this study. To avoid any problems and difficulties in the research process, it is vital to raise awareness of ethical issues. The target sample was first made aware of the goals of this research through a cover letter, and their answers would be kept strictly confidential and anonymous. If the respondents had any inquiries, the contact information of the researcher was provided. Participating in the survey would therefore not cause the respondents any potential physical or psychological distress. Since the participation in the survey was voluntary, no penalty would be imposed even if the target samples refused to take part, discontinue, or deliberately skipped any of the questions. Only the researcher had direct access to all data regarding the research.

3.9 Summary

This study is expected to provide an innovative analytical method in the design field, and it will contribute to the development of experimental aesthetics. In addition, this study may be helpful to designers in understanding the relationship between certain cultural and creative products and the consumers' perceptions, which would motivate them to improve their designs in the future. Similarly, this study also provides aesthetic and perceptual recommendations for silk scarf buyers, who may make more reasonable purchase decisions. Most importantly, however, by illustrating its vitality and influence, this study will hopefully promote the inheritance and development of China's excellent traditional culture.

CHAPTER 4

DATA ANALYSIS AND RESULTS

4.1 Introduction

This chapter aims to present the results of data analysis that are closely related to the research objectives. Specifically, SPSS software will be used to conduct a detailed descriptive analysis of the collected questionnaire data. The analysis content covers the cognitive evaluation of silk scarf products by users and designers in the three dimensions of vision, attention and perception. It also includes designers' professional product design evaluation and users' preference feedback. Through this comprehensive analysis, this chapter will deeply explore the application effects of Dunhuang mural elements in contemporary silk scarf design and their cognitive acceptance among target groups, providing solid data support for subsequent research. This chapter is divided into the following sections: (4.1) Introduction; (4.2) Reliability of the Research Instrument; (4.3) Data Analysis and Results of User Survey; (4.4) Data Analysis and Results of Designer Survey; (4.5) Data Analysis and Results of expert Survey; (4.6) Summary.

4.2 Reliability of the Research Instrument

Cronbach's alpha confirmed the reliability of the survey. Cronbach (1951) proposed the alpha value for measurement reliability. Reliability alpha values above 0.7 indicate good data reliability (Nunnally, 1978), ensuring consistent measurements across

survey items. Research by Tavakol and Dennick (2011) shows that Cronbach's alpha has a high reference value in assessment questionnaires. This method ensures the reliability of the survey and the validity of the results.

Before analysing the data, the instrument's reliability needs to be tested by performing a reliability analysis. The table below shows the reliability of the user questionnaire. 99 question items were used to investigate the cognitive ergonomics evaluation of users' cognitive emotions and preferences for the silk scarf product. The results show that Cronbach's alpha reliability is 0.9, indicating that the questionnaire produces scores with a consistency of 90%. Therefore, the questionnaire is satisfactory.

Table 4.1: User questionnaire reliability statistics

User Questionnaire Reliability Statistics	
Cronbach's Alpha	N of Items
0.9	99

The following table shows the reliability of the designer's questionnaire. 109 question items were used to investigate the ergonomics evaluation of designer's cognitive and preferences of silk scarf products. The results show that Cronbach's alpha reliability is 0.9, indicating that the questionnaire produces scores with a consistency of 90%. Therefore, the questionnaire is satisfactory.

Table 4.2: Designer questionnaire reliability statistics

Designer Questionnaire Reliability Statistics	
Cronbach's Alpha	N of Items
0.9	109

The following table shows the reliability of the expert's questionnaire. 10 question items were used to investigate the ergonomics evaluation by experts. The results show that Cronbach's alpha reliability is 0.9, indicating that the questionnaire produces scores with a consistency of 90%. Therefore, the questionnaire is satisfactory

Table 4.3: Expert Validation statistics

Expert Validation Survey Reliability Statistics	
Cronbach's Alpha	N of Items
0.9	10

4.3 Data Analysis and Results of User Survey

4.3.1 Demographic Profile of the Respondents

This study processed the collected questionnaires. After testing, there were 384 valid questionnaires without any outliers in the respondents' responses. Descriptive statistical analysis was used to describe the respondents' general information, and a frequency table of each item was output. The results are shown in Table 4.2.

Table 4.2 shows the demographic results of the user version of the questionnaire. Most of the samples were female, accounting for 80.5%, and male respondents accounted for only 19.5%. Shandong Province had a larger sample size, accounting for 54.2% of the total sample, and other regions in China account for 45.8%. The sample size of those living in big cities was the smallest, accounting for only 9.4% of the total sample. People living in the second big city accounted for 20.8% of respondents. Among them, respondents living in town cities were the most essential part of the sample, accounting

for 37.2% of the total sample. rural area samples accounted for 32.6%, second only to town cities.

The minimum age in the sample was 18 years old, the maximum age was 45 years old, and the average age was 30.1 ± 9.5 years old. Young people aged 18 to 23 accounted for 34.4% of the sample, making up the largest group. Another significant proportion of young people were between 41 and 45, accounting for 24.0%. The third largest sample size was between the ages of 24 and 30, accounting for 21.9%. The smallest number was a sample size between 31 and 40 years old. It represented only 19.8% of the total sample size.

Regarding marital status, there were single people, accounting for 40.6% of the total sample. The proportion of married respondents was 57.6%. The most minor proportion was the number of divorcees, accounting for only 1.8% of the total sample.

Among the overall respondents, the most significant number, 45.1%, were civil servants. Student respondents accounted for 43.8% of the total, ranking second. The private sectors was only 8.2%. The lowest proportion is among the unemployed, accounting for only 2.9% of the respondents. The educational background is summarised below, 82.0% of the sample had a bachelor's degree or above. In contrast, high school samples ranked second, accounting for 14.6% of the total sample. Samples with a junior college education accounted for 2.9% of the total. There are only two people with junior high school and below. They account for 0.5% of the total.

From the perspective of average monthly income, the situation is as follows: the lowest income was 500 yuan per month, the highest was 14,000 yuan per month, and the average was 5494.8 ± 3849.0 . The most significant number of people had an average monthly income of less than 4,000 yuan, accounting for 34.4% of the total sample. In second place were those with incomes from 6,001 to 8,000 yuan, accounting for 23.2% of the total sample. Respondents with an average monthly income between 4001 and 6000 yuan accounted for 18.2% of the total sample. Respondents with an average monthly income between 8,001 and 10,000 yuan accounted for 12.8% of the total sample. The proportion with an average monthly income above 10,001 yuan was the smallest, accounting for 11.5% of the total sample size.

Table 4.4: Demographics and characteristics of users

Item	N	Percentage (%)	Minim	Max.	Mean ($\pm$ SD)
Sex					
Man	75.0	19.5			
Women	309.0	80.5			
Residence					
Shandong province	208.0	54.2			
Other provinces	176	45.8			
District					
Big cities	36.0	9.4			
Second big cities	80.0	20.8			
Town cities	143.0	37.2			
Rural area	125.0	32.6			
Age			18.0	45.0	30.1 $\pm$ 9.5
18-23 years	132.0	34.4			
24-30 years	84.0	21.9			
31-40 years	76.0	19.8			
41-45 years	92.0	24.0			
Marital Status					
Single	156.0	40.6			
Married	221.0	57.6			
Divorced	7.0	1.8			
Occupational Working					
Civil servants	173	45.1			
Private sectors	32.0	8.2			
Student	168	43.8			
Unemployed	11.0	2.9			
Education Level					
Junior high school and below	2.0	0.5			
High school	56.0	14.6			
Junior college	11.0	2.9			
Bachelor's degree or above	315.0	82.0			
Personal Monthly Income			500.0	14000.0	5494.8 $\pm$ 3849.0
Less Than 4000 yuan	132.0	34.4			
4001 yuan- 6000 yuan	70.0	18.2			
6001 yuan- 8000 yuan	89.0	23.2			
8001 yuan- 10000 yuan	49.0	12.8			
More Than 10001 yuan	44.0	11.5			

N=384

4.3.2 User Cognitive Evaluation of Silk Scarf Products

4.3.2.1 RQ1 What are the Dunhuang mural elements of silk scarf design for young women in China?

Descriptive analyses of questions related to the RQ1 are as follows. Table 4.5 shows the single choice question “Which element of the Dunhuang mural in the Cultural Creation Silk Scarf inspires people to buy it?” In the question, 44.5% of the respondents chose the colour scheme option, 33.6% chose the pattern design elements option, 14.6% chose the religious story elements option, and 7.3% chose the function of the product itself option.

Table 4.5: Single choice question1

Item	N	Percentage (%)
Which element of the Dunhuang mural in the Cultural Creation Silk Scarf inspires people to buy it?		
Religious story elements	56.0	14.6
Color scheme	171.0	44.5
Pattern design elements	129.0	33.6
Function of the product itself	28.0	7.3

N=384

Table 4.6 shows the multiple choice question “Which channel is used to learn about Dunhuang element silk scarf products?” For the question, there were 672 responses: 31.1% people chose TikTok, 21.9% people chose WeChat public website, 20.4% people chose advertising, 19.5% respondents chose the Microblogging option, and 7.1% respondents chose the other option.

Table 4.6: Single choice question2

Item	N	Percentage (%)
Which channel is used to learn about Dunhuang element silk scarf products?		
Microblogging	131.0	19.5
WeChat public website	147.0	21.9
TikTok	209.0	31.1
Advertising	137.0	20.4
Other	48.0	7.1

4.3.2.2 RQ2 What are the CE perspectives of Dunhuang mural elements for innovative contemporary silk scarf designs for young women in China?

The questions related to the RQ2 are shown in Table 4.6: An analysis of the frequency of use of single choice questions collated the data as seen in the Table 4.7: In the question “Which style of silk scarf design do you think would attract your attention more?” Respondents' choices are summarised below: 30.5% of the respondents chose the fashionable and dynamic option, 24.5% of the respondents chose ethnic characteristics, 18.0% of the respondents chose the warm and cordial option, 17.7% of the respondents chose the traditional and stable option, and 6.8% of the respondents chose the international style option.

In the question “What do you think needs to be improved about contemporary silk scarf products?” 38.3% of the respondents chose the pattern style option, 25.0% of the respondents chose the color style option, 24.2% of the respondents chose the texture of for the material option, 10.9% of the respondents chose the size and shape option, and 1.6% of the respondents chose the other option.

Table 4.7: CE perspective1

	N	Percentage (%)
Which style of silk scarf design do you think would attract your attention more?		
Traditional and stable	68.0	17.7
Fashionable and dynamic	117.0	30.5
Warm and cordial	69.0	18.0
Ethnic characteristics	94.0	24.5
International style	26.0	6.8
Other	10.0	2.6
What do you think needs to be improved about contemporary silk scarf products?		
Colour style	96.0	25.0
Pattern style	147.0	38.3
Texture of material	93.0	24.2
Size and shape	42.0	10.9
Other	6.0	1.6

N=384

Table 4.8 shows the terms of emotional experience of silk scarf products and the investigation is conducted through a seven-point Likert scale. 1=Strongly disagree. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree. In the users' evaluation of the importance of the emotional experience of the silk scarf product, the highest score is "pleasure" with a mean±(SD) of 5.7±1.2, followed by "relaxation" and "emotional resonance" with the same mean±(SD) of 5.6±1.3. The Mean±(SD) for the Healing option followed closely at 5.6±1.2, followed by Affinity (5.5±1.2) and Pressure Relief (5.4±1.4).

Table 4.8: CE perspective2

	Min	Max	Mean±(SD)
Affinity	1.0	7.0	5.2±1.4
Affinity	1.0	7.0	5.5±1.2
sense of joy	1.0	7.0	5.7±1.2
Heal	1.0	7.0	5.6±1.2
Relaxed Feeling	1.0	7.0	5.6±1.3
Pressure Relief	1.0	7.0	5.4±1.4
Emotional Resonance	1.0	7.0	5.6±1.3

N=384

In terms of multiple choice questions, Table 4.9 shows the case of multiple choice questions, and the data are organized and analyzed as follows: As can be seen from the frequency analysis table below, in the question "Which style of silk scarf do you prefer to buy?" 29.4% of the respondents chose simplicity and fashion, 20.8% of respondents chose cultural creativity, 17.7% of respondents chose casual and sporty, 15.2% of respondents chose college and age-defying, 12.4% of respondents chose ladylike and feminine, while only 4.4% respondents would choose scarves in punk and heavy styles.

In the question "What colour do you prefer for daily scarves?" 22.2% of the respondents preferred blue, 17.1% preferred white, 13.8% chose black, 11.4% preferred grey, and 9.0% of respondents liked green. Fewer people liked yellow and red, with 8.8% and 7.9% of respondents choosing them, respectively.

In the question "What are your requirements for cultural and creative silk scarf products?" 17.6% of the respondents chose appearance features, 15.3% of the respondents chose cultural connotation, 14.9% of the respondents chose creativity, 12.4% of the respondents chose materials and quality, 11.9% of respondents chose the practical option, 10.4% chose the commemorative meaning option, and only 2.8% chose the packaging option.

In the question "What problems do you think exist in the current cultural and creative silk scarf products?", the most answered options are: 17.1% of the respondents chose the monotonous style, and 13.7% chose lack of innovation in design. 11.1% of the respondents chose the "too expensive" option, 11.1%, 10.9%, and 10.8%, respectively, chose the "absence of cultural connotation" and "lack of functional practicability". "poor product quality ". 4.5% of respondents chose the no well-known brand option.

Table 4.9: CE perspective3

Item	N	Percentage (%)
Which style of silk scarf do you prefer to buy?		
Casual and sporty	148.0	17.7
Ladylike and feminine	104.0	12.4
College and age-defying	127.0	15.2
Punk and heavy	37.0	4.4
Simple and fashionable	246.0	29.4
Cultural creativity	174.0	20.8
Total	836.0	100.0
Which colour of silk scarf do you prefer for everyday use?		
Blue	200.0	22.2
Black	124.0	13.8
White	154.0	17.1
Red	71.0	7.9
Pink	88.0	9.8
Green	81.0	9.0
Grey	103.0	11.4
Yellow	79.0	8.8
Total	900.0	100.0
What would you look for in a cultural and creative silk scarf product?		
Appearance features	273.0	17.6
Cultural connotation	238.0	15.3
Creativity	232.0	14.9
Branding	97.0	6.3
Collection value	131.0	8.4
Commemorative meaning	161.0	10.4
practicality	185.0	11.9
Materials and quality	193.0	12.4
Packaging	43.0	2.8
Total	1553.0	100.0
What do you think are the problems with the current cultural and creative silk scarf products?		
Monotonous style	225.0	17.1
Poor product quality	143.0	10.8
Lack of functionality and practicality	144.0	10.9
Lack of innovation in design	181.0	13.7
Cultural connotation is lost	146.0	11.1
Too expensive	147.0	11.1
Unbalanced audience	130.0	9.9
Less access to purchase	70.0	5.3
No well-known brands	59.0	4.5
Inadequate market system	68.0	5.2
Other	6.0	0.5
Total	1319.0	100.0

N=384

4.3.2.3 RQ3 What is the significance of Dunhuang mural elements with CE perspective for innovative contemporary silk scarf design for young women in China?

The descriptive analysis of the RQ3 is shown in Table 4.10 This section was evaluated using a seven-point Likert scale, where 1=strongly disagree. 2=Basically disagree,

3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree. The evaluation was performed comparatively in terms of three dimensions of CE: Vision, Attention, and Perception. Each dimension was divided into six groups of comparative silk scarf product pictures, and each group contained two silk scarf product pictures: one contained Dunhuang mural elements, while the other did not.

Descriptive analysis of visual seven-point scale data: The first set of questions examines the creative design of this scarf. The first one was designed using Dunhuang fresco patterns and tones, using blue and red contrasting tones. The proportions of "strongly disagree", "neutral", and "strongly agree" ratios were 1.6%, 8.3%, and 31.3%, respectively. The second scarf had no traditional cultural elements and a repeating pattern design. "strongly disagree", "neutral", and "strongly agree" ratios were 8.9%, 23.2%, and 6.5%, respectively.

The second group of examination questions is: The colour of this silk scarf had an auspicious meaning. The first silk scarf was designed by combining the Dunhuang flying sky shape with the caisson pattern. Strongly disagree, neutral and strongly agree are 0.0%, 6.8% and 44.8%. The second silk scarf product combined square and round cases that had no traditional Chinese cultural elements; strongly disagree, with neutral and Strongly agree ratios of 12.2%, 23.4% and 3.6%.

The third group of questions is: This silk scarf showcases traditional culture. The first silk scarf used red and green contrasting tones and was designed based on the caisson pattern and the image of Feitian in the early Tang Dynasty. The "strongly disagree", "neutral", and "strongly agree" ratios were 0.3 %, 5.7% and 43.0%, respectively. The

second scarf had a blue-grey square continuous pattern and did not have traditional cultural elements. Strongly disagree, the proportions of neutral and strongly agree were 20.1%, 16.9% and 3.4%.

The fourth group of questions examined is: This silk scarf has a distinctive pattern. The first silk scarf was based on the pattern of the three flying rabbits in Dunhuang. The proportions of "strongly disagree", "neutral", and "strongly agree" were 0.3%, 6.3%, and 34.9%, respectively. The second silk scarf was designed using a combination of abstract and square motifs, Strongly disagree, with neutral and Strongly agree ratios of 1.3%, 16.4% and 21.1%.

The fifth group examined: This silk scarf shows off festivity and wealth. The first silk scarf was designed based on the colour structure of a Dunhuang mural and the Nine-Coloured Deer. The proportion of Strongly disagree, neutral and Strongly agree was 0.8%, 6.5% and 42.7%. The second silk scarf pattern was a printed watercolour work that did not contain traditional cultural elements. Strongly disagree, neutral and Strongly agree ratios are 9.1%, 18.0% and 8.1%.

The last group examined this silk scarf, which is a unique colour. The first silk scarf pattern was re-created based on the image of a nine-colour deer in Dunhuang murals. The proportions of "strongly disagree", "neutral", and "strongly agree" are 0.5%, 8.9%, and 33.1%, respectively. The second silk scarf pattern was printed from Gongbi paintings; strongly disagree, neutral and strongly agreed proportions are 1.3%, 20.8% and 14.8%.

Table 4.10: Vision seven-point scale data

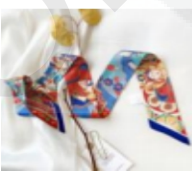
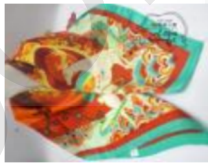
	Item	N	Percentage (%)
The design of this silk scarf is innovative. 	Strongly disagree	6.0	1.6
	Basically disagree	6.0	1.6
	Partially disagree	16.0	4.2
	Neutral	32.0	8.3
	Partially agree	79.0	20.6
	Basically agree	125.0	32.6
	Strongly agree	120.0	31.3
This is a silk scarf designed using Dunhuang fresco patterns and tones. 	Strongly disagree	34.0	8.9
	Basically disagree	51.0	13.3
	Partially disagree	69.0	18.0
	Neutral	89.0	23.2
	Partially agree	74.0	19.3
	Basically agree	42.0	10.9
	Strongly agree	25.0	6.5
This silk scarf has no traditional cultural elements and uses a repeating pattern design. The colour of this silk scarf has an auspicious meaning 	Strongly disagree	0.0	0.0
	Basically disagree	4.0	1.0
	Partially disagree	3.0	0.8
	Neutral	26.0	6.8
	Partially agree	59.0	15.4
	Basically agree	120.0	31.3
	Strongly agree	172.0	44.8
This silk scarf is based on a combination of the Feitian of the Dunhuang frescoes and the caisson pattern. 	Strongly disagree	47.0	12.2
	Basically disagree	61.0	15.9
	Partially disagree	72.0	18.8
	Neutral	90.0	23.4
	Partially agree	58.0	15.1
	Basically agree	42.0	10.9
	Strongly agree	14.0	3.6
This silk scarf features a combination of square and round cases that do not have traditional Chinese cultural elements.			

Table 4.10: Continued

This silk scarf showcases traditional culture.		Strongly disagree	1.0	0.3
		Basically disagree	2.0	0.5
		Partially disagree	8.0	2.1
		Neutral	22.0	5.7
		Partially agree	55.0	14.3
		Basically agree	131.0	34.1
		Strongly agree	165.0	43.0
This silk scarf is based on the Feitian and caisson pattern from Cave 329 of the early Tang Dynasty in the Mogao Caves at Dunhuang.				
	Strongly disagree	77.0	20.1	
	Basically disagree	74.0	19.3	
	Partially disagree	64.0	16.7	
	Neutral	65.0	16.9	
	Partially agree	63.0	16.4	
	Basically agree	28.0	7.3	
	Strongly agree	13.0	3.4	
This silk scarf features a repeating square pattern design.				
	Strongly disagree	1.0	0.3	
	Basically disagree	8.0	2.1	
	Partially disagree	15.0	3.9	
	Neutral	24.0	6.3	
	Partially agree	52.0	13.5	
	Basically agree	150.0	39.1	
	Strongly agree	134.0	34.9	
This silk scarf is a Dunhuang three rabbits and Feitian pattern silk scarf.				
	Strongly disagree	5.0	1.3	
	Basically disagree	12.0	3.1	
	Partially disagree	33.0	8.6	
	Neutral	63.0	16.4	
	Partially agree	82.0	21.4	
	Basically agree	108.0	28.1	
	Strongly agree	81.0	21.1	
This silk scarf is designed using a combination of abstract and square motifs.				

Table 4.10: Continued

This silk scarf shows off festivity and wealth.			Strongly disagree	3.0	0.8	
			Basically disagree	3.0	0.8	
			Partially disagree	9.0	2.3	
			Neutral	25.0	6.5	
			Partially agree	49.0	12.8	
			Basically agree	131.0	34.1	
This silk scarf is designed using the colour structure of a Dunhuang mural and the Nine-Coloured Deer material.			Strongly agree	164.0	42.7	
			Strongly disagree	35.0	9.1	
			Basically disagree	58.0	15.1	
			Partially disagree	67.0	17.4	
			Neutral	69.0	18.0	
			Partially agree	61.0	15.9	
			Basically agree	63.0	16.4	
This scarf is printed directly from a watercolour painting.			Strongly agree	31.0	8.1	
This silk scarf is a unique colour			Strongly disagree	2.0	0.5	
			Basically disagree	10.0	2.6	
			Partially disagree	18.0	4.7	
			Neutral	34.0	8.9	
			Partially agree	78.0	20.3	
			Basically agree	115.0	29.9	
The silk scarf is a reworking of elements related to the nine coloured deer in the Dunhuang frescoes.			Strongly agree	127.0	33.1	
			Strongly disagree	5.0	1.3	
			Basically disagree	15.0	3.9	
			Partially disagree	37.0	9.6	
			Neutral	80.0	20.8	
			Partially agree	86.0	22.4	
			Basically agree	104.0	27.1	
This silk scarf is printed using a Chinese brushwork design.			Strongly agree	57.0	14.8	

N=384

N=384

Visual data summarization and analysis is shown in Table 4.11:

In order to achieve clarity and precision in comparative analysis, this study adopted a simplified approach to the seven-point scale. Specifically, the seven options in the original scale were reclassified into two broad options: agree versus disagree. In this process, a score of 1 to 3 on the scale was interpreted as expressing a "disagree" response. In contrast, a score of 4 to 7 was interpreted as expressing an "agree" attitude (1=strongly disagree, 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree). This move aims to simplify the data structure so that the differences between each group of pictures can be more intuitively displayed and compared. Through this method, the study can more effectively analyze and explain the respondents' preferences and attitudes towards different pictures. The following scale sections on vision, attention, and perception will follow this method. The summary results of the vision data are shown in the Table 4.11 below.

There were six sets of comparative silk scarf product images, two product images in each set, one with Dunhuang mural elements and the other without traditional cultural elements. In the first group, the evaluation theme was that the silk scarf product was innovative. In the first assessment of the silk scarf designed using Dunhuang mural patterns and tones, 92.7% were in favour. For the second silk scarf product with no traditional cultural elements and designed using repetitive patterns, 59.9% of respondents held a supportive view. Comparing the two products, more people favoured the silk scarf with Dunhuang mural elements as being innovative.

The second group of silk scarf products was evaluated on whether the colours of the scarves had auspicious meanings. The first silk scarf was designed to combine Dunhuang's flying nymphs and algal well motifs. The primary colour of the silk scarf is traditional Chinese red, contrasted with green, which was a bright and colourful tone, and 98.2% of the respondents agreed that the silk scarf had an auspicious meaning. The second silk scarf have no Dunhuang mural elements; the use of a warm square pattern design silk scarf produces colour harmony and elegance; 53.1% of the user respondents agreed that the colour of this silk scarf has an auspicious meaning.

The third group of product images assesses whether the silk scarf products show traditional culture. 97.1% of the respondents agreed that silk scarves designed according to the Dunhuang lotus flower flying algae Well pattern can show traditional culture. However, only 44.0% of the respondents agreed that the second silk scarf designed with a repeating square pattern can show traditional culture. Based on the values, the respondents generally believed that the first silk scarf picture was more capable of highlighting traditional culture.

The fourth group of product pictures examines the question if this silk scarf has a distinctive pattern. The first silk scarf product was based on the Dunhuang Three hares flying algae Pattern with a support rate of 93.8%. The second was designed using a combination of abstract and square patterns, with 87.0% of respondents in favour. The two had little contrast, with the first winning slightly in score.

The fifth set of images examined is: This silk scarf shows festivity and wealth. The first silk scarf product was based on the colour structure of Dunhuang frescoes and the

material of the nine-coloured deer, and 96.1% of respondents support this silk scarf. The second scarf, printed directly from watercolour paintings, was supported by 58.3% of the respondents. The first silk scarf scored much higher in approval than the second silk scarf product, with more people believing that silk scarves with elements of Dunhuang frescoes were more festive and wealthy.

The last group examined this silk scarf, which is a unique colour. The first silk scarf was based on the image of the nine-coloured deer in Dunhuang's murals and received 92.2% support. The second silk scarf, printed with Chinese brushwork patterns, received 85.2% support from respondents.

Table 4.11: Visual data summarization and analysis

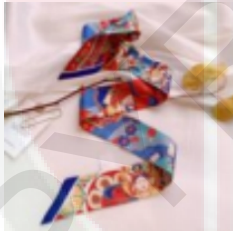
	Item	N	Percentage (%)
The design of this silk scarf is innovative. 	Disagree	28.0	7.3
	Agree	356.0	92.7
This is a silk scarf designed using Dunhuang fresco patterns and tones. 	Disagree	154.0	40.1
	Agree	230	59.9
This silk scarf has no traditional cultural elements and uses a repeating pattern design. The colour of this silk scarf has an auspicious meaning 	Disagree	7.0	1.8
	Agree	377.0	98.2
This silk scarf is based on a combination of the Feitian of the Dunhuang frescoes and the caisson pattern.			

Table 4.11: Continued

	Disagree	180.0	46.9
	Agree	204.0	53.1
This silk scarf features a combination of square and round cases that do not have traditional Chinese cultural elements			
This silk scarf showcases traditional culture.			
	Disagree	11.0	2.9
	Agree	373.0	97.1
This silk scarf is based on the flying apsaras and caisson pattern from Cave 329 of the early Tang Dynasty in the Mogao Caves at Dunhuang.			
	Disagree	215.0	56.0
	Agree	169.0	44.0
This silk scarf features a repeating square pattern design			
This silk scarf has a distinctive pattern.			
	Disagree	24.0	6.3
	Agree	360.0	93.8
This silk scarf is a Dunhuang three rabbits and Feitian pattern silk scarf.			
	Disagree	50.0	13.0
	Agree	334.0	87.0
This silk scarf is designed using a combination of abstract and square motifs.			
This silk scarf shows off festivity and wealth.			
	Disagree	15.0	3.9
	Agree	369.0	96.1
This silk scarf is designed using the colour structure of a Dunhuang mural and the Nine-Coloured Deer material.			

Table 4.11: Continued

	Disagree	160.0	41.7
	Agree	224.0	58.3
This scarf is printed directly from a watercolour painting.			
This silk scarf is a unique colour.			
	Disagree	30.0	7.8
	Agree	354.0	92.2
The silk scarf is a reworking of elements related to the nine coloured deer in the Dunhuang frescoes.			
	Disagree	57.0	14.8
	Agree	327.0	85.2
This silk scarf is printed using a Chinese brushwork design.			
N=384			

Descriptive analysis of Attention seven-point scale data is shown in Table 4.12: The first group of inspection questions is: This silk scarf will get more attention. The first silk scarf product was based on the image of two flying fairies in Dunhuang murals. The neutral and strongly agree ratios were 1.6%, 10.7% and 27.3%. The second scarf did not contain traditional cultural elements. The scarf's strongly disagree, neutral and strongly agree ratios were 8.3%, 20.8% and 8.1%.

The second set of examination questions is: This silk scarf grabs attention more often. This silk scarf featured a secondary design using auspicious clouds and a nine-coloured

deer motif, which "strongly disagree", "neutral", and "strongly agree". The ratios are 1.8%, 10.7%, and 25.3%. The second scarf was created using a simple contrast between the primary colour of lemon yellow and black and white squares. The ratios of "strongly disagree", "neutral", and "strongly agree" were 10.4%, 18.5%, and 4.9%, respectively.

The third group examined: This scarf catches attention more often. The first silk scarf was designed with Dunhuang elements. Strongly disagree, neutral and Strongly agree ratios were 0.8%, 10.2% and 28.9%. The second scarf was created with contrasting tones of light green and earthy red combined with abstract patterns. "strongly disagree", "neutral", and "strongly agree" ratios were 4.2%, 21.6%, and 5.7%, respectively.

The fourth set of inspection questions is: This silk scarf has an outstanding shape. The first silk scarf was a re-creation of the Dunhuang frescoed Feitian motif. This scarf Strongly disagrees, neutral and Strongly agree with ratios of 1.0%, 11.2% and 28.6%. The second scarf, printed with two hand-painted bird patterns, is bright and lively. This scarf's strongly disagree, neutral and strongly agree ratios were 6.0%, 20.1% and 7.0%.

The fifth group of questions examined is: This silk scarf is very attractive. The first silk scarf concerned the image of a nine-color deer in Dunhuang murals. This scarf's strongly disagree, neutral and strongly agree ratios were 0.3%, 6.5% and 30.2%. The second scarf was printed with cartoon-patterned portraits and flowers without referencing traditional cultural elements. This scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 8.6%, 21.6%, and 6.5%, respectively.

The last group examined is: This is the silk scarf that is more interested in. The first silk scarf was designed based on the contrasting tones of warm red and grey-green of Dunhuang murals and the caisson pattern. The design of this scarf was intense. The first silk scarf's Disagree, neutral and Strongly agree ratios were 2.1%, 16.1% and 25.3%. The second silk scarf was an abstract painted motif without traditional cultural elements. This silk scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 3.6%, 23.7%, and 6.5%, respectively.

Table 4.12: Attention seven-point scale data

	Item	N	Percentage (%)
This silk scarf will get your attention 	Strongly disagree	6.0	1.6
	Basically disagree	14.0	3.6
	Partially disagree	22.0	5.7
	Neutral	41.0	10.7
	Partially agree	72.0	18.8
	Basically agree	123.0	32.0
	Strongly agree	105.0	27.3
This silk scarf features the image of a double Feitian being from a Dunhuang mural. 	Strongly disagree	32.0	8.3
	Basically disagree	60.0	15.6
	Partially disagree	63.0	16.4
	Neutral	80.0	20.8
	Partially agree	53.0	13.8
	Basically agree	65.0	16.9
	Strongly agree	31.0	8.1
This silk scarf has no traditional cultural elements. This silk scarf grabs your attention more often. 	Strongly disagree	7.0	1.8
	Basically disagree	19.0	4.9
	Partially disagree	33.0	8.6
	Neutral	41.0	10.7
	Partially agree	92.0	24.0
	Basically agree	95.0	24.7
	Strongly agree	97.0	25.3
This silk scarf features a secondary design using the auspicious clouds and nine-coloured deer motif from the Dunhuang frescoes. 	Strongly disagree	40.0	10.4
	Basically disagree	74.0	19.3
	Partially disagree	74.0	19.3
	Neutral	71.0	18.5
	Partially agree	67.0	17.4
	Basically agree	39.0	10.2
	Strongly agree	19.0	4.9
This silk scarf is relatively simple, reflecting the black and white squares and yellow contrast.			

Table 4.12: Continued

This scarf catches your attention more often.				
	Strongly disagree	3.0	0.8	
	Basically disagree	10.0	2.6	
	Partially disagree	19.0	4.9	
	Neutral	39.0	10.2	
	Partially agree	86.0	22.4	
	Basically agree	116.0	30.2	
This silk scarf uses the traditional elements of the Dunhuang mural of the nine-coloured deer and the auspicious cloud motif.		Strongly agree	111.0	28.9
	Strongly disagree	16.0	4.2	
	Basically disagree	43.0	11.2	
	Partially disagree	79.0	20.6	
	Neutral	83.0	21.6	
	Partially agree	76.0	19.8	
	Basically agree	65.0	16.9	
This silk scarf has an outstanding shape		Strongly agree	22.0	5.7
	Strongly disagree	4.0	1.0	
	Basically disagree	9.0	2.3	
	Partially disagree	16.0	4.2	
	Neutral	43.0	11.2	
	Partially agree	84.0	21.9	
	Basically agree	118.0	30.7	
This silk scarf is a re-creation of the Dunhuang Feitian.		Strongly agree	110.0	28.6
	Strongly disagree	23.0	6.0	
	Basically disagree	50.0	13.0	
	Partially disagree	78.0	20.3	
	Neutral	77.0	20.1	
	Partially agree	74.0	19.3	
	Basically agree	55.0	14.3	
A hand-painted design of two birds is printed on this scarf.		Strongly agree	27.0	7.0
This silk scarf is very attractive.				
	Strongly disagree	1.0	0.3	
	Basically disagree	2.0	0.5	
	Partially disagree	11.0	2.9	
	Neutral	25.0	6.5	
	Partially agree	82.0	21.4	
	Basically agree	147.0	38.3	
This silk scarf is a reference to the Dunhuang mural image of the Nine-Coloured Deer.		Strongly agree	116.0	30.2
	Strongly disagree	33.0	8.6	
	Basically disagree	68.0	17.7	
	Partially disagree	69.0	18.0	
	Neutral	83.0	21.6	
	Partially agree	61.0	15.9	
	Basically agree	45.0	11.7	
This silk scarf is printed with cartoon patterned character portraits and flowers, without reference to traditional cultural elements.		Strongly agree	25.0	6.5

Table 4.12: Continued

This is the silk scarf you are more interested in.



Strongly disagree	8.0	2.1
Basically disagree	16.0	4.2
Partially disagree	27.0	7.0
Neutral	62.0	16.1
Partially agree	79.0	20.6
Basically agree	95.0	24.7

This silk scarf is a reference to the Dunhuang frescoes of the flying sky, lotus flower and caisson pattern.



Strongly disagree	14.0	3.6
Basically disagree	51.0	13.3
Partially disagree	62.0	16.1
Neutral	91.0	23.7
Partially agree	74.0	19.3
Basically agree	67.0	17.4

This silk scarf is an abstract painted motif without traditional cultural elements.

Strongly agree	25.0	6.5
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N=384

N=384

Descriptive analysis of attention data stigmatization is shown in Figure 4.13:

The second part of the product image evaluation is related to the principle of attention. The first set of images asks: Does the silk scarf get attention? The first silk scarf used the image of two Dunhuang Feitian figures, and the second silk scarf was a design without traditional cultural elements. The first silk scarf had a support rate of 89.1%, far exceeding the second silk scarf's support rate of 59.6%. The data proves that silk scarves containing elements of Dunhuang frescoes are more capable of triggering consumers' attention.

The second image is about This silk scarf that grabs your attention more often. The first silk scarf used the auspicious clouds and nine-coloured deer motif from Dunhuang frescoes in its innovative design, which received an approval rate of 84.6%. The second, more minimalist silk scarf with a contrasting geometric pattern received a 51.0% approval rating, much lower than the first scarf with Dunhuang frescoes.

The third group is the evaluation of "This scarf catches your attention more often."

The first silk scarf with Dunhuang frescoes of nine-coloured deer and auspicious clouds had an approval rate of 91.7%, much higher than the second silk scarf without traditional Chinese cultural elements, which had an approval rate of 64.1%.

The fourth group is about: This silk scarf has an outstanding shape; the first silk scarf used Dunhuang's Feitian motif and had an approval rate of 92.5%, while the second silk scarf, which had no traditional Chinese cultural elements and was only printed with two hand-painted bird motifs, had an approval rate of 60.7%.

The fifth group is the evaluation: This silk scarf is beautiful. The first silk scarf was designed to represent the image of the nine-coloured deer in Dunhuang murals and had a support rate of 96.4%. The second silk scarf was printed with cartoon characters and flowers without reference to traditional cultural elements and received 55.7% support.

The last group was examined: The more attractive silk scarf. The first silk scarf with 86.7% support was designed concerning Dunhuang Feitian, lotus flowers, and algal wells. The second silk scarf, which had no traditional cultural elements and was only printed with abstract paintings, received 66.9% support. The data shows that in terms of attention, silk scarves with Dunhuang frescoes are more likely to attract consumers' attention than those without traditional cultural elements.

Table 4.13: Attention data summarization and analysis

	Item	N	Percentage (%)
This silk scarf will get your attention 	Disagree	42.0	10.9
	Agree	342.0	89.1
This silk scarf features the image of a double Feitian being from a Dunhuang mural. 	Disagree	155.0	40.4
	Agree	229.0	59.6
This silk scarf has no traditional cultural elements. This silk scarf grabs your attention more often. 	Disagree	59.0	15.4
	Agree	325.0	84.6
This silk scarf features a secondary design using the auspicious clouds and nine-coloured deer motif from the Dunhuang frescoes. 	Disagree	188.0	49.0
	Agree	196.0	51.0
This silk scarf is relatively simple, reflecting the black and white squares and yellow contrast. This scarf catches your attention more often. 	Disagree	32.0	8.3
	Agree	352.0	91.7
This silk scarf uses the traditional elements of the Dunhuang mural of the nine-coloured deer and the auspicious cloud motif. 	Disagree	138.0	35.9
	Agree	246.0	64.1
This silk scarf uses a weak contrasting tonal pattern with no traditional Chinese cultural elements.			

Table 4.13: Continued

This silk scarf has an outstanding shape				
	Disagree	29.0	7.6	
	Agree	355.0	92.5	
This silk scarf is a re-creation of the Dunhuang Feitian.				
	Disagree	151.0	39.3	
	Agree	233.0	60.7	
A hand-painted design of two birds is printed on this scarf.				
This silk scarf is very attractive.				
	Disagree	14.0	3.7	
	Agree	370.0	96.4	
This silk scarf is a reference to the Dunhuang mural image of the Nine-Coloured Deer.				
	Disagree	170.0	44.3	
	Agree	214.0	55.7	
This silk scarf is printed with cartoon patterned character portraits and flowers, without reference to traditional cultural elements.				
This is the silk scarf you are more interested in.				
	Disagree	51.0	13.3	
	Agree	333.0	86.7	
This silk scarf is a reference to the Dunhuang frescoes of the flying sky, lotus flower and caisson pattern.				
	Disagree	127.0	33.1	
	Agree	257.0	66.9	
This silk scarf is an abstract painted motif without traditional cultural elements.				

N=384

Descriptive analysis of Perception seven-point scale data is shown in Table 4.14: The first group of products examined is This silk scarf, which is even more striking and

prominent. The first silk scarf was designed based on the image of a nine-colour deer and auspicious cloud patterns in Dunhuang murals. This silk scarf's Strongly disagree, neutral and Strongly agree ratios were 0.0%, 6.0% and 42.4%. The second scarf pattern was made of cartoon flowers, which did not reflect traditional Chinese cultural elements. The strongly disagree, neutral and strongly agree ratios of this scarf were 4.2%, 20.6% and 7.0%.

The second group of questions examined is: This silk scarf conveys traditional auspiciousness. The first silk scarf was a secondary creation using the Dunhuang fresco image of the Feitian and auspicious clouds. Strongly disagree, neutral and strongly agree ratios are 0,0%, 5.7% and 36.2%. The second silk scarf used an abstract floral motif that did not contain elements of traditional Chinese culture. Strongly disagree, neutral and strongly agree ratios were 4.2%, 21.4% and 8.1%.

The third group of inspection questions is: This silk scarf has even more cultural connotations. The first silk scarf was re-created based on the auspicious cloud patterns and flying images of Dunhuang murals. The silk scarf pattern is based on blue and grey tones, with warm colours and black and white colours—elegant yet intelligent overall. The scarf strongly disagrees, neutral, and strongly agree ratios were 0.0%, 4.7%, and 38.0%, respectively. The second scarf had a simple and elegant pattern, with blue flowers on a white background that was fresh and elegant. This scarf's "strongly disagree", "neutral", and "strongly agree" ratios are 6.5%, 21.9% and 5.2%.

The fourth group of questions examined is: This silk scarf pleases the senses. The first silk scarf was generally warm in colour and depicts the Dunhuang flying fairies were

dancing in auspicious clouds on a deep red background. This scarf's strongly disagree, neutral and strongly agree ratios were 0.8%, 10.7% and 32.8%. The second scarf had brightly coloured flowers were blooming on a black frame on a white background. This scarf's strongly disagree, neutral and strongly agree ratios were 3.1%, 24.7% and 7.0%.

The fifth group of questions examined is: This silk scarf has a sense of quality. The first silk scarf flexibly drew on the classic caisson pattern in Dunhuang murals, using the contrast of lake blue and orange-red. The overall colour of the scarf was bright and lively. This scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 0.8%, 5.7%, and 34.6%, respectively. The second scarf was derived from hand-painted floral patterns and did not contain traditional Chinese cultural elements. The "strongly disagree", "neutral", and "strongly agree" ratios for this scarf were 2.6%, 22.1%, and 8.1%, respectively.

The last group of questions examined is: This silk scarf will feel de-stressed. The first silk scarf drew on the Dunhuang murals' caisson pattern and the classic deer shape, combined with contrasting warm green and orange-red tones, calm and energetic. This scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 2.3%, 11.5%, and 28.1%, respectively. The design of the second silk scarf was derived from an abstract computer painting and has no traditional cultural elements. This scarf's strongly disagree, neutral and strongly agree ratios were 4.9%, 27.6% and 4.9%.

Table 4.14: Perception seven-point scale data

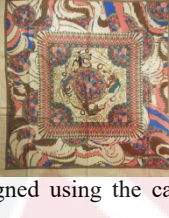
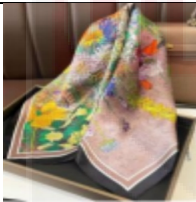
	Item	N	Percentage (%)
This silk scarf is even more striking and prominent 	Strongly disagree	0.0	0.0
	Basically disagree	1.0	0.3
	Partially disagree	7.0	1.8
	Neutral	23.0	6.0
	Partially agree	71.0	18.5
	Basically agree	119.0	31.0
This silk scarf is designed using the image of the nine-coloured deer from the Dunhuang mural and the auspicious cloud motif. 	Strongly agree	163.0	42.4
	Strongly disagree	16.0	4.2
	Basically disagree	41.0	10.7
	Partially disagree	77.0	20.1
	Neutral	79.0	20.6
	Partially agree	74.0	19.3
This silk scarf conveys traditional auspiciousness. 	Basically agree	70.0	18.2
	Strongly agree	27.0	7.0
	Strongly disagree	0.0	0.0
	Basically disagree	2.0	0.5
	Partially disagree	8.0	2.1
	Neutral	22.0	5.7
This scarf is designed using the caisson pattern from Dunhuang murals. 	Partially agree	84.0	21.9
	Basically agree	129.0	33.6
	Strongly agree	139.0	36.2
	Strongly disagree	16.0	4.2
	Basically disagree	30.0	7.8
	Partially disagree	68.0	17.7
This silk scarf uses an abstract floral motif that does not contain elements of traditional Chinese culture. 	Neutral	82.0	21.4
	Partially agree	91.0	23.7
	Basically agree	66.0	17.2
	Strongly agree	31.0	8.1
	Strongly disagree	0.0	0.0
	Basically disagree	1.0	0.3
This silk scarf has even more cultural connotations 	Partially disagree	7.0	1.8
	Neutral	18.0	4.7
	Partially agree	61.0	15.9
	Basically agree	151.0	39.3
	Strongly agree	146.0	38.0
	Strongly disagree	25.0	6.5
This silk scarf uses the Dunhuang fresco of a Feitian being and other traditional cultural elements. 	Basically disagree	57.0	14.8
	Partially disagree	75.0	19.5
	Neutral	84.0	21.9
	Partially agree	67.0	17.4
	Basically agree	56.0	14.6
	Strongly agree	20.0	5.2
This silk scarf uses a simple floral motif and does not contain traditional cultural elements. 	Strongly agree	20.0	5.2
	Strongly disagree	3.0	0.8
	Basically disagree	6.0	1.6
	Partially disagree	20.0	5.2
	Neutral	41.0	10.7
	Partially agree	79.0	20.6
This silk scarf fills the senses with pleasure 	Basically agree	109.0	28.4
	Strongly agree	126.0	32.8
This silk scarf is designed using the Dunhuang Feitian and auspicious clouds motif.			

Table 4.14: Continued

	Strongly disagree	12.0	3.1
	Basically disagree	34.0	8.9
	Partially disagree	72.0	18.8
	Neutral	95.0	24.7
	Partially agree	77.0	20.1
	Basically agree	67.0	17.4
	Strongly agree	27.0	7.0
This silk scarf has a sense of quality			
	Strongly disagree	3.0	0.8
	Basically disagree	5.0	1.3
	Partially disagree	22.0	5.7
	Neutral	22.0	5.7
	Partially agree	74.0	19.3
	Basically agree	125.0	32.6
	Strongly agree	133.0	34.6
This silk scarf is designed based on the patterns of Dunhuang murals.			
	Strongly disagree	10.0	2.6
	Basically disagree	28.0	7.3
	Partially disagree	83.0	21.6
	Neutral	85.0	22.1
	Partially agree	84.0	21.9
	Basically agree	63.0	16.4
	Strongly agree	31.0	8.1
This silk scarf is derived from hand-painted floral motifs without traditional Chinese cultural elements.			
	Strongly disagree	9.0	2.3
	Basically disagree	14.0	3.6
	Partially disagree	40.0	10.4
	Neutral	44.0	11.5
	Partially agree	65.0	16.9
	Basically agree	104.0	27.1
	Strongly agree	108.0	28.1
This silk scarf uses the Dunhuang mural deer shape and part of the caisson pattern image.			
	Strongly disagree	19.0	4.9
	Basically disagree	46.0	12.0
	Partially disagree	72.0	18.8
	Neutral	106.0	27.6
	Partially agree	71.0	18.5
	Basically agree	51.0	13.3
	Strongly agree	19.0	4.9
The design of this silk scarf is derived from an abstract computer painting and has no traditional cultural elements.			

N=384

Descriptive analysis of perception data summarization is shown in Figure 4.15: The first set of questions was about this silk scarf, which is even more striking and prominent. With 97.9% support, the first silk scarf used the innovative design of the nine-coloured deer and auspicious cloud pattern from Dunhuang frescoes. The second

silk scarf, which received 65.1% support, did not reflect traditional Chinese cultural elements and used cartoon flowers in its design.

The second set of questions was about “how this silk scarf conveys traditional auspiciousness”. The first silk scarf, an innovative design using the flying sky and auspicious cloud motifs from Dunhuang murals, received 97.4% support, higher than the second silk scarf's 70.3% approval rating. The second silk scarf used abstract floral motifs and did not include traditional Chinese cultural elements.

The third question was “whether this silk scarf has even more cultural connotations”. The first silk scarf contained the image of Dunhuang Feitian and received 97.9% support. The second silk scarf had a simple floral pattern. It did not contain traditional Chinese cultural connotations, receiving 59.1% support, much lower than the first scarf, which had a simple floral pattern and did not include traditional cultural elements, much lower than the first scarf.

The fourth group examined the question: The silk scarf pleases the senses. 92.5% support was given to the first silk scarf, designed with Dunhuang Feitian and auspicious clouds, much higher than the second silk scarf, which did not have traditional cultural elements, which received 69.3% support.

The fifth group question was about this silk scarf having a sense of quality. The first silk scarf design was derived from the Dunhuang caisson pattern and received 92.2% support. The second silk scarf with hand-painted flowers and no traditional Chinese cultural elements received 68.5% support. The second silk scarf without traditional

cultural elements scored much lower than the first silk scarf product with Dunhuang elements.

The last group examined was: This silk scarf will make feel de-stressed. The first silk scarf had a support rating of 83.6%. This silk scarf used the Dunhuang mural's nine-coloured deer shape as part of the algal well diagram. The second silk scarf was derived from abstract computer paintings and did not have traditional cultural elements, with a 64.3% approval rate.

Overall, regarding feelings, the silk scarf with Dunhuang mural elements in each group scored much higher than the second silk scarf without traditional cultural elements, showing that silk scarves with Dunhuang fresco elements bring more good feelings to consumers.

Table 4.15: Perception data summarisation and analysis

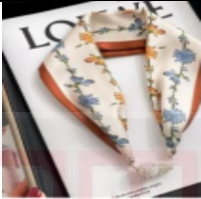
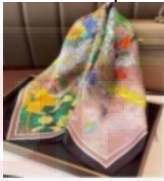
	Item	N	Percentage (%)
This silk scarf is even more striking and prominent	Disagree	8.0	2.1
	Agree	376.0	97.9
This silk scarf is designed using the image of the nine-coloured deer from the Dunhuang mural and the auspicious cloud motif.	Disagree	134.0	34.9
	Agree	250.0	65.1
This silk scarf uses cartoonish flowers that do not reflect traditional Chinese cultural elements.	Disagree	10.0	2.6
This silk scarf conveys traditional auspiciousness.	Agree	374.0	97.4
	Disagree	114.0	29.7
This scarf is designed using the caisson pattern from Dunhuang murals.	Agree	270.0	70.3
	Disagree	8.0	2.1
This silk scarf uses an abstract floral motif that does not contain elements of traditional Chinese culture.	Agree	376.0	97.9
This silk scarf has even more cultural connotations	Disagree	157.0	40.9
	Agree	227.0	59.1
This silk scarf uses the Dunhuang fresco of a Feitian being. And other traditional cultural elements.	Disagree	29.0	7.6
	Agree	355.0	92.5
This silk scarf uses a simple floral motif and does not contain traditional cultural elements.			
This silk scarf fills the senses with pleasure			
This silk scarf is designed using the Dunhuang Feitian and auspicious clouds motif.			

Table 4.15: Continued

 This silk scarf is designed using a computer-generated floral design.	Disagree	118.0	30.7
	Agree	266.0	69.3
 This silk scarf has a sense of quality	Disagree	30.0	7.8
	Agree	354.0	92.2
 This silk scarf is designed based on the patterns of Dunhuang murals.	Disagree	121.0	31.5
	Agree	263.0	68.5
 This silk scarf is derived from hand-painted floral motifs without traditional Chinese cultural elements.	Disagree	63.0	16.4
	Agree	321.0	83.6
 This silk scarf uses the Dunhuang mural deer shape and part of the caisson pattern image.	Disagree	137.0	35.7
	Agree	247.0	64.3
The design of this silk scarf is derived from an abstract computer painting and has no traditional cultural elements.			
N=384			

4.4 Data Analysis and Results of Designer Survey

4.4.1 Demographic Profile of Designer Respondents

The collected questionnaires were processed, and it was examined that there were no outliers in the respondents' answers and 51 valid questionnaires. Descriptive statistical analysis is used to describe the general information of the respondents, and the frequency table of each item is output and the collated results are shown in Table 4.16.

From Table 4.16, it can be seen that from the perspective of gender, 30 people were female, accounting for 58.8%, and 21 people were male, accounting for 41.2%; from the perspective of place of residence, 33 people were born in Shandong Province, accounting for 64.7%, and 18 people were born in other provinces, accounting for 35.3%; from the perspective of place of birth, 43.1% of respondents were born in town cities, 29.4% of them were born in second big cities, 15.7% of respondents were born in big cities, and 11.8% were born in rural area; from the perspective of age, 29.4% of respondents were between 18-23 years old, and respondents between 24-30 years old were 17.6%. 29.4% of respondents were between 31-40 years old, and 41-55 years old were 23.5%; from the perspective of marital status, 20 respondents were single, accounting for 39.2%, and 29 respondents were married, accounting for 56.9%, and 2 respondents were divorcee, accounting for 3.9%, ; from the perspective of the level of education, the number of subjects with bachelor degree or above is higher, accounting for 90.2%. From the perspective of personal monthly income, 17.5% of the respondents had a monthly income of less than 4,000 yuan, 14% had a monthly income of 4001yuan- 6000yuan. 12.3% of the respondents had an average income of 6001yuan-8000yuan, 15.8% of the respondents had an average income of 8001yuan-10000yuan, and 29.8% of the respondents had an income of more than 10001 yuan.

Table 4.16: Descriptive statistical analysis of respondent information

Item	N	Percentage (%)	Minim.	Max.	Mean($\pm$ SD)
Sex					
Man	21.0	41.2			
Women	30.0	58.8			
Residence					
Shandong	33.0	64.7			
Others	18.0	35.3			
District					
Big cities	8.0	15.7			
Second big cities	15.0	29.4			
Town cities	22.0	43.1			
Rural area	6.0	11.8			
Age			19.0	45.0	31.2 $\pm$ 8.7
18-23 years old	15.0	29.4			
24-30 years old	9.0	17.6			
31-40 years old	15.0	29.4			
41-45 years old	12.0	23.5			
Marital Status					
Single	20.0	39.2			
Married	29.0	56.9			
divorcee	2.0	3.9			
Education level					
Junior high school and below	0.0	0.0			
High school	0.0	0.0			
Junior college	5.0	0.8			
Bachelor degree or above	46.0	90.2			
Personal monthly income			500.0	13000.0	8094.1 $\pm$ 3886.7
Less than 4000 yuan	10.0	17.5			
4001 yuan- 6000 yuan	8.0	14.0			
6001 yuan- 8000 yuan	7.0	12.3			
8001 yuan- 10000 yuan	9.0	15.8			
More than 10001 yuan	17.0	29.8			

N=51

4.4.2 Designer Cognitive Evaluation of Silk Scarf Products

4.4.2.1 RQ1 What are the Dunhuang mural elements of silk scarf design for young women in China?

Descriptive analysis of questions related to the RQ1: Table 4.17 shows “Which element of the Dunhuang mural elements in the Cultural Creation Silk Scarf would most inspire you to buy it?” In the question, 47.1% of the respondents chose color schemes, 33.3% chose pattern design elements, 15.7% chose religious story elements, and 3.9% chose the function of the product.

Table 4.17: Single choice question1

Item	N	Percentage (%)
Which element of the Dunhuang mural elements in the Cultural Creation Silk Scarf would most inspire you to buy it?		
Religious story elements	8.0	15.7
Color scheme	24.0	47.1
Pattern design elements	17.0	33.3
Function of the product itself	2.0	3.9

N=51

Table 4.18 shows the multiple-choice question answers about “Which channel you usually use to learn about Dunhuang Element silk scarf products?”. There were 100 responses; 58.8% of people chose TikTok, and 49.0% chose the WeChat public website. Advertising was selected by 49.0% of people, and 35.3% chose the Microblogging option.

Table 4.18: Single choice question 2

Item	N	Percentage (%)
Which channel do you usually use to learn about Dunhuang Element silk scarf products?		
Microblogging	18.0	35.3
WeChat public website	25.0	49.0
TikTok	30.0	58.8
Advertising	25.0	49.0
Other	2.0	3.9

N=51

From Table 4.19, the shape and pattern of scarves were essential elements in product design. 37.3% and 51.0% of the respondent's agree and strongly agree, respectively; 2.0% were neutral, and 9.8% disagreed with the description.

In the question, if traditional Chinese cultural elements contribute to innovative product design. 27.5% and 60.8% of the respondents agree and strongly agree, respectively; 2.0% were neutral, and 9.8% disagree with the description.

Table 4.19: CE perspective1

item	N	Percent (%)
The shape and pattern of scarves are important elements in product design.		
Strongly disagree	3.0	5.9
Disagree	2.0	3.9
Neutral	1.0	2.0
Agree	19.0	37.3
Strongly agree	26.0	51.0
Traditional Chinese cultural elements contribute to innovative product design.		
Strongly disagree	3.0	5.9
Disagree	2.0	3.9
Neutral	1.0	2.0
Agree	14.0	27.5
Strongly agree	31.0	60.8

N=51

Table 4.20 shows the following topic concerning the design value rating of Dunhuang mural elements; this board includes four dimensions of evaluation: figure pattern, animal pattern, landscape pattern, and pattern. The scoring rules are: 1=very worthless, 2=basically worthless, 3=partially worthless, 4=neutral, 5=partially valuable, 6=basically valuable, 7=very valuable.

As can be seen from the table below, in the design value evaluation of Dunhuang mural elements, the Decorative pattern had the highest value evaluation score, with a mean value of 6.5, and the Landscape pattern had the second highest value evaluation score, with a mean value of 6.3, followed by Animal pattern, with a mean value of 5.9, and character pattern had a minor value evaluation mean, with a mean value of 5.5. the data shows that the respondents have a higher recognition of the value of decorative patterns in Dunhuang mural design.

Table 4.20: DME

Item	Min	Max	Mean($\pm$ SD)
Please rate the design value of the following Dunhuang mural elements			
Character pattern	1.0	7.0	5.8 $\pm$ 1.5
Animal pattern	3.0	7.0	5.9 $\pm$ 1.2
Landscape pattern	1.0	7.0	6.3 $\pm$ 1.1
Decorative pattern	1.0	7.0	6.5 $\pm$ 1.1

N=51

4.4.2.2 RQ2 What are the CE perspective of Dunhuang mural elements for innovative contemporary silk scarf design for young women in China?

A description of the problem associated with the RQ2 is shown in Table 4.21. In the question description, “you apply the theory of CE in product design.” The proportion of respondent's agree or strongly agree is 35.3% and 39.2%, respectively; 15.7% of the respondents were neutral, and 9.8% did not agree with the description.

Table 4.21: CE perspective2

Item	N	Percent (%)
You apply the theory of CE in product design.		
Strongly disagree	2.0	3.9
Disagree	3.0	5.9
Neutral	8.0	15.7
Agree	18.0	35.3
Strongly agree	20.0	39.2

N=51

Table 4.22 shows the question, “Which style of silk scarf design would attract your attention more?” 45.1% of the respondents chose Ethnic characteristics, 27.5% chose the Fashionable and dynamic option, and only 3.9% chose warm and cordial options.

In the question “What do you think needs to be improved about contemporary silk scarf products?” 39.2% of the respondents chose the Pattern style option, 31.4% of the respondents chose the Color style option, and 19.6% of the respondents chose the Texture of for the material option, 7.8% of the respondents chose the size and shape option, and 2.0% of the respondents chose the other option.

Table 4.22: CE perspective3

Item	N	Percentage (%)
Which style of silk scarf design do you think would attract your attention more?		
Traditional and stable	7.0	13.7
Fashionable and dynamic	14.0	27.5
warm and cordial	2.0	3.9
Ethnic characteristics	23.0	45.1
International style	5.0	9.8
What do you think needs to be improved about contemporary silk scarf products?		
Colour style	16.0	31.4
Pattern style	20.0	39.2
Texture of material	10.0	19.6
size and shape	4.0	7.8
other	1.0	2.0

N=51

Table 4.23 shows the emotional experience of the silk scarf product: please rate the importance of the following keywords; a descriptive statistical analysis was performed. The results are shown in the table below. Among the respondent's evaluation of the importance of emotional experience in silk scarf products, the highest score was sense of joy, with an average value of 6.1, followed by heal, relaxed feeling, and emotional, with average values of 6.0 and 5.9 respectively. The mean values of Emotional resonance and affinity were 5.9 and 5.6, respectively; the mean value of pressure relief was 5.7.

Table 4.23: CE perspective4

	Minimum	Maximum	Mean($\pm$ SD)
Affinity	2.0	7.0	5.6 $\pm$ 1.1
Affinity	2.0	7.0	5.8 $\pm$ 1.1
sense of joy	4.0	7.0	6.1 $\pm$ 1.0
Heal	4.0	7.0	6.0 $\pm$ 1.0
Relaxed feeling	2.0	7.0	5.9 $\pm$ 1.1
Pressure relief	2.0	7.0	5.7 $\pm$ 1.1
Emotional resonance	4.0	7.0	5.9 $\pm$ 1.1

N=51

Table 4.24 shows the multiple-choice questions in the following table and uses frequency analysis. The results are shown in the table below. In the question "Which style of silk scarf do you prefer to buy?", there were a total of 119.0 responses:

30.3% people would choose simple and fashionable, 28.6% people would choose cultural creativity, and 17.6% People would choose Ladylike and feminine, and only 4.2% people chose punk and heavy style scarves.

In the question “Which colour of silk scarf do you prefer for everyday use?” There were 157.0 responses, of which 19.1% people preferred blue, 15.9% people preferred gray, and 12.7% preferred white and green. In comparison, fewer people preferred pink, with 7.0% responses.

In the question “What would you look for in a cultural and creative silk scarf product?” There were a total of 238.0 responses. 17.7% people chose appearance features and creativity, and 12.6% people chose cultural connotation, materials and quality. Only 3.4% people chose the packaging option.

In the question “What do you think are the problems with the current cultural and creative silk scarf products?” There were a total of 187.0 responses: 15.0% people chose the monotonous style option, 13.4% people chose the Lack of innovation in design option, 12.8% People chose the Too expensive option, and no well-known brands had 4.3% responses.

Table 4.24: CE perspective5

Item	N	Percentage (%)
Which style of silk scarf do you prefer to buy?		
Casual and sporty	9.0	7.6
Ladylike and feminine	21.0	17.6
College and age-defying	14.0	11.8
Punk and heavy	5.0	4.2
Simple and fashionable	36.0	30.3
Cultural creativity	34.0	28.6
Total	119.0	100.0
Which colour of silk scarf do you prefer for everyday use?		
Blue	30.0	19.1
Black	18.0	11.5
White	20.0	12.7
Red	16.0	10.2
Pink	11.0	7.0
Green	20.0	12.7
Grey	25.0	15.9
Yellow	17.0	10.8
Total	157.0	100.0
What would you look for in a cultural and creative silk scarf product?		
Appearance features	42.0	17.7
Cultural connotation	30.0	12.6
Creativity	42.0	17.7
Branding	11.0	4.6
Collection value	22.0	9.2
Commemorative meaning	25.0	10.5
practicality	28.0	11.8
Materials and quality	30.0	12.6
Packaging	8.0	3.4
Total	238.0	100.0
What do you think are the problems with the current cultural and creative silk scarf products?		
Monotonous style	28.0	15.0
Poor product quality	19.0	10.2
Lack of functionality and practicality	16.0	8.6
Lack of innovation in design	25.0	13.4
Cultural connotation is lost	21.0	11.2
Too expensive	24.0	12.8
unbalanced audience	20.0	10.7
Less access to purchase	13.0	7.0
No well-known brands	8.0	4.3
Inadequate market system	13.0	7.0
Total	187.0	100.0

N=51

4.4.2.3 RQ3 What is the significance of Dunhuang mural elements with CE perspective for innovative contemporary silk scarf design for young women in China?

The descriptive analyses associated with the RQ3 are shown in Figure 4.25. In the question “Whether Dunhuang mural elements can innovate modern silk scarf design.”

27.5% and 62.8% of the respondents agree and strongly agree, respectively; 2.0% were neutral, and 7.9% did not agree with the description. In the question “Using elements from Dunhuang murals to innovate contemporary silk scarf designs was a good way.” 27.5% and 62.8% of the respondents agreed and strongly agreed, respectively; 3.9% were neutral, and 5.9% disagreed with the description. In the question “CE is helpful for innovative product design.” 39.2% and 43.1% of the respondents agreed and strongly agreed, respectively; 9.8% of the respondents were neutral, and 7.8% disagreed with the description.

Table 4.25: CE perspective6

Item	N	Percentage (%)
Dunhuang mural elements can innovate modern silk scarf design.		
Strongly disagree	3.0	5.9
Disagree	1.0	2.0
Neutral	1.0	2.0
Agree	14.0	27.5
Strongly agree	32.0	62.8
Using elements from Dunhuang murals to innovate contemporary silk scarf design is a good way.		
Strongly disagree	2.0	3.9
Disagree	1.0	2.0
Neutral	2.0	3.9
Agree	14.0	27.5
Strongly agree	32.0	62.8
CE is useful for innovative product design.		
Strongly disagree	2.0	3.9
Disagree	2.0	3.9
Neutral	5.0	9.8
Agree	20.0	39.2
Strongly agree	22.0	43.1

N=51

Table 4.26 shows that this section was evaluated using a seven-point Likert scale. The evaluation was assessed in terms of three dimensions of CE: Vision, attention and perception. Where 1=strongly disagree, 2=basically disagree, 3=partially disagree, 4=neutral, 5=partially agree, 6=basically agree, 7=strongly agree. The SPSS (Statistical Product and Service Solutions) tool summarised the data analysis. In

order to facilitate data comparison, each dimension is divided into two table types for descriptive analysis. The first table is the original data of the seven-point scale, and the second table is the summarized display of the data of the same dimension. The induction method classifies scores of 1 to 3 as disagreement and 4 to 7 as agreement. The following is a description and analysis of the original data of Vision's 7-point scale.

Descriptive analysis of visual seven-point scale data is shown in Table 4.26:

Question examined in the first set of pictures: The design of this silk scarf is innovative. The first one used the pattern of Dunhuang mural elements and the contrasting tones of blue and red. The "strongly disagree", "neutral", and "strongly agree" ratios for this silk scarf were 0.0%, 5.9%, and 45.1%, respectively. The second scarf was designed with simple yellow-red abstract graphics. The proportions of strongly disagree, neutral and strongly agree for this scarf were 7.8%, 29.4% and 7.8%.

The second group of examination questions is: The colour of this silk scarf has an auspicious meaning. The first silk scarf was in the shape of Dunhuang Feitian. The knot and traditional Chinese red and green contrasting tones highlight the festive atmosphere. The strongly disagree, neutral and strongly agree ratios for this scarf were 0.0%, 3.9% and 58.8%. The second scarf product adopted a warm yellow tone, and the square shape on the outside echoes the curved pattern in the centre. The proportions of strongly disagree, neutral and strongly agree for this scarf were 5.9%, 37.3% and 3.9%.

The question of the third group is: This silk scarf showcases traditional culture. The first silk scarf of this group referred to the early Tang Dynasty caisson pattern and the image of a Feitian for combination innovation. The ratio of this scarf strongly

disagreed, neutral and strongly agree were 0.0%, 2.0% and 52.9%. The second scarf was a cool-toned square pattern combination. The proportions of strongly disagree, neutral and strongly agree for this scarf were 9.8%, 29.4% and 2.0%.

The fourth group of questions examined is: This silk scarf has a distinctive pattern. The first silk scarf is based on the Dunhuang three rabbits flying caisson pattern as the design reference blueprint. This scarf's strongly disagree, neutral and strongly agree ratios were 0.0%, 3.9% and 52.9%, respectively. The second scarf was an abstract pattern with a warm yellow tone. The proportions of strongly disagree, neutral and strongly agree for this scarf were 2.0%, 5.9% and 47.1%.

The fifth group examined: This silk scarf shows off festivity and wealth. The first reorganized silk scarf was designed based on the classic animal image of Dunhuang, the nine-color deer. The contrasting tones of red and green highlighted the traditional features. The scarf strongly disagrees, and the proportions of neutral and strongly agree are 0.0%, 5.9%, and 54.9%. The second scarf pattern did not contain traditional cultural elements. The scarf pattern was a watercolour work. The proportions of strongly Disagree, neutral and strongly agree for this scarf were 7.8%, 7.8% and 9.8%.

The last group examined this silk scarf, which is a unique colour. The first silk scarf was designed based on the image of deer in Dunhuang murals. The proportions of "strongly disagree", "neutral", and "strongly agree" with this scarf were 0.0%, 5.9%, and 37.3%, respectively. The second scarf pattern was printed from meticulous Chinese floral works. The strongly Disagree, neutral and strongly agree ratios for this scarf were 0.0%, 7.8% and 31.4%.

Table 4.26: Vision seven-point scale data

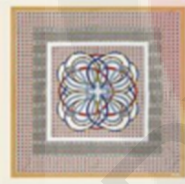
	Item	N	Percentage (%)
The design of this silk scarf is innovative. 	Strongly disagree	0.0	0.0
	Basically disagree	1.0	2.0
	Partially disagree	1.0	2.0
	Neutral	3.0	5.9
	Partially agree	10.0	19.6
	Basically agree	13.0	25.5
This is a silk scarf designed using Dunhuang fresco patterns and tones. 	Strongly disagree	4.0	7.8
	Basically disagree	3.0	5.9
	Partially disagree	3.0	5.9
	Neutral	15.0	29.4
	Partially agree	12.0	23.5
	Basically agree	10.0	19.6
This silk scarf has no traditional cultural elements and uses a repeating pattern design. The colour of this silk scarf has an auspicious meaning 	Strongly agree	4.0	7.8
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	26.0	6.8
	Neutral	2.0	3.9
	Partially agree	7.0	13.7
This silk scarf is based on a combination of the Feitian of the Dunhuang frescoes and the caisson pattern. 	Strongly agree	30.0	58.8
	Strongly disagree	3.0	5.9
	Basically disagree	3.0	5.9
	Partially disagree	5.0	9.8
	Neutral	19.0	37.3
	Partially agree	13.0	25.5
This silk scarf features a combination of square and round cases that do not have traditional Chinese cultural elements. This silk scarf showcases traditional culture. 	Strongly agree	2.0	3.9
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	0.0	0.0
	Neutral	1.0	2.0
	Partially agree	8.0	15.7
This silk scarf is based on the Feitian and caisson pattern from Cave 329 of the early Tang Dynasty in the Mogao Caves at Dunhuang. 	Strongly agree	27.0	52.9
	Strongly disagree	5.0	9.8
	Basically disagree	4.0	7.8
	Partially disagree	9.0	17.6
	Neutral	15.0	29.4
	Partially agree	9.0	17.6
This silk scarf features a repeating square pattern design.	Strongly agree	1.0	2.0
	Basically agree	8.0	15.7

Table 4.26: Continued

This silk scarf has a distinctive pattern.			
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	0.0	0.0
	Neutral	2.0	3.9
	Partially agree	10.0	19.6
	Basically agree	12.0	23.5
This silk scarf is a Dunhuang three rabbits and Feitian pattern silk scarf.		Strongly agree	27.0 52.9
	Strongly disagree	1.0	2.0
	Basically disagree	0.0	0.0
	Partially disagree	1.0	2.0
	Neutral	3.0	5.9
	Partially agree	7.0	13.7
	Basically agree	12.0	23.5
This silk scarf is designed using a combination of abstract and square motifs.		Strongly agree	24.0 47.1
This silk scarf shows off festivity and wealth.			
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	0.0	0.0
	Neutral	3.0	5.9
	Partially agree	5.0	9.8
	Basically agree	15.0	29.4
This silk scarf is designed using the colour structure of a Dunhuang mural and the Nine-Coloured Deer material.		Strongly agree	28.0 54.9
	Strongly disagree	4.0	7.8
	Basically disagree	6.0	11.8
	Partially disagree	5.0	9.8
	Neutral	4.0	7.8
	Partially agree	20.0	39.2
	Basically agree	7.0	13.7
This scarf is printed directly from a watercolour painting.		Strongly agree	5.0 9.8
This silk scarf is a unique colour			
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	0.0	0.0
	Neutral	3.0	5.9
	Partially agree	12.0	23.5
	Basically agree	17.0	33.3
The silk scarf is a reworking of elements related to the nine coloured deer in the Dunhuang frescoes.		Strongly agree	19.0 37.3
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	8.0	15.7
	Neutral	4.0	7.8
	Partially agree	8.0	15.7
	Basically agree	15.0	29.4
This silk scarf is printed using a Chinese brushwork design.		Strongly agree	16.0 31.4

N=51

Visual data summarization and analysis is shown in Table 4.26: There were six sets of comparative images of silk scarf products, two product pictures in each set, one with Dunhuang mural elements and the other without traditional cultural elements. The evaluation theme of the first group was that this silk scarf product is innovative. Among them, 94.1% of the respondents showed they were in favour of the first silk scarf designed with Dunhuang mural patterns and tones, while 80.4% of the respondents were in favour of the second silk scarf product that did not have traditional cultural elements and was designed with repetitive patterns. The silk scarf with Dunhuang mural art elements is more innovative and favoured.

The second group assessed whether they favoured the colour of silk scarves having auspicious meanings. 94.1% of respondents favoured the first silk scarf product based on combining Dunhuang flying nymphs and algal good motifs. Among them, 78.4% favoured the auspicious meaning of the second product, which did not have traditional Chinese cultural elements.

The third group assessed whether the silk scarf products highlight traditional culture. 92.2% of the respondents agreed that silk scarves based on Dunhuang Feitian and caisson patterns could highlight traditional culture. However, only 64.7% of the respondents agreed that the second silk scarf with a repeating square pattern highlighted traditional culture. The data shows that respondents generally think that the first picture of a silk scarf is more capable of highlighting traditional culture.

The fourth set of questions was: This silk scarf has a distinctive pattern. The first silk scarf product was based on the Dunhuang Three Dunhuang Feitian patterns with a

support rate of 94.1%. The second was designed using a combination of abstract and square patterns, with 90.2% of respondents in favour. The first silk scarf was a slight winner in terms of score.

The fifth group examined: This silk scarf shows off festivity and wealth. The first silk scarf product was designed based on the colour structure of Dunhuang murals, and the nine-coloured deer motif received 92.2% support. The second silk scarf, printed with watercolour paintings, received a 70.6% approval rate. The data suggests that silk scarves using elements of Dunhuang murals are more likely to be festivity.

The last group examined this silk scarf, which is a unique colour. The first silk scarf using the Dunhuang mural nine-coloured deer design received 94.1% approval, while the second silk scarf with a Chinese brushstroke pattern received 84.3% approval.

Table 4.27: Visual data summarisation and analysis

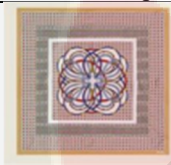
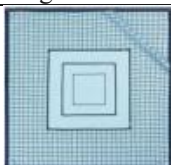
	Item	N	Percentage (%)
The design of this silk scarf is innovative.			
	Disagree	3.0	5.9
	Agree	48.0	94.1
This is a silk scarf designed using Dunhuang fresco patterns and tones.			
	Disagree	10.0	19.6
	Agree	41.0	80.4
This silk scarf has no traditional cultural elements and uses a repeating pattern design.			
The colour of this silk scarf has an auspicious meaning			
	Disagree	3.0	5.9
	Agree	48.0	94.1
This silk scarf is based on a combination of the Feitian of the Dunhuang frescoes and the caisson pattern.			
	Disagree	11.0	21.6
	Agree	40.0	78.4
This silk scarf features a combination of square and round cases that do not have traditional Chinese cultural elements			
This silk scarf showcases traditional culture.			
	Disagree	4.0	7.8
	Agree	47.0	92.2
This silk scarf is based on the flying apsaras and caisson pattern from Cave 329 of the early Tang Dynasty in the Mogao Caves at Dunhuang.			
	Disagree	18.0	35.3
	Agree	33.0	64.7
This silk scarf features a repeating square pattern design			
This silk scarf has a distinctive pattern.			
	Disagree	3.0	5.9
	Agree	48.0	94.1
This silk scarf is a Dunhuang three rabbits and Feitian pattern silk scarf.			

Table 4.27: Continued

	Disagree	5.0	9.8
	Agree	46.0	90.2
This silk scarf is designed using a combination of abstract and square motifs.			
This silk scarf shows off festivity and wealth.			
	Disagree	4.0	7.8
	Agree	47.0	92.2
This silk scarf is designed using the colour structure of a Dunhuang mural and the Nine-Coloured Deer material.			
	Disagree	15.0	29.4
	Agree	36.0	70.6
This scarf is printed directly from a watercolour painting.			
This silk scarf is a unique colour.			
	Disagree	3.0	5.9
	Agree	48.0	94.1
The silk scarf is a reworking of elements related to the nine coloured deer in the Dunhuang frescoes.			
	Disagree	8.0	15.7
	Agree	43.0	84.3
This silk scarf is printed using a Chinese brushwork design.			

N=51

Descriptive analysis of Attention seven-point scale data is shown in Table 4.28:

The first group of inspection questions is: This silk scarf will get more attention. The first silk scarf product used blue and coffee tones to contrast and match, drawing on the image of two Dunhuang Feitian figures for design. This silk scarf's strongly disagree, neutral and strongly agree ratios are 0.0%, 13.7% and 37.3%. The second

style had an overall grass green tone and is designed with a white and green checkered pattern, which did not reflect traditional Chinese cultural elements. The scarf had Strongly disagree, neutral and strongly agree ratios of 13.7%, 9.8% and 9.8%.

The second set of inspection questions is: This silk scarf grabs attention more often. The first silk scarf used a contrasting combination of orange and green, drawing on the design of the nine-colour deer and auspicious cloud patterns in Dunhuang murals. This silk scarf had strongly disagree, neutral and strongly agree ratios of 2.0%, 11.8% and 39.2%. The second scarf had a medium yellow tone with a black and white square pattern, and the design was simple and novel. This scarf's strongly disagree, neutral and strongly agree ratios were 15.7%, 27.5% and 3.9%.

The third group of questions is: This scarf catches attention more often. The first scarf used the classic image of a nine-colour deer and the traditional auspicious cloud pattern. The black background was matched with brightly coloured patterns, which were elegant and solemn. This scarf's strongly disagree, neutral and strongly agree ratios were 0.0%, 9.8% and 43.1%. The second scarf had an earthy red background with a light blue abstract pattern. It did not draw on traditional cultural elements. This scarf had strongly disagree, neutral and strongly agree ratios of 5.9%, 17.6% and 13.7%.

The fourth set of inspection questions is: This silk scarf has an outstanding shape. The first silk scarf was elegant blue-grey, with four Dunhuang Feitian figures around the Dunhuang caisson pattern. This scarf's strongly disagree, neutral and strongly agree ratios were 0.0%, 7.8% and 39.2%. The second scarf had a black border with a white background and two blue birds jumping on the branch in the middle. This scarf's

"strongly disagree", "neutral", and "strongly agree" ratios were 0.0%, 21.6%, and 9.8%, respectively.

The fifth group of inspection questions is: This silk scarf is very attractive. The first silk scarf was designed to reflect the classic colour combinations of Dunhuang murals, the image of nine-colour deer, and ribbons in Dunhuang murals. The design of this silk scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 0.0%, 2.0%, and 51.0%. The second scarf did not reflect traditional cultural elements and is made of cartoon characters and flowers. This scarf had strongly disagree, neutral and strongly agree ratios of 13.7%, 25.5% and 5.9%.

The last group examined is: This is the silk scarf that is more interested in. The centre of the first silk scarf was the Dunhuang mural caisson pattern, surrounded by images of Feitains. This scarf strongly disagrees, neutral, and strongly agree ratios were 0.0%, 13.7%, and 37.3%, respectively. The second scarf had a black border with a white background and a vivid abstract pattern in the centre. This scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 2.0%, 13.7%, and 15.7 %, respectively.

Table 4.28: Attention seven-point scale data

	Item	N	Percentage (%)
This silk scarf will get your attention 	Strongly disagree	0.0	0.0
	Basically disagree	1.0	2.0
	Partially disagree	0.0	0.0
	Neutral	7.0	13.7
	Partially agree	8.0	15.7
	Basically agree	16.0	31.4
	Strongly agree	19.0	37.3
This silk scarf features the image of a double Feitian being from a Dunhuang mural. 	Strongly disagree	7.0	13.7
	Basically disagree	4.0	7.8
	Partially disagree	12.0	23.5
	Neutral	5.0	9.8
	Partially agree	11.0	21.6
	Basically agree	7.0	13.7
	Strongly agree	5.0	9.8
This silk scarf has no traditional cultural elements. 	Strongly disagree	1.0	2.0
	Basically disagree	1.0	2.0
	Partially disagree	2.0	3.9
	Neutral	6.0	11.8
	Partially agree	10.0	19.6
	Basically agree	11.0	21.6
	Strongly agree	20.0	39.2
This silk scarf grabs your attention more often. 	Strongly disagree	8.0	15.7
	Basically disagree	4.0	7.8
	Partially disagree	10.0	19.6
	Neutral	14.0	27.5
	Partially agree	7.0	13.7
	Basically agree	6.0	11.8
	Strongly agree	2.0	3.9
This silk scarf is relatively simple, reflecting the black and white squares and yellow contrast. 	Strongly disagree	0.0	0.0
	Basically disagree	2.0	3.9
	Partially disagree	0.0	0.0
	Neutral	5.0	9.8
	Partially agree	7.0	13.7
	Basically agree	15.0	29.4
	Strongly agree	22.0	43.1
This silk scarf uses the traditional elements of the Dunhuang mural of the nine-coloured deer and the auspicious cloud motif. 	Strongly disagree	3.0	5.9
	Basically disagree	3.0	5.9
	Partially disagree	7.0	13.7
	Neutral	9.0	17.6
	Partially agree	14.0	27.5
	Basically agree	8.0	15.7
	Strongly agree	7.0	13.7

Table 4.28: Continued

This silk scarf has an outstanding shape			
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	0.0	0.0
	Neutral	4.0	7.8
	Partially agree	10.0	19.6
	Basically agree	17.0	33.3
This silk scarf is a re-creation of the Dunhuang Feitian.		Strongly agree	20.0 39.2
		Strongly disagree	0.0 0.0
	Basically disagree	4.0	7.8
	Partially disagree	10.0	19.6
	Neutral	11.0	21.6
	Partially agree	12.0	23.5
	Basically agree	9.0	17.6
	Strongly agree	5.0	9.8
A hand-painted design of two birds is printed on this scarf.			
This silk scarf is very attractive.			
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	0.0	0.0
	Neutral	1.0	2.0
	Partially agree	12.0	23.5
	Basically agree	12.0	23.5
This silk scarf is a reference to the Dunhuang mural image of the Nine-Coloured Deer.		Strongly agree	26.0 51.0
		Strongly disagree	7.0 13.7
	Basically disagree	5.0	9.8
	Partially disagree	8.0	15.7
	Neutral	13.0	25.5
	Partially agree	9.0	17.6
	Basically agree	6.0	11.8
	Strongly agree	3.0	5.9
This silk scarf is printed with cartoon patterned character portraits and flowers, without reference to traditional cultural elements.			
This is the silk scarf you are more interested in.			
	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	1.0	2.0
	Neutral	7.0	13.7
	Partially agree	9.0	17.6
	Basically agree	15.0	29.4
This silk scarf is a reference to the Dunhuang frescoes of the flying sky, lotus flower and caisson pattern.		Strongly agree	19.0 37.3
		Strongly disagree	1.0 2.0
	Basically disagree	5.0	9.8
	Partially disagree	6.0	11.8
	Neutral	7.0	13.7
	Partially agree	12.0	23.5
	Basically agree	12.0	23.5
	Strongly agree	8.0	15.7
This silk scarf is an abstract painted motif without traditional cultural elements.			

N=51

Descriptive analysis of Attention data summarization is shown in Table 4.29:

The second part of the product image evaluation is related to the principle of attention and was assessed using a seven-point Likert scale. The first group of images was about “This silk scarf would get attention.” The first silk scarf, designed with the image of the two Dunhuang Feitian figures, received an approval rate of 94.1% The second silk scarf, which used simple geometric shapes in its design, received a 54.9% approval rate. Users noticed more silk scarves with Dunhuang fresco elements than those without traditional cultural elements.

The second set of images is about “This silk scarf that grabs your attention more often.” The first silk scarf drew on the auspicious clouds and nine-coloured deer motifs of the Dunhuang murals, which received 92.2% support from respondents. With its simple black-and-white square design, the second silk scarf received 56.9% support, much lower than the first.

The third group evaluated "This scarf catches attention more often". The first scarf, which used the Dunhuang frescoes of the nine-coloured deer and auspicious clouds, received a 92.2% approval rate. The second silk scarf with contrasting grey tones and no traditional Chinese cultural elements received 74.5% support.

The fourth group is about this silk scarf, which has an outstanding shape. The first silk scarf designed with Dunhuang flying sky motifs received 92.2% support, while the second with hand-painted bird motifs received 68.6% support.

The fifth group was the evaluation: This silk scarf is beautiful. The first silk scarf was designed with the image of the Nine-Coloured Deer in Dunhuang murals combined with geometric shapes, and it gained a support rate of 94.1%. The second silk scarf, which has no traditional cultural elements and draws on cartoon character portraits and floral motifs, received a much lower approval rate of 54.9% than the first silk scarf.

The last group was examined: this silk scarf was attractive. The first silk scarf, which referenced Dunhuang's lotus flower and Feitian, received a 94.1% approval rate. The second silk scarf, printed with contemporary abstract motifs, received 72.6 %support.

The data proves that users are likelier to notice silk scarves with Dunhuang mural elements than those without traditional cultural elements.

Table 4.29: Attention data summarization and analysis

	Item	N	Percentage (%)
This silk scarf will get your attention 	Disagree	3.0	5.9
	Agree	48.0	94.1
This silk scarf features the image of a double Feitian being from a Dunhuang mural. 	Disagree	23.0	45.1
	Agree	28.0	54.9
This silk scarf has no traditional cultural elements. This silk scarf grabs your attention more often. 	Disagree	4.0	7.8
	Agree	47.0	92.2
This silk scarf features a secondary design using the auspicious clouds and nine-coloured deer motif from the Dunhuang frescoes.			

Table 4.29: Continued

	Disagree	22.0	43.1
	Agree	29	56.9
This silk scarf is relatively simple, reflecting the black and white squares and yellow contrast.			
This scarf catches your attention more often.			
	Disagree	4.0	7.8
	Agree	47.0	92.2
This silk scarf uses the traditional elements of the Dunhuang mural of the nine-coloured deer and the auspicious cloud motif.			
	Disagree	13.0	25.5
	Agree	38.0	74.5
This silk scarf uses a weak contrasting tonal pattern with no traditional Chinese cultural elements.			
This silk scarf has an outstanding shape			
	Disagree	4.0	7.8
	Agree	47.0	92.2
This silk scarf is a re-creation of the Dunhuang Feitian.			
	Disagree	16.0	31.4
	Agree	35.0	68.6
A hand-painted design of two birds is printed on this scarf.			
This silk scarf is very attractive.			
	Disagree	3.0	5.9
	Agree	48.0	94.1
This silk scarf is a reference to the Dunhuang mural image of the Nine-Coloured Deer.			
	Disagree	23.0	45.1
	Agree	28.0	54.9
This silk scarf is printed with cartoon patterned character portraits and flowers, without reference to traditional cultural elements.			

Table 4.29: Continued

This is the silk scarf you are more interested in.				
		Disagree	3.0	5.9
		Agree	48.0	94.1
This silk scarf is a reference to the Dunhuang frescoes of the flying sky, lotus flower and caisson pattern.				
		Disagree	14.0	27.5
		Agree	37.0	72.6
This silk scarf is an abstract painted motif without traditional cultural elements.				
N=51				

Descriptive analysis of Perception seven-point scale data is shown in Table 4.30:

The first group of products examined is “This silk scarf, which is even more striking and prominent”. The first silk scarf was designed based on the image of Buddha, auspicious cloud patterns, and nine-color deer in Dunhuang murals. The bright red background colour and beautiful traditional patterns made this scarf unique. This scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 0.0%, 2.0%, and 54.9%, respectively. The second scarf did not reflect traditional cultural elements and the strongly disagree, neutral and strongly agree ratios of this scarf were 2.0%, 27.5% and 9.8%.

The second group of inspection questions is: This silk scarf conveys traditional auspiciousness. The first silk scarf drew on the image of flying fairies in Dunhuang murals. Clouds and mist surround the three Feitian figures in the silk scarf, and the atmosphere was peaceful. This scarf's strongly disagree, neutral and strongly agree ratios are 0,0%, 3.9% and 51.0%. The second scarf used warm white and dark yellow colour contrast to depict gorgeous floral patterns and did not include traditional

elements. The second scarf strongly disagrees, neutral, and strongly agree ratios were 3.9%, 25.5%, and 11.8%, respectively.

The third group of inspection questions is: This silk scarf has even more cultural connotations. The first silk scarf was an overall contrast between blue-grey and brown. The silk scarf presented figures such as flying fairies, auspicious clouds, and mountains from Dunhuang murals as prototypes. This scarf had strong disagree, neutral, and strongly agree ratios of 0.0%, 2.0%, and 56.9%, respectively. The second scarf did not reflect traditional cultural elements. The scarf pattern was elegant, with blue flowers on a white background. This scarf's strongly disagree, neutral and strongly agree ratios were 13.7%, 19.6% and 9.8%.

The fourth group of questions examined is: This silk scarf pleases the senses, The graceful Feitian in the first scarf was looming in the unpredictable auspicious clouds. The overall dark red colour was combined with elegant patterns, which made people relax and happy. This scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 0.8%, 5.9%, and 45.1%, respectively. The second scarf depicted modern floral graphics and did not reflect traditional cultural elements. This scarf's strongly disagree, neutral and strongly agree ratios were 2.0%, 19.6% and 3.9 %.

The fifth group of questions examined is: This silk scarf has a sense of quality. The first scarf adopted red and blue contrasting tones and flexibly innovates the caisson pattern of Dunhuang murals. This scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 0.0%, 11.8%, and 43.1%, respectively. The second scarf did not contain traditional Chinese cultural elements and was printed with computer-generated floral graphics, this scarf. "strongly disagree", "neutral", and "strongly agree" ratios were 3.9%, 23.5%, and 11.8%, respectively.

The last group of questions examined is: This silk scarf will feel de-stressed. The first silk scarf was in contrasting tones of warm green and orange-red, with nine-colour deer surrounding the Dunhuang caisson pattern. The scarf had strongly disagreed, neutral and strongly agreed on ratios of 0.0%, 7.8% and 35.3%. The second scarf was overall warm yellow, with abstract graphics inside the square frame. It did not reflect traditional cultural elements. The second scarf's "strongly disagree", "neutral", and "strongly agree" ratios were 5.9%, 27.5%, and 13.7%, respectively.

Table 4.30: Perception seven-point scale data

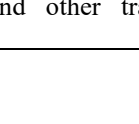
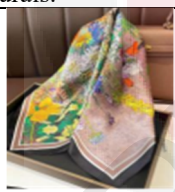
	Item	N	Percentage (%)
This silk scarf is even more striking and prominent 	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	0.0	0.0
	Neutral	1.0	2.0
	Partially agree	6.0	11.8
	Basically agree	16.0	31.4
This silk scarf is designed using the image of the nine-coloured deer from the Dunhuang mural and the auspicious cloud motif. 	Strongly agree	28.0	54.9
This silk scarf uses cartoonish flowers that do not reflect traditional Chinese cultural elements. 	Strongly disagree	1.0	2.0
	Basically disagree	6.0	11.8
	Partially disagree	6.0	11.8
	Neutral	14.0	27.5
	Partially agree	10.0	19.6
	Basically agree	9.0	17.6
This silk scarf conveys traditional auspiciousness. 	Strongly agree	5.0	9.8
This scarf is designed using the caisson pattern from Dunhuang murals. 	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	2.0	3.9
	Neutral	2.0	3.9
	Partially agree	6.0	11.8
	Basically agree	15.0	29.4
This scarf is designed using the caisson pattern from Dunhuang murals. 	Strongly agree	26.0	51.0
This silk scarf uses an abstract floral motif that does not contain elements of traditional Chinese culture. 	Strongly disagree	2.0	3.9
	Basically disagree	2.0	3.9
	Partially disagree	10.0	19.6
	Neutral	13.0	25.5
	Partially agree	11.0	21.6
	Basically agree	7.0	13.7
This silk scarf has even more cultural connotations	Strongly agree	6.0	11.8
This silk scarf uses the Dunhuang fresco of a Feitian being and other traditional cultural elements.	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	1.0	2.0
	Neutral	1.0	2.0
	Partially agree	3.0	5.9
	Basically agree	17.0	33.3
This silk scarf uses the Dunhuang fresco of a Feitian being and other traditional cultural elements.	Strongly agree	29.0	56.9

Table 4.30: Continued

 This silk scarf uses a simple floral motif and does not contain traditional cultural elements.	Strongly disagree	7.0	13.7
	Basically disagree	5.0	9.8
	Partially disagree	11.0	21.6
	Neutral	10.0	19.6
	Partially agree	8.0	15.7
	Basically agree	5.0	9.8
	Strongly agree	5.0	9.8
 This silk scarf fills the senses with pleasure This silk scarf is designed using the Dunhuang Feitian and auspicious clouds motif.	Strongly disagree	3.0	0.8
	Basically disagree	2.0	3.9
	Partially disagree	1.0	2.0
	Neutral	3.0	5.9
	Partially agree	8.0	15.7
	Basically agree	14.0	27.5
	Strongly agree	23.0	45.1
 This silk scarf is designed using a computer-generated floral design.	Strongly disagree	1.0	2.0
	Basically disagree	3.0	5.9
	Partially disagree	15.0	29.4
	Neutral	10.0	19.6
	Partially agree	10.0	19.6
	Basically agree	10.0	19.6
	Strongly agree	2.0	3.9
 This silk scarf has a sense of quality This silk scarf is designed based on the patterns of Dunhuang murals.	Strongly disagree	0.0	0.0
	Basically disagree	2.0	3.9
	Partially disagree	1.0	2.0
	Neutral	6.0	11.8
	Partially agree	8.0	15.7
	Basically agree	12.0	23.5
	Strongly agree	22.0	43.1
 This silk scarf is derived from hand-painted floral motifs without traditional Chinese cultural elements.	Strongly disagree	2.0	3.9
	Basically disagree	4.0	7.8
	Partially disagree	11.0	21.6
	Neutral	12.0	23.5
	Partially agree	8.0	15.7
	Basically agree	8.0	15.7
	Strongly agree	6.0	11.8
 This silk scarf will make you feel de-stressed. This silk scarf uses the Dunhuang mural deer shape and part of the caisson pattern image.	Strongly disagree	0.0	0.0
	Basically disagree	0.0	0.0
	Partially disagree	2.0	3.9
	Neutral	4.0	7.8
	Partially agree	16.0	31.4
	Basically agree	11.0	21.6
	Strongly agree	18.0	35.3
 The design of this silk scarf is derived from an abstract computer painting and has no traditional cultural elements.	Strongly disagree	3.0	5.9
	Basically disagree	3.0	5.9
	Partially disagree	7.0	13.7
	Neutral	14.0	27.5
	Partially agree	12.0	23.5
	Basically agree	5.0	9.8
	Strongly agree	7.0	13.7

N=51

Descriptive analysis of perception data summarization is shown in Table 4.31:

The first set of questions was if this silk scarf is even more striking and prominent. The first silk scarf was designed by combining the nine-coloured deer and auspicious cloud pattern of Dunhuang murals and received a support rate of 92.2%. The second silk scarf, with a support rate of 74.5%, was based on cartoon flowers and does not reflect traditional Chinese cultural elements.

The second set of questions was about if this silk scarf conveys traditional auspiciousness. The first silk scarf received 92.2% support and was innovatively designed using Dunhuang murals of flying skies and auspicious clouds. The second silk scarf, which used beautiful warm colours and abstract floral motifs, did not draw on traditional cultural elements and received 72.6% support.

The third group of questions was if this silk scarf has even more cultural connotations; the first silk scarf was designed with Dunhuang Feitian figures and auspicious clouds and received 94.1% support. The second scarf received 54.9% the respondents' support, but the scarf, which did not draw on Chinese traditional culture and was printed with simple floral motifs, received much less support than the first scarf.

The fourth group examined if this silk scarf fills the senses with pleasure. The first silk scarf was brightly coloured, with smooth patterns of auspicious clouds complementing the beautiful Dunhuang Feitian figures, and received a support rate of 92.2%. The second silk scarf was colourful and printed with realistic floral motifs, which had no traditional cultural elements, and received a support rate of 62.8%.

The fifth group question was if this silk scarf having a sense of quality. The first silk scarf drew on the caisson pattern of Dunhuang frescoes and adopted contrasting shades of blue and red, with rich and elegant colours, obtaining a support rate of 92.2%. The second silk scarf with hand-painted floral motifs was rich in colour, more realistic in pattern, and had no traditional cultural elements, receiving a 66.7% approval rate. The second silk scarf scored much lower than the first product with Dunhuang elements.

The last group examined is if this silk scarf will make you feel de-stressed.. The first silk scarf had a 90.2% support rating. This silk scarf used the Dunhuang algal well pattern in the centre and the image of a deer in a Dunhuang mural in the four corners. The silk scarf contrasted warm green tones and vermillion hues, complementing the pattern's design. The second silk scarf used abstract computer paintings in similar tones to the first silk scarf and did not have traditional cultural elements, with a support rating of 74.5%.

Overall, silk scarves with Dunhuang mural elements can bring a better impression and experience to designer users than those without traditional cultural elements. At present, the traditional national culture we cherish is still the soul pillar of art design. Designers should integrate it into modern design to meet contemporary cultural and spiritual needs. Dunhuang mural art should be incorporated into modern design to show the infinite artistic beauty of the combination of tradition and modernity (Liu, Yanhong, 2020).

Table 4.31: Perception data summarisation and analysis

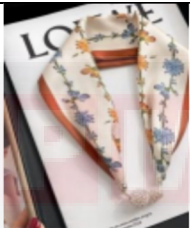
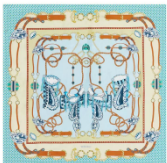
	Item	N	Percentage (%)
This silk scarf is even more striking and prominent	Disagree	4.0	7.8
	Agree	47.0	92.2
This silk scarf is designed using the image of the nine-coloured deer from the Dunhuang mural and the auspicious cloud motif.	Disagree	13.0	25.5
	Agree	38.0	74.5
This silk scarf uses cartoonish flowers that do not reflect traditional Chinese cultural elements.	Disagree	4.0	7.8
This silk scarf conveys traditional auspiciousness.	Agree	47.0	92.2
	Disagree	4.0	7.8
This scarf is designed using the caisson pattern from Dunhuang murals.	Agree	47.0	92.2
	Disagree	14.0	27.5
	Agree	37.0	72.6
This silk scarf uses an abstract floral motif that does not contain elements of traditional Chinese culture.	Disagree	3.0	5.9
This silk scarf has even more cultural connotations	Agree	48.0	94.1
	Disagree	23.0	45.1
This silk scarf uses the Dunhuang fresco of a Feitian being. And other traditional cultural elements.	Agree	28.0	54.9
	Disagree	23.0	45.1
This silk scarf uses a simple floral motif and does not contain traditional cultural elements.	Agree	28.0	54.9

Table 4.31: Continued

This silk scarf fills the senses with pleasure				
	Disagree	4.0	7.8	
	Agree	47.0	92.2	
This silk scarf is designed using the Dunhuang Feitian and auspicious clouds motif.				
	Disagree	19.0	37.3	
	Agree	32.0	62.8	
This silk scarf is designed using a computer-generated floral design.				
This silk scarf has a sense of quality.				
	Disagree	4.0	7.8	
	Agree	47.0	92.2	
This silk scarf is designed based on the patterns of Dunhuang murals.				
	Disagree	17.0	33.3	
	Agree	34.0	66.7	
This silk scarf is derived from hand-painted floral motifs without traditional Chinese cultural elements.				
This silk scarf will make you feel de-stressed.				
	Disagree	5.0	9.8	
	Agree	46.0	90.2	
This silk scarf uses the Dunhuang mural deer shape and part of the caisson pattern image.				
	Disagree	13.0	25.5	
	Agree	38.0	74.5	
The design of this silk scarf is derived from an abstract computer painting and has no traditional cultural elements.				

N=51

4.5 Data Analysis and Results of Expert Survey

The expert survey provides valuable insights into the integration of Dunhuang mural elements and cognitive ergonomics (CE) in contemporary silk scarf design for young women in China. Below is a detailed discussion of each survey question, presenting the mean (M) and standard deviation (SD) along with supporting literature.

4.5.1 Recognizing the Design Value of Dunhuang Mural Elements

The survey reveals that experts strongly recognize the design value of Dunhuang mural elements, with a mean score of 4.6 and standard deviation of 0.5. This indicates a high level of agreement on the artistic and cultural significance of Dunhuang motifs in modern fashion design. Literature suggests that Dunhuang murals serve as a vital part of Chinese heritage and have been widely utilized in textile and fashion industries to preserve cultural identity (Zhang, 2021). Integrating traditional art into contemporary products enhances aesthetic appeal and cultural appreciation among younger consumers (Li & Sun, 2020).

4.5.2 Applying Cognitive Ergonomics to Product Design

Experts highly support the application of cognitive ergonomics in product design, as reflected by a mean score of 4.5 and SD of 0.7. Cognitive ergonomics plays a crucial role in optimizing visual elements, color harmony, and user interaction with a product (Norman, 2013). Prior research highlights that color psychology and pattern recognition significantly impact users' cognitive responses, influencing their

preference and comfort in design (Sun & Liu, 2020). Thus, integrating CE principles ensures that Dunhuang mural elements are not only visually appealing but also cognitively engaging.

4.5.3 Suitability of Dunhuang Mural Elements in Silk Scarf Design

With a mean score of 4.6 and SD of 0.6, experts affirm that Dunhuang mural elements are highly suitable for silk scarf design. The flowing lines, intricate patterns, and vibrant colors found in Dunhuang murals align well with modern textile aesthetics (Wang, 2019). Research suggests that traditional Chinese art forms provide unique visual motifs, making them adaptable for contemporary fashion products while maintaining their cultural authenticity (Guo, 2021).

4.5.4 Essential Role of Dunhuang Mural Elements in Silk Scarves

A mean score of 4.4 and SD of 0.7 indicates that experts recognize the essential nature of Dunhuang mural elements in silk scarf design. Traditional motifs contribute to the overall storytelling aspect of fashion, adding depth and symbolism to the product (Chen & Zhou, 2022). The application of historical elements in textile design has been found to enhance consumer engagement and emotional attachment, particularly among those who appreciate heritage-based aesthetics (Feng et al., 2021).

4.5.5 Key Elements of Dunhuang Murals for Silk Scarf Design

Experts confirm that the three primary elements—line, pattern, and color—are critical for silk scarf design, as shown by a mean score of 4.4 and SD of 0.7. Previous studies emphasize that line work from Dunhuang murals creates a sense of fluidity, patterns contribute to symbolic representation, and colors generate emotional impact (Guo, 2021). The combination of these elements results in a visually harmonious and culturally rich product.

4.5.6 Combining Dunhuang Mural Elements with Cognitive Ergonomics

With a mean score of 4.5 and SD of 0.5, experts strongly agree that integrating Dunhuang mural elements with cognitive ergonomics enhances silk scarf design. Cognitive ergonomics ensures that the visual and tactile experiences align with user perception and comfort (Tang et al., 2022). Prior research confirms that the combination of traditional art and CE principles improves usability, aesthetic appeal, and consumer satisfaction (Norman, 2013).

4.5.7 Attracting Consumers with Dunhuang Mural Elements

Experts believe that incorporating Dunhuang mural elements into silk scarf design can attract consumers, as reflected by a mean score of 4.3 and SD of 0.7. Studies on “Guochao”, a rising trend of integrating traditional Chinese cultural elements into modern products, suggest that young consumers are increasingly drawn to heritage-based designs (Wu & Chen, 2022). The use of Dunhuang elements not only adds

artistic uniqueness but also aligns with consumer preferences for cultural authenticity (Xie & Zhang, 2021).

4.5.8 Enhancing Product Competitiveness with a Design Framework

A high mean score of 4.6 and SD of 0.6 indicates strong expert agreement that a well-defined design framework incorporating Dunhuang elements can enhance the competitiveness of silk scarves. Previous research suggests that products infused with cultural heritage stand out in the market due to their unique artistic value and historical significance (Feng et al., 2021). By leveraging both traditional elements and cognitive ergonomics, a structured design approach can improve brand differentiation and consumer engagement.

4.5.9 Innovation in Contemporary Silk Scarf Design

Experts find the contemporary silk scarf design framework innovative, with a mean score of 4.4 and SD of 0.7. Literature on cultural design innovation highlights the importance of blending historical aesthetics with modern production techniques to create novel and marketable products (Chen & Wang, 2021). The incorporation of Dunhuang fresco elements into silk scarves offers a unique fusion of tradition and modernity, making the design framework a valuable approach for future fashion development.

4.5.10 Effectiveness of Design Principles in Guiding Product Development

With a mean score of 4.4 and SD of 0.7, experts agree that the design principles embedded in the framework effectively guide silk scarf development. Structured frameworks ensure that cultural elements are transformed into contemporary fashion in a way that maintains their artistic integrity while meeting modern design standards (Zhao, 2020). This aligns with existing research, which emphasizes that aesthetic principles derived from traditional art can serve as a guiding tool for innovative product design (Li & Sun, 2020).

4.6 The Development of New Framework

4.6.1 Correlation Analysis of User Data

Before the development of the design framework, Pearson correlation analyses were conducted in this study on user demographic variables and three scales of cognitive ergonomics to clarify the correlation between the user demographic variables and three cognitive ergonomics scales.

The three dimensions of cognitive ergonomics used in this study are vision, attention and perception. Each dimension has 12 pictures. The 12 photos in the Vision section are numbered V1, V2, V3 ..., and V12. The 12 photos in the Attention section are numbered A1, A2, A3 ..., and A12. The 12 images in the Perception section are numbered P1, P2, P3..., and P12.

4.6.1.1 The correlation analysis between the demographic variables and Vision

The correlation analysis based on Table 4.32 shows that Gender is significantly negatively correlated with V2 and V10, with correlation coefficients of -0.151 and -0.113, respectively. Gender is significantly positively correlated with V7 with a correlation coefficient of 0.117, as evidenced by this data. Women prefer products with traditional cultural elements more than men. A significant positive correlation exists between age and V2, V4, V9, and V10, with correlation coefficients of 0.209, 0.148, 0.144, and 0.208, respectively. A significant negative correlation exists between age and V7 and V8, with correlation coefficients of -0.138 and -0.143, respectively. The data suggests the older the respondents are, the more interested they will be in silk scarf products that do not contain traditional cultural elements. Marital status is significantly positively correlated with V1, V2, V4, V6, V9, V10, and V11, with correlation coefficients of 0.128, 0.254, 0.175, 0.156, 0.174, 0.231, and 0.121 respectively. Marital status is negatively correlated with V8. Data proves that marital status influences the feedback on the product, which will be different and fluctuate wildly. Occupational status correlates negatively with V2, V4, V9, and V10. The correlation coefficients are -0.218, -0.165, -0.132, and -0.142, respectively, which proves that civil servants may be more interested in Dunhuang mural element products than others. Educational background has a significant negative correlation with V4, V6, and V11, with correlation coefficients of -0.148, -0.127, and -0.113, respectively, indicating that people with higher professional qualifications may be more interested in products that do not contain Dunhuang mural elements. Monthly income status is positively correlated with V2, V4, V6, V9, and V10, with correlation coefficients of 0.165, 0.115, 0.103, 0.108, and 0.134, respectively; monthly income status is

significantly negatively correlated with V7 and V8, with correlation coefficients of -0.153 and -0.114. This data shows that higher-income people will be more interested in silk scarf products with the Dunhuang mural element.

According to the data, several demographic variables such as gender, age, marital status, occupation, education, and income of user respondents are significantly related to vision. Gender differences show up in many products. There are statistically significant differences between websites produced by men and women, so websites in male- and female-dominated markets should consider aesthetic diversity that can appeal to their target audience (Moss, G. et al., 2006). Gender as a social factor will affect cultural product choices and preferences, and gender differences should be considered when designing and marketing cultural products to meet the needs of different user groups (Ottoni et al., 2021). Demographic data has always played an essential role in international market segmentation (Cleveland M. et al., 2011). Income level plays a crucial role in an individual's access to and utilisation of cultural capital, affecting their involvement in traditional culture (Lareau & Weininger, 2003).

Table 4.32: Correlation analysis of demographic variables with Vision

Item	Pearson Correlation	Sig. (2-tailed)
Sex		
V1-The design of this silk scarf is innovative.	-0.096	0.060
V2-The design of this silk scarf is innovative.	-.151**	0.003
V3-The colour of this silk scarf has an auspicious meaning	0.004	0.939
V4-The colour of this silk scarf has an auspicious meaning	-0.086	0.092
V5-This silk scarf showcases traditional culture.	0.084	0.099
V6-This silk scarf showcases traditional culture.	-0.098	0.055
V7-This silk scarf has a distinctive pattern.	.117*	0.022
V8-This silk scarf has a distinctive pattern.	0.094	0.066
V9-This silk scarf shows off festivity and wealth.	-0.056	0.275
V10-This silk scarf shows off festivity and wealth.	-.113*	0.026
V11-This silk scarf is a unique colour	0.040	0.440
V12-This silk scarf is a unique colour	-0.056	0.270
Living		
V1-The design of this silk scarf is innovative.	-0.051	0.323
V2-The design of this silk scarf is innovative.	-0.048	0.349
V3-The colour of this silk scarf has an auspicious meaning	0.026	0.611
V4-The colour of this silk scarf has an auspicious meaning	0.019	0.704

Table 4.32: Continued

V5-This silk scarf showcases traditional culture.	-0.048	0.353
V6-This silk scarf showcases traditional culture.	0.040	0.439
V7-This silk scarf has a distinctive pattern.	0.019	0.712
V8-This silk scarf has a distinctive pattern.	0.037	0.468
V9-This silk scarf shows off festivity and wealth.	-0.012	0.811
V10-This silk scarf shows off festivity and wealth.	0.061	0.232
V11-This silk scarf is a unique colour	-0.038	0.460
V12-This silk scarf is a unique colour	-0.004	0.943
District		
V1-The design of this silk scarf is innovative.	0.023	0.651
V2-The design of this silk scarf is innovative.	-0.010	0.850
V3-The colour of this silk scarf has an auspicious meaning	0.039	0.442
V4-The colour of this silk scarf has an auspicious meaning	0.032	0.527
V5-This silk scarf showcases traditional culture.	0.028	0.579
V6-This silk scarf showcases traditional culture.	-0.003	0.949
V7-This silk scarf has a distinctive pattern.	0.010	0.838
V8-This silk scarf has a distinctive pattern.	0.059	0.249
V9-This silk scarf shows off festivity and wealth.	0.030	0.556
V10-This silk scarf shows off festivity and wealth.	0.019	0.707
V11-This silk scarf is a unique colour	0.061	0.235
V12-This silk scarf is a unique colour	-0.002	0.968
Age		
V1-The design of this silk scarf is innovative.	0.097	0.057
V2-The design of this silk scarf is innovative.	.209**	0.000
V3-The colour of this silk scarf has an auspicious meaning	0.049	0.337
V4-The colour of this silk scarf has an auspicious meaning	.148**	0.004
V5-This silk scarf showcases traditional culture.	-0.032	0.527
V6-This silk scarf showcases traditional culture.	.144**	0.005
V7-This silk scarf has a distinctive pattern.	-.138**	0.007
V8-This silk scarf has a distinctive pattern.	-.143**	0.005
V9-This silk scarf shows off festivity and wealth.	.147**	0.004
V10-This silk scarf shows off festivity and wealth.	.208**	0.000
V11-This silk scarf is a unique colour	0.092	0.072
V12-This silk scarf is a unique colour	0.079	0.124
Marital Status		
V1-The design of this silk scarf is innovative.	.128*	0.012
V2-The design of this silk scarf is innovative.	.254**	0.000
V3-The colour of this silk scarf has an auspicious meaning	0.078	0.126
V4-The colour of this silk scarf has an auspicious meaning	.175**	0.001
V5-This silk scarf showcases traditional culture.	-0.020	0.703
V6-This silk scarf showcases traditional culture.	.156**	0.002
V7-This silk scarf has a distinctive pattern.	-0.084	0.099
V8-This silk scarf has a distinctive pattern.	-.123*	0.016
V9-This silk scarf shows off festivity and wealth.	.174**	0.001
V10-This silk scarf shows off festivity and wealth.	.231**	0.000
V11-This silk scarf is a unique colour	.121*	0.017
V12-This silk scarf is a unique colour	0.068	0.183
Occupation		
V1-The design of this silk scarf is innovative.	-0.106	0.038
V2-The design of this silk scarf is innovative.	-.218**	0.000
V3-The colour of this silk scarf has an auspicious meaning	-0.039	0.447
V4-The colour of this silk scarf has an auspicious meaning	-.165**	0.001
V5-This silk scarf showcases traditional culture.	-0.008	0.882
V6-This silk scarf showcases traditional culture.	-0.093	0.068
V7-This silk scarf has a distinctive pattern.	0.083	0.104
V8-This silk scarf has a distinctive pattern.	0.078	0.127
V9-This silk scarf shows off festivity and wealth.	-.132**	0.010
V10-This silk scarf shows off festivity and wealth.	-.142**	0.005
V11-This silk scarf is a unique colour	-0.071	0.163
V12-This silk scarf is a unique colour	-0.064	0.210

Table 4.32: Continued

Educational background		
V1-The design of this silk scarf is innovative.	-0.042	0.407
V2-The design of this silk scarf is innovative.	-0.074	0.150
V3-The colour of this silk scarf has an auspicious meaning	-0.002	0.970
V4-The colour of this silk scarf has an auspicious meaning	-.148**	0.004
V5-This silk scarf showcases traditional culture.	0.022	0.663
V6-This silk scarf showcases traditional culture.	-.127*	0.013
V7-This silk scarf has a distinctive pattern.	0.011	0.826
V8-This silk scarf has a distinctive pattern.	0.016	0.754
V9-This silk scarf shows off festivity and wealth.	-0.001	0.986
V10-This silk scarf shows off festivity and wealth.	-0.071	0.165
V11-This silk scarf is a unique colour	-.113*	0.027
V12-This silk scarf is a unique colour	-0.050	0.324
Monthly Income		
V1-The design of this silk scarf is innovative.	0.077	0.133
V2-The design of this silk scarf is innovative.	.165**	0.001
V3-The colour of this silk scarf has an auspicious meaning	0.051	0.316
V4-The colour of this silk scarf has an auspicious meaning	.115*	0.024
V5-This silk scarf showcases traditional culture.	-0.048	0.344
V6-This silk scarf showcases traditional culture.	.103*	0.044
V7-This silk scarf has a distinctive pattern.	-.153**	0.003
V8-This silk scarf has a distinctive pattern.	-.114*	0.025
V9-This silk scarf shows off festivity and wealth.	.108*	0.034
V10-This silk scarf shows off festivity and wealth.	.134**	0.009
V11-This silk scarf is a unique colour	0.032	0.527
V12-This silk scarf is a unique colour	0.084	0.100

N=384

4.6.1.2 The correlation analysis between demographic variables and Attention

It can be seen from Table 4.33 the correlation analysis results suggest that gender has a significant negative correlation with A3, A4, A6, A7, A8, and A11, and the correlation coefficients are -0.141, -0.170, -0.163, -0.128, -0.127, and -0.124 respectively; there are many significant correlation data between gender and Attention, indicating that different age groups may pay attention to different styles of scarves and need to be studied separately. Place of birth has a significant negative correlation with A1 and A3, with correlation coefficients of -0.119 and -0.124, respectively, indicating that people born in big cities may be more interested in products that do not contain Dunhuang mural elements. Age is significantly positively correlated with A3, A4, A6, and A7, and the correlation coefficients are 0.272, 0.228, 0.177, and 0.106, respectively, indicating that the correlation between age and Attention is relatively significant, but

the situation is quite changeable. Marital status significantly correlates positively with A2, A3, A4, A6, A7, A8, and A10. The correlation coefficients are 0.128, 0.108, 0.277, 0.222, 0.197, 0.120, 0.124, and 0.122, respectively. It indicates that married or divorced respondents may be more interested in Dunhuang mural element silk scarves than single people. Occupation has a significant negative correlation with A3, A4, A6, and A7. The correlation coefficients are -0.196, -0.118, -0.140, and -0.116, respectively, indicating that occupation is closely related to product attention, but the situation is multivariate. Educational background is significantly negatively correlated with A5 and A8, with correlation coefficients of -0.112 and -0.104, respectively, indicating that educational background is less relevant to product attention than other demographic variables. Monthly income is significantly positively correlated with A3, A4, and A6, and the correlation coefficients are 0.217, 0.174, and 0.126, respectively, indicating that people with higher incomes are more likely to pay attention to silk scarf products that do not contain Dunhuang mural elements.

Demographic data has always played an essential role in international market segmentation (Cleveland M. et al., 2011). Attention is the brain's filtering or selection of information, the consciousness focus, and the concentration of mental activities on specific things (Xue et al., 2004). Education level is related to attention ability and may be associated with the development of cognitive skills during education. People with higher education may perform better on certain types of attention tasks (Batty et al., 2007). Capturing the user's attention is crucial. Dunhuang murals attract the eye with their unique colour schemes, and this visual effect helps guide users' attention to the product, exerting long-term impact on brand and product (Wu & Liu, 2023).

Table 4.33: Correlation analysis of demographic variables with Attention

	Pearson Correlation	Sig. (2-tailed)
Sex		
A1-This silk scarf will get your attention	-0.032	0.533
A2-This silk scarf will get your attention	-0.099	0.051
A3-This silk scarf grabs your attention more often.	-.141**	0.006
A4-This silk scarf grabs your attention more often.	-.170**	0.001
A5-This scarf catches your attention more often.	-0.099	0.052
A6-This scarf catches your attention more often.	-.163**	0.001
A7-This silk scarf has an outstanding shape	-.128*	0.012
A8-This silk scarf has an outstanding shape	-.127*	0.013
A9-This silk scarf is very attractive.	-0.001	0.990
A10-This silk scarf is very attractive.	-0.067	0.188
A11-This is the silk scarf you are more interested in.	-.124*	0.015
A12-This is the silk scarf you are more interested in.	-0.067	0.191
Living		
A1-This silk scarf will get your attention	-.119*	0.020
A2-This silk scarf will get your attention	-0.072	0.158
A3-This silk scarf grabs your attention more often.	-.124*	0.015
A4-This silk scarf grabs your attention more often.	-0.044	0.388
A5-This scarf catches your attention more often.	-0.016	0.750
A6-This scarf catches your attention more often.	0.018	0.721
A7-This silk scarf has an outstanding shape	-0.022	0.664
A8-This silk scarf has an outstanding shape	-0.002	0.965
A9-This silk scarf is very attractive.	0.002	0.974
A10-This silk scarf is very attractive.	0.052	0.308
A11-This is the silk scarf you are more interested in.	0.037	0.474
A12-This is the silk scarf you are more interested in.	0.053	0.298
District		
A1-This silk scarf will get your attention	-0.011	0.823
A2-This silk scarf will get your attention	0.087	0.088
A3-This silk scarf grabs your attention more often.	0.071	0.167
A4-This silk scarf grabs your attention more often.	0.058	0.260
A5-This scarf catches your attention more often.	0.042	0.415
A6-This scarf catches your attention more often.	0.076	0.135
A7-This silk scarf has an outstanding shape	0.036	0.484
A8-This silk scarf has an outstanding shape	0.078	0.128
A9-This silk scarf is very attractive.	0.007	0.895
A10-This silk scarf is very attractive.	0.042	0.417
A11-This is the silk scarf you are more interested in.	0.083	0.104
A12-This is the silk scarf you are more interested in.	0.027	0.599
Age		
A1-This silk scarf will get your attention	0.077	0.134
A2-This silk scarf will get your attention	0.077	0.130
A3-This silk scarf grabs your attention more often.	.272**	0.000
A4-This silk scarf grabs your attention more often.	.228**	0.000
A5-This scarf catches your attention more often.	0.020	0.694
A6-This scarf catches your attention more often.	.177**	0.000
A7-This silk scarf has an outstanding shape	.106*	0.038
A8-This silk scarf has an outstanding shape	0.097	0.056
A9-This silk scarf is very attractive.	-0.024	0.635
A10-This silk scarf is very attractive.	0.099	0.052
A11-This is the silk scarf you are more interested in.	0.038	0.458
A12-This is the silk scarf you are more interested in.	0.051	0.318
Marital Status		
A1-This silk scarf will get your attention	.128*	0.012
A2-This silk scarf will get your attention	.108*	0.035
A3-This silk scarf grabs your attention more often.	.277**	0.000
A4-This silk scarf grabs your attention more often.	.222**	0.000

Table 4.33: Continued

A5-This scarf catches your attention more often.	0.062	0.225
A6-This scarf catches your attention more often.	.197**	0.000
A7-This silk scarf has an outstanding shape	.120*	0.019
A8-This silk scarf has an outstanding shape	.124*	0.015
A9-This silk scarf is very attractive.	0.023	0.649
A10-This silk scarf is very attractive.	.122*	0.017
A11-This is the silk scarf you are more interested in.	0.060	0.244
A12-This is the silk scarf you are more interested in.	0.048	0.344
Occupation		
A1-This silk scarf will get your attention	-0.099	0.053
A2-This silk scarf will get your attention	-0.071	0.165
A3-This silk scarf grabs your attention more often.	-.196**	0.000
A4-This silk scarf grabs your attention more often.	-.118*	0.021
A5-This scarf catches your attention more often.	-0.082	0.109
A6-This scarf catches your attention more often.	-.140**	0.006
A7-This silk scarf has an outstanding shape	-.116*	0.023
A8-This silk scarf has an outstanding shape	-0.078	0.125
A9-This silk scarf is very attractive.	-0.004	0.934
A10-This silk scarf is very attractive.	-0.059	0.246
A11-This is the silk scarf you are more interested in.	-0.061	0.232
A12-This is the silk scarf you are more interested in.	-0.077	0.131
Educational Background		
A1-This silk scarf will get your attention	-0.098	0.056
A2-This silk scarf will get your attention	-0.090	0.077
A3-This silk scarf grabs your attention more often.	-0.065	0.205
A4-This silk scarf grabs your attention more often.	-0.089	0.083
A5-This scarf catches your attention more often.	-.112*	0.029
A6-This scarf catches your attention more often.	-0.062	0.226
A7-This silk scarf has an outstanding shape	-0.048	0.350
A8-This silk scarf has an outstanding shape	-.104*	0.042
A9-This silk scarf is very attractive.	-0.078	0.127
A10-This silk scarf is very attractive.	-0.074	0.149
A11-This is the silk scarf you are more interested in.	-0.050	0.328
A12-This is the silk scarf you are more interested in.	-0.034	0.506
Monthly Income		
A1-This silk scarf will get your attention	0.080	0.115
A2-This silk scarf will get your attention	0.076	0.136
A3-This silk scarf grabs your attention more often.	.217**	0.000
A4-This silk scarf grabs your attention more often.	.174**	0.001
A5-This scarf catches your attention more often.	0.020	0.701
A6-This scarf catches your attention more often.	.126*	0.014
A7-This silk scarf has an outstanding shape	0.079	0.123
A8-This silk scarf has an outstanding shape	0.075	0.143
A9-This silk scarf is very attractive.	-0.032	0.527
A10-This silk scarf is very attractive.	0.050	0.324
A11-This is the silk scarf you are more interested in.	0.020	0.695
A12-This is the silk scarf you are more interested in.	0.078	0.127

N=384

4.6.1.3 The partial correlation analysis between the demographic variables and Perception

From the following correlation analysis, it is clear that: As can be seen from Table 4.34, Gender is significantly negatively correlated with P2, P4, P11, and P12, with correlation coefficients of -0.128, -0.160, -0.103, and -0.114 respectively, indicating that women have a more robust perception of Dunhuang mural element products. The place of residence is significantly negatively correlated with P2, P4, and P11, and the correlation coefficients are -0.128, -0.160, -0.103, and -0.114 respectively; the place of residence is significantly positively correlated with P1 and P7, with the correlation coefficients being 0.111 and 0.111 respectively; age and P2, P4, P6, and P11 are significantly positively correlated, and the correlation coefficients are 0.156, 0.151, 0.113, and 0.123 respectively, indicating that people living in Shandong have a strong perception of silk scarf products with Dunhuang mural elements. Marital status has a significant positive correlation with P2, P4, P6, P10, and P11, and the correlation coefficients are 0.144, 0.137, 0.127, 0.111, and 0.168 respectively, indicating that married people have a more vital perception of silk scarf products with Dunhuang mural elements. Occupational status has a significant negative correlation with P2, P5, and P6, with correlation coefficients of -0.187, -0.121, and -0.174, indicating that public employees are more perceptive of Dunhuang mural element scarves than non-public employees. There is a significant positive correlation between monthly income and P2, with a correlation coefficient of 0.116, indicating that The higher the income is, the stronger the perception people may have of silk scarves that do not contain Dunhuang mural elements.

Research data shows that Perception has significant correlations with demographic variables. Perceptions are reliable sources for forming true beliefs and bring us into direct contact with the world, providing a unique way of acquiring facts (Brewer, 1999). The visual effects of colour significantly impact human perception and behaviour. The colours of Dunhuang murals not only have cultural connotations but also create unique emotional connections in users' hearts. This emotional connection is crucial for brand loyalty (Wu & Liu, 2023).

Table 4.34: Correlation analysis of demographic variables with Perception

	Pearson Correlation	Sig. (2-tailed)
Sex		
P1-This silk scarf is even more striking and prominent	-0.065	0.206
P2-This silk scarf is even more striking and prominent	-.128*	0.012
P3-This silk scarf conveys traditional auspiciousness.	0.019	0.710
P4-This silk scarf conveys traditional auspiciousness.	-.160**	0.002
P5-This silk scarf has even more cultural connotations	0.018	0.720
P6-This silk scarf has even more cultural connotations	-0.081	0.113
P7-This silk scarf fills the senses with pleasure	-0.016	0.759
P8-This silk scarf fills the senses with pleasure	-0.036	0.477
P9-This silk scarf has a sense of quality	-0.086	0.092
P10-This silk scarf has a sense of quality	-0.083	0.105
P11-This silk scarf will make you feel de-stressed.	-.103*	0.044
P12-This silk scarf will make you feel de-stressed.	-.114*	0.025
Living		
P1-This silk scarf is even more striking and prominent	-0.065	0.206
P2-This silk scarf is even more striking and prominent	-.128*	0.012
P3-This silk scarf conveys traditional auspiciousness.	0.019	0.710
P4-This silk scarf conveys traditional auspiciousness.	-.160**	0.002
P5-This silk scarf has even more cultural connotations	0.018	0.720
P6-This silk scarf has even more cultural connotations	-0.081	0.113
P7-This silk scarf fills the senses with pleasure	-0.016	0.759
P8-This silk scarf fills the senses with pleasure	-0.036	0.477
P9-This silk scarf has a sense of quality	-0.086	0.092
P10-This silk scarf has a sense of quality	-0.083	0.105
P11-This silk scarf will make you feel de-stressed.	-.103*	0.044
P12-This silk scarf will make you feel de-stressed.	-.114*	0.025
District		
P1-This silk scarf is even more striking and prominent	.111*	0.030
P2-This silk scarf is even more striking and prominent	0.009	0.861
P3-This silk scarf conveys traditional auspiciousness.	0.031	0.543
P4-This silk scarf conveys traditional auspiciousness.	0.046	0.370
P5-This silk scarf has even more cultural connotations	0.067	0.188
P6-This silk scarf has even more cultural connotations	0.056	0.269
P7-This silk scarf fills the senses with pleasure	.111*	0.030
P8-This silk scarf fills the senses with pleasure	0.013	0.799
P9-This silk scarf has a sense of quality	0.043	0.404
P10-This silk scarf has a sense of quality	0.021	0.682
P11-This silk scarf will make you feel de-stressed.	-0.020	0.694
P12-This silk scarf will make you feel de-stressed.	-0.035	0.492

Table 4.34: Continued

Age		
P1-This silk scarf is even more striking and prominent	-0.017	0.734
P2-This silk scarf is even more striking and prominent	.156**	0.002
P3-This silk scarf conveys traditional auspiciousness.	-0.045	0.382
P4-This silk scarf conveys traditional auspiciousness.	.151**	0.003
P5-This silk scarf has even more cultural connotations	0.043	0.401
P6-This silk scarf has even more cultural connotations	.113*	0.027
P7-This silk scarf fills the senses with pleasure	0.029	0.576
P8-This silk scarf fills the senses with pleasure	0.017	0.744
P9-This silk scarf has a sense of quality	0.063	0.219
P10-This silk scarf has a sense of quality	0.094	0.067
P11-This silk scarf will make you feel de-stressed.	.123*	0.016
P12-This silk scarf will make you feel de-stressed.	0.055	0.284
Marital Status		
P1-This silk scarf is even more striking and prominent	0.010	0.838
P2-This silk scarf is even more striking and prominent	.144**	0.005
P3-This silk scarf conveys traditional auspiciousness.	-0.028	0.586
P4-This silk scarf conveys traditional auspiciousness.	.137**	0.007
P5-This silk scarf has even more cultural connotations	0.073	0.151
P6-This silk scarf has even more cultural connotations	.127*	0.012
P7-This silk scarf fills the senses with pleasure	0.066	0.197
P8-This silk scarf fills the senses with pleasure	0.008	0.874
P9-This silk scarf has a sense of quality	0.078	0.126
P10-This silk scarf has a sense of quality	.111*	0.030
P11-This silk scarf will make you feel de-stressed.	.168**	0.001
P12-This silk scarf will make you feel de-stressed.	0.099	0.053
Occupation		
P1-This silk scarf is even more striking and prominent	0.042	0.414
P2-This silk scarf is even more striking and prominent	-.187**	0.000
P3-This silk scarf conveys traditional auspiciousness.	0.050	0.331
P4-This silk scarf conveys traditional auspiciousness.	-0.093	0.070
P5-This silk scarf has even more cultural connotations	-.121*	0.017
P6-This silk scarf has even more cultural connotations	-.174**	0.001
P7-This silk scarf fills the senses with pleasure	-0.031	0.546
P8-This silk scarf fills the senses with pleasure	-0.019	0.704
P9-This silk scarf has a sense of quality	-0.055	0.283
P10-This silk scarf has a sense of quality	-0.087	0.090
P11-This silk scarf will make you feel de-stressed.	-0.094	0.064
P12-This silk scarf will make you feel de-stressed.	-0.052	0.313
Educational Background		
P1-This silk scarf is even more striking and prominent	-0.073	0.154
P2-This silk scarf is even more striking and prominent	-0.097	0.058
P3-This silk scarf conveys traditional auspiciousness.	-0.014	0.779
P4-This silk scarf conveys traditional auspiciousness.	-0.084	0.099
P5-This silk scarf has even more cultural connotations	-0.055	0.286
P6-This silk scarf has even more cultural connotations	-0.034	0.511
P7-This silk scarf fills the senses with pleasure	-0.083	0.106
P8-This silk scarf fills the senses with pleasure	-0.073	0.155
P9-This silk scarf has a sense of quality	-0.060	0.239
P10-This silk scarf has a sense of quality	-0.019	0.712
P11-This silk scarf will make you feel de-stressed.	-0.012	0.817
P12-This silk scarf will make you feel de-stressed.	0.007	0.890
Monthly Income		
P1-This silk scarf is even more striking and prominent	-0.040	0.433
P2-This silk scarf is even more striking and prominent	.116*	0.023
P3-This silk scarf conveys traditional auspiciousness.	-0.045	0.383
P4-This silk scarf conveys traditional auspiciousness.	0.069	0.175
P5-This silk scarf has even more cultural connotations	0.024	0.636
P6-This silk scarf has even more cultural connotations	0.086	0.091
P7-This silk scarf fills the senses with pleasure	0.013	0.807
P8-This silk scarf fills the senses with pleasure	-0.014	0.785
P9-This silk scarf has a sense of quality	0.023	0.650
P10-This silk scarf has a sense of quality	0.064	0.210
P11-This silk scarf will make you feel de-stressed.	0.058	0.259
P12-This silk scarf will make you feel de-stressed.	0.012	0.814

N=384

4.7 Summary

This chapter presents a detailed analysis of the collected survey data, closely aligning with the research objectives. Using SPSS software, the study conducts a descriptive analysis of both user and designer evaluations regarding silk scarf products, particularly focusing on the cognitive dimensions of vision, attention, and perception. Additionally, the chapter examines expert opinions on integrating Dunhuang mural elements into contemporary silk scarf design, assessing their effectiveness and acceptance among target consumers. The results highlight that Dunhuang mural elements play a significant role in silk scarf design, particularly when analyzed from a CE perspective. Experts, designers, and users recognize that the integration of traditional motifs enhances the aesthetic, cultural, and functional value of silk scarves. The findings also confirm that cognitive ergonomics principles improve product usability, visual appeal, and consumer engagement, making the design more innovative and market-competitive. The chapter describes the demographic profile of the respondents and the study variables, which were descriptively analysed using the SPSS tool for questions related to the first three research objectives of the study. Data analysis shows that the design of silk scarf products and Dunhuang mural elements are closely related to the field of CE. Using the principles of cognitive ergonomics to integrate Dunhuang mural elements into contemporary silk scarf design can significantly improve the design quality and enhance the product's market competitiveness. The chapter establishes that the key to developing a successful silk scarf design framework lies in harmonizing user cognitive preferences with Dunhuang mural elements. This approach enhances product differentiation, increases user satisfaction, and strengthens market competitiveness.

CHAPTER 5

DISCUSSION AND FINDINGS

5.1 Introduction

The discussion centred on four core research objectives: firstly, to identify Dunhuang mural elements that can be applied to silk scarf design; secondly, to analyse how Dunhuang mural elements can be incorporated into silk scarf design from a cognitive ergonomics perspective; then to explore the impact of Dunhuang mural elements in innovative silk scarf design through cognitive ergonomics assessment, and finally, to develop a new framework for silk scarf design that incorporates Dunhuang mural elements. This chapter primarily focuses on the following sections: Introduction; Discussion of Finding; The Development of New Framework; Summary.

5.2 Discussion of Finding

The following section summarizes the results of these analyses, which correspond to the specific objectives in Chapter One.

5.2.1 The Core Dunhuang Mural Elements for Silk Scarf Design

The first research objective was to identify Dunhuang mural elements in silk scarf design for young women in China.

The findings of this study indicate that Dunhuang mural elements (DME) hold significant value in contemporary silk scarf design, particularly for young women in China. The analysis confirms that designers widely recognize and support the incorporation of Dunhuang mural elements, as they enhance product innovation and cultural relevance. The study highlights three primary components of Dunhuang murals: patterns, lines, and colors (Zhang, 1952; He, 2023), with color being the most influential element in modern design applications. These mural elements offer a rich artistic heritage that can be transformed into contemporary design components, adding both aesthetic and cultural depth to silk scarves.

5.2.1.1 Patterns

The study categorizes Dunhuang mural patterns into four main types: Character, Animal, Landscape, and Decorative patterns (Fu & Xing, 2020). Among these, Decorative patterns are the most preferred by designers, as they seamlessly integrate into modern product designs while retaining their traditional essence. These patterns, inspired by the intricate detailing of Dunhuang frescoes, offer a blend of elegance and cultural significance, making them particularly appealing to young Chinese women.

5.2.1.2 Lines

Lines in Dunhuang murals reflect fluidity, movement, and grace, often depicting celestial beings, flowing garments, and natural elements. Their application in silk scarf design can enhance visual dynamism, creating scarves that exude a sense of movement and sophistication. Designers utilize these flowing lines to evoke the ethereal quality

of Dunhuang artistry, making them particularly attractive to younger demographics seeking fashionable yet culturally rich accessories.

5.2.1.3 Colors

Color is identified as the most crucial element in Dunhuang mural-inspired designs (Fu & Xing, 2020). The vibrant and harmonious color schemes found in Dunhuang murals—often featuring warm ochres, deep blues, and rich greens—are symbolic and emotionally evocative. The study finds that blue is the most preferred color for silk scarves, aligning with contemporary fashion trends. Dunhuang murals' use of complementary color contrasts and tonal harmonies inspires designers to create visually striking and emotionally resonant scarf designs.

5.2.2 Evaluating the Cognitive Ergonomics Perspective of Dunhuang Mural Elements for Innovative Contemporary Silk Scarf Design

The second objective is to evaluate the CE perspective of Dunhuang mural elements for innovative contemporary silk scarf design for young women in China.

The integration of cognitive ergonomics (CE) in product design plays a crucial role in enhancing user experience, particularly in fashion design, where aesthetics, usability, and emotional response significantly impact consumer preference. This study highlights the application of cognitive ergonomics to Dunhuang mural elements (DME) in contemporary silk scarf design, confirming their effectiveness in influencing user perception, attention, and visual appeal.

5.2.2.1 Cognitive Ergonomics and the Perception of Dunhuang Mural Elements

The findings from the designer questionnaire affirm that cognitive ergonomics is a widely acknowledged design principle, essential for fostering emotional engagement, efficiency, and satisfaction in product design (Christy & Duraisamy, 2020). The evaluation of silk scarf designs through cognitive ergonomics revealed that scarves incorporating Dunhuang mural elements received higher subjective ratings across multiple dimensions compared to scarves without these elements. The three key dimensions evaluated, vision, attention, and perception, are central to cognitive ergonomics and were used to assess how users and designers perceive and interact with Dunhuang-inspired scarves.

1. Vision – The colors, patterns, and lines extracted from Dunhuang murals strongly influence visual perception, making the designs more attractive and engaging. Dunhuang murals are known for their harmonious color schemes, often using complementary contrasts to create a rhythmic visual effect (Yang et al., 2020). The study confirms that users prefer silk scarves with these color compositions, as they evoke joy, healing, and relaxation, reinforcing the importance of color psychology in fashion design.
2. Attention – The ability of Dunhuang-inspired scarves to capture and maintain consumer attention was significantly higher than that of scarves without mural elements. The decorative patterns in Dunhuang murals—particularly those featuring intricate, symmetrical designs—were found to stimulate user interest and prolong gaze duration, making them more visually engaging and memorable. This aligns with cognitive ergonomics principles that emphasize design elements capable of maintaining user attention.
3. Perception – The study further demonstrates that users perceive scarves incorporating Dunhuang elements as more meaningful and aesthetically pleasing. The high evaluation scores reflect a strong emotional connection to the cultural and artistic value embedded in the design. The combination of historical elements and modern aesthetics enhances the perception of luxury and exclusivity, making these scarves more desirable in the contemporary market.

5.2.2.2 User Preferences and Cognitive Ergonomics in Scarf Design

User feedback further supports the role of cognitive ergonomics in shaping purchase intent and product perception. The study identifies several key preferences that align with cognitive ergonomic principles:

- Ethnic characteristics and fashionable styles were the most preferred design choices, highlighting a demand for culturally inspired yet modern products.
- Simple and fashionable designs ranked highest in purchase intention, with cultural and creative styles following closely. This suggests that while consumers appreciate traditional aesthetics, they favor a contemporary reinterpretation of Dunhuang elements in silk scarf design.
- Blue emerged as the most preferred color, indicating a psychological association with calmness and elegance, which aligns with previous studies on color perception and emotional response in fashion (Fu & Xing, 2020).

The expert questionnaire further validates these findings, with experts rating the application of cognitive ergonomics in silk scarf design highly (Mean = 4.5, SD = 0.5). Experts recognized the synergy between Dunhuang elements and cognitive ergonomics, confirming that the integration of cultural aesthetics with ergonomic design principles enhances product appeal and usability.

5.2.3 The Significance of Dunhuang Mural Elements from a Cognitive Ergonomics Perspective for Innovative Contemporary Silk Scarf Design

The third objective is to analyse the significance of Dunhuang mural elements with CE perspective for innovative contemporary silk scarf designed for young women in China.

The findings of this study highlight the substantial design value of Dunhuang mural elements (DME) and their significance in innovative silk scarf design. Designers widely recognize that incorporating DME into silk scarf design not only enriches the artistic and cultural appeal of the products but also enhances their market competitiveness. This aligns with the theoretical and practical relevance of integrating traditional artistic elements into contemporary design (Chen & Li, 2021). The revitalization of DME in silk scarf design enables designers to preserve cultural heritage while innovating modern products, ensuring that traditional aesthetics remain relevant in contemporary fashion (Lu, 2016).

From the perspective of cognitive ergonomics (CE), this study confirms that Dunhuang mural elements positively impact users' visual perception, attention, and emotional experience. Cognitive ergonomics is essential in product design as it enhances emotional engagement, usability, and efficiency (Christy & Duraisamy, 2020). The application of CE principles ensures that DME-based designs not only appeal aesthetically but also provide an intuitive and comfortable experience for users. The study employed three 7-point Likert scales measuring designers' and users' responses to silk scarf designs based on vision, attention, and perception. The results indicate that silk scarves incorporating Dunhuang mural elements consistently received higher scores across all dimensions, reinforcing the effectiveness of CE in guiding design decisions.

5.2.3.1 Influence of Dunhuang Mural Elements on User Perception and Engagement

Dunhuang murals are renowned for their harmonious color schemes, intricate patterns, and expressive lines, which collectively create an immersive visual experience (Fu &

Xing, 2020). The study findings show that these elements play a crucial role in eliciting positive emotional responses, including joy, healing, and relaxation, which are essential in contemporary fashion design. Specifically, the decorative patterns found in Dunhuang murals were the most preferred by designers and users, as they enhance the uniqueness and aesthetic quality of silk scarves. Additionally, color plays a dominant role in perception, with blue emerging as the most preferred color in the study, emphasizing its calming and elegant attributes that align with user expectations. The study further confirms that the visual appeal and cognitive impact of silk scarves are significantly heightened when DME is integrated into the design. The contrast and rhythm in Dunhuang mural colors, achieved through complementary color schemes, enhance user engagement and stimulate cognitive responses, making the scarves more attractive and memorable (Yang et al., 2020). This validates the hypothesis that aesthetically enriched designs incorporating cultural elements can create a deeper emotional connection with users and foster brand loyalty.

5.2.3.2 The Role of Cognitive Ergonomics in Enhancing Product Innovation

Applying cognitive ergonomics to silk scarf design enables designers to tailor products to user preferences more effectively. The study findings indicate that the combination of DME with CE principles enhances the overall usability and appreciation of silk scarf products.

- Vision: The intricate patterns and harmonious colors of Dunhuang murals captivate users' visual senses, increasing their aesthetic appreciation and preference for silk scarves incorporating these elements.
- Attention: DME-based scarves attract consumer interest more effectively than conventional designs. The combination of strong traditional motifs with modern interpretations helps the products stand out in a competitive fashion market.

- **Perception:** Users and designers rated DME-integrated silk scarves highly for their cultural and emotional significance, demonstrating that traditional aesthetics can be seamlessly merged with contemporary fashion.

By integrating cognitive ergonomics, the study emphasizes that cultural elements can be transformed into functional and emotionally engaging design components. This approach not only enhances the aesthetic and sensory appeal of the product but also improves usability, comfort, and consumer satisfaction.

5.2.4 Discussion on the Development of a Contemporary Silk Scarf Design Framework

The fourth research objective aimed to develop a new framework that integrates Dunhuang mural elements with a CE perspective for innovative contemporary silk scarf design for young women in China. Based on the study findings, a Contemporary Silk Scarf Design Framework (CSSDF) was proposed, incorporating Dunhuang mural elements and CE principles to enhance aesthetic appeal, usability, and consumer engagement. The framework is structured around key cognitive ergonomics dimension (vision, attention, and perception) which play a critical role in user experience and product attractiveness.

5.2.4.1 Integration of Dunhuang Mural Elements and Cognitive Ergonomics

The study confirms that Dunhuang mural elements (DME), particularly colors, patterns, and lines, are highly valued by designers and users for their cultural significance and aesthetic appeal. Through expert validation, it was established that these elements enhance visual impact, user engagement, and emotional connection in

contemporary scarf design. The application of CE principles in product design ensures that the integration of these elements is not only visually appealing but also aligns with user cognitive preferences, enhancing mental comfort, ease of recognition, and aesthetic harmony.

The findings demonstrate that scarves incorporating Dunhuang mural elements score significantly higher in CE-related evaluations compared to those without such elements. This suggests that the proper application of DME enhances visual stimulation, user attention, and perception, ultimately improving product desirability and consumer satisfaction. The study further highlights that the symbolic and emotional attributes of Dunhuang mural colors play a key role in influencing user preference, reinforcing the need for a strategic application of these elements in design.

5.2.4.2 Framework Development Process

The CSSDF framework was developed through a structured four-step process:

1. Preliminary Model Construction

- Identified vision, attention, and perception as three key cognitive ergonomics dimensions influencing scarf design.
- Selected colors, patterns, and lines as the core Dunhuang mural elements for integration.
- Mapped designer creativity with user cognitive preferences to establish the foundation for design innovation.

2. Innovative Application of Dunhuang Mural Elements

- Conducted an in-depth analysis of Dunhuang mural colors, patterns, and lines to identify key design motifs.
- Transformed traditional elements into modern, stylish scarf designs that balance cultural heritage with contemporary aesthetics.

3. User Preferences and Expert Evaluation

- Gathered consumer data using Likert scale evaluations to assess the appeal and effectiveness of DME in scarf design.
- Verified the framework through expert analysis, ensuring its applicability and innovation in the fashion industry.

4. Framework Establishment

- Developed a structured design framework that seamlessly integrates Dunhuang mural elements and cognitive ergonomics principles.
- Ensured the framework aligns with contemporary fashion trends while preserving cultural heritage and artistic value.

5.2.4.3 Validation of the Contemporary Silk Scarf Design Framework

The CSSDF framework was validated through expert questionnaires, with 23 experts. The 23 experts selected for this study include 12 textile and fashion designers, 6 academics specializing in cognitive ergonomics, and 5 experts in Dunhuang mural art and cultural heritage, ensuring a well-rounded evaluation of Dunhuang mural elements in contemporary silk scarf design. Among them, 15 are from China and 8 from other countries, providing both local and international perspectives. Their professional experience ranges from 5 to 20 years, with many having research publications or industry expertise in fashion design, textile innovation, or traditional Chinese art applications. Selection criteria focused on their ability to assess user preferences, emotional responses, and design innovation, contributing to a deeper understanding of cognitive ergonomics in silk scarf design.

Statistical analysis of expert feedback revealed high mean scores (ranging from 4.3 to 4.6 on a 5-point scale), confirming that the framework successfully meets the dual objectives of design innovation and cultural preservation. The reliability test

(Cronbach's $\alpha = 0.9$) further supports the framework's consistency and applicability in real-world design practice.

5.3 Summary

This chapter integrates cognitive ergonomics theory and Dunhuang mural elements to develop a novel framework for contemporary silk scarf design, systematically analyzing their impact on product quality and aesthetic appeal. The findings confirm that Dunhuang mural elements enhance market competitiveness, user preference, and designer innovation, reinforcing their relevance in modern fashion. The proposed Contemporary Silk Scarf Design Framework (CSSDF) offers valuable theoretical and practical insights, guiding the integration of cultural heritage with contemporary product design. This research not only enriches the academic discourse on fashion design but also establishes a structured paradigm for harmonizing traditional aesthetics with user-centered innovation, demonstrating significant scholarly and industry relevance.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This study has achieved remarkable research results concerning the application effect of CE based on Dunhuang mural elements in silk scarf design. Through sufficient data analysis and consideration of user preferences and designer perspectives, the study reveals the beneficial impact of Dunhuang mural elements on silk scarf design and establishes a corresponding development framework. In this chapter, the study will summarize the research results and provide suggestions for subsequent research, hoping to provide valuable reference and inspiration for academic research and practical applications in related fields. This chapter primarily focuses on the following sections: (1) Introduction; (2) Conclusion; (3) Research Contribution to Knowledge; (4) Novelty of the Study; (5) Benefits of the Study; (6) Limitations of the Study; (7) Recommendations for Future Research.

6.2 Conclusion

This study explores the development of a framework for integrating Dunhuang mural elements into contemporary silk scarf design from the perspective of cognitive ergonomics. By investigating the preferences of consumers and designers for scarves with Dunhuang mural patterns, the impact of these elements on scarf design is analysed in the light of cognitive ergonomics. This chapter will summarise the study's main findings and prospects for future research.

Research Objective (RO) 1 is fulfilled by identifying and classifying key Dunhuang mural elements such as patterns, lines, and colors, with a particular emphasis on decorative patterns and the dominance of blue as the most preferred color, as supported by survey data. RO2 is accomplished through an in-depth evaluation of cognitive ergonomics, where findings indicate that incorporating cognitive design principles enhances emotional engagement, mental well-being, and efficiency, thereby enriching user experience. The study finds that joy, healing, and relaxation are the most prominent emotional responses associated with Dunhuang-inspired silk scarves, confirming the importance of cognitive ergonomics in consumer perception. RO3 is realized by analyzing the economic, aesthetic, and cultural significance of Dunhuang mural elements in silk scarf design, revealing that appearance is the top priority for both consumers and designers, while issues such as lack of innovation and repetitive designs present challenges in the cultural and creative scarf industry. The research underscores that strong traditional patterns significantly enhance visual appeal, usability, and market competitiveness, while improvements in pattern styles are essential for increasing consumer interest. Finally, RO4 is achieved through the development of a new design framework that integrates Dunhuang mural elements with cognitive ergonomics, providing a structured approach to contemporary silk scarf innovation. This framework focuses on cultural authenticity, cognitive ergonomics application, user preferences, and digital promotion, ensuring that Dunhuang-inspired silk scarves not only preserve cultural heritage but also align with modern fashion trends and consumer demands. By deeply exploring Dunhuang's artistic traditions and leveraging emerging digital platforms like TikTok, the framework enhances the accessibility and appreciation of cultural designs among young consumers, positioning Dunhuang mural-inspired silk scarves as a distinctive and competitive product in the fashion industry.

6.3 Research Contribution to Knowledge

The following are the five main contributions of this study to the body of knowledge:

a) Developing a new framework

The new framework for silk scarf design developed in this study is based on the principles of cognitive ergonomics and the in-depth study of Dunhuang mural elements, which provides a new mode of thinking and design methodology for the field of silk scarf design. The innovation of this framework is that it integrates the cognitive preferences of users, the aesthetic value of cultural elements, and the practical needs of product design, thus guiding designers to create aesthetically pleasing and culturally significant products.

b) Fusion Of Dunhuang mural elements with contemporary design

Through a systematic analysis of the application of Dunhuang mural elements in silk scarves, this study shows a successful example of combining traditional culture and art with modern product design. This integration enhances the cultural depth and market appeal of silk scarf products. It provides a critical case for the modern transformation of traditional culture and art, indicating a new path for traditional elements to be innovatively interwoven with modern design.

c) Exploration of the application of CE in products design

This study demonstrates the innovative application of cognitive ergonomics in integrating traditional art elements into modern product design by applying cognitive

ergonomics theories to designing silk scarves with Dunhuang mural elements. This study underlines the importance of design practice based upon user cognitive and perceptual considerations. It also provides new perspectives on enhancing products' cultural and aesthetic value through cognitive ergonomics theory.

d) Promoting the inheritance and innovation of traditional culture

This study explores the contemporary interpretation and innovative use of traditional cultural symbols through the modern design application of Dunhuang mural elements. It provides a new path for the inheritance and innovation of Dunhuang culture and other traditional Chinese cultures, as well as concrete, practical examples and theoretical support for integrating traditional cultural elements into modern life.

e) Enriching the theoretical system in products design

By combining the theory of cognitive ergonomics with the practice of silk scarf design, this study enriches the theoretical system in the field of product design. Integrating theory and practice improves the design field's understanding of user cognitive processes. It provides a new methodology for design research, i.e., to innovate design practice by applying interdisciplinary theories.

f) Revealing the design significance of Dunhuang mural elements

This study sheds light on the positive impact of Dunhuang mural elements on product recognition. By examining the cognitive value of these elements, this research provides a more scientific and feasible guidance for the design of products. This understanding contributes to improving product design practices, offering designers a solid foundation rooted in CE theory.

Overall, this study provides an in-depth academic exploration of the application of cognitive ergonomics in design and a new paradigm for integrating traditional cultural elements with modern design at the practical level. The study will promote theoretical and practical innovation in the design field and the modern transformation of traditional culture.

6.4 Novelty of the Study

The novelty of this research is the development of a new contemporary silk scarf design framework. This study aims to create a comprehensive design framework that explores the application and significance of Dunhuang mural elements in silk scarf design. Through detailed data analysis, this framework seeks to establish a set of guiding design principles and frameworks that successfully integrate the theoretical basis of cognitive ergonomics with current market needs. It provides a practical and operational guide for designers and indicates directions for future silk scarf designs. The Contemporary Silk Scarf Design Framework (CSSDF) is shown in Figure 6.1.

By using this framework, designers can more accurately appreciate consumers' cognitive needs and cultural preferences during product design. The framework leads to better products that meet the target market's expectations. This framework supplements traditional design methods and innovatively integrates consumers' psychological reactions and cultural backgrounds into design decisions, ensuring consistency between design decisions and consumer preferences.

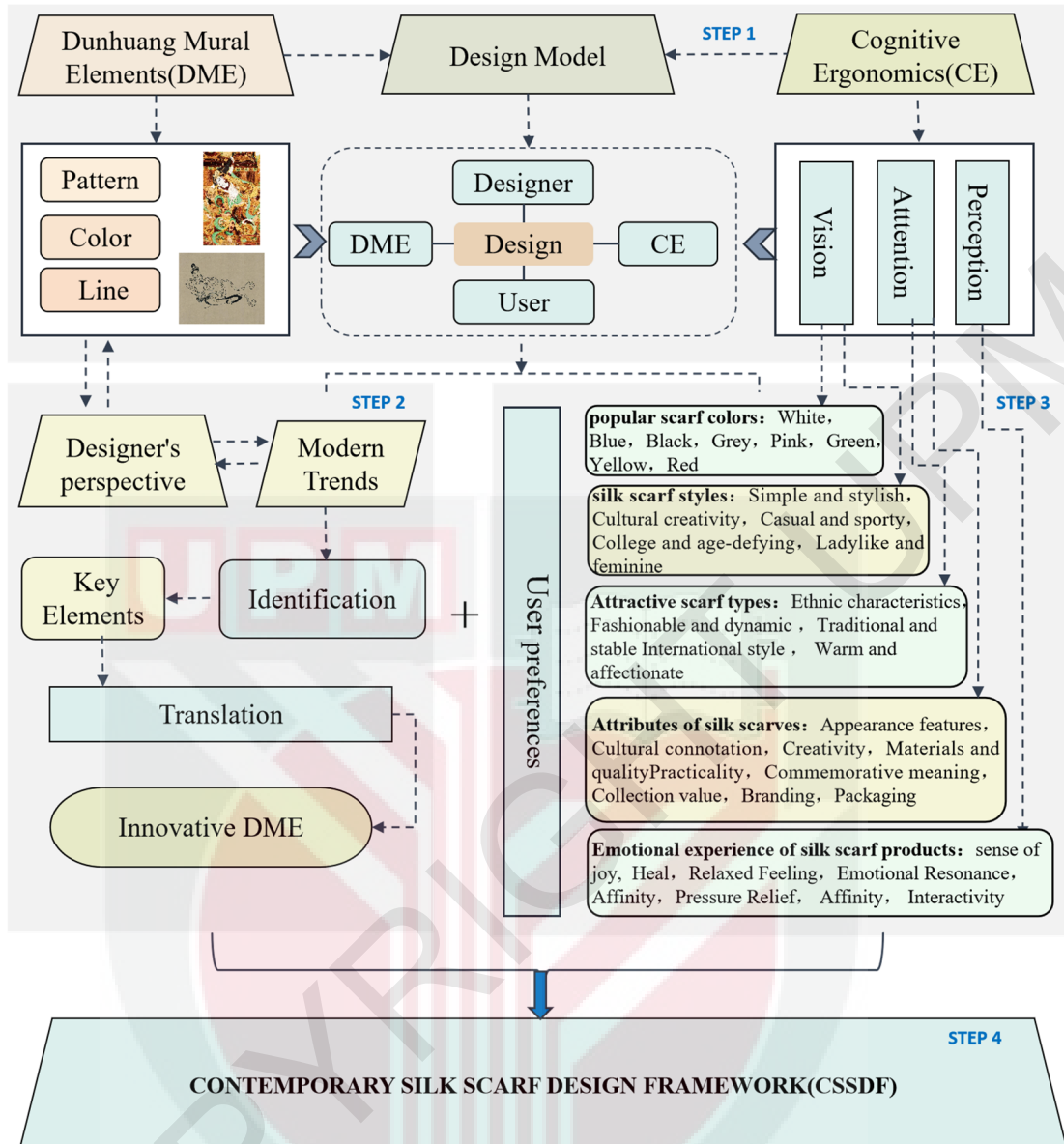


Figure 6.1: Contemporary silk scarf design framework

Furthermore, this framework provides a new design thinking model and method system by integrating cognitive needs and cultural elements, opening up an innovative path for designers. It encourages designers to consider functionality and practicality while paying attention to products' cultural significance and emotional value, thus creating products that meet usage needs and have profound cultural connotations.

In conclusion, the design framework established in this study is an essential contribution to the current field of industrial design. It provides scientific and systematic theoretical support and practical guidance for applying Dunhuang mural elements in modern silk scarf design. It offers designers a new way of thinking, creating, and promoting theory and practice in industrial design, leading to further development.

6.5 Benefits of the Study

The study has identified benefits in four aspects as follows:

a) Cultural and creative products

This research combines traditional elements of Dunhuang murals with silk scarf designs to create silk scarves that meet modern consumers' preferences and values. This integration enhances the product's market appeal and provides a reference for optimizing cultural and creative products.

b) Designers and product development

The research provides designers with a new design framework and guiding principles based on cognitive ergonomics. With the user's cognitive process at the core, this design method encourages designers to create creative cultural silk scarf that aligns with the market and consumers' needs. It will become an essential reference for promoting the innovation and development of Chinese cultural and creative products.

c) Manufacturers

By applying these research results, manufacturers can produce products that align with market trends and consumer expectations to increase sales and profits. This close integration of design and market demand helps manufacturers invest resources more effectively and improve the market competitiveness of their products.

d) Customers or users

The optimized design of these newly developed products better meets users' aesthetic and functional needs for Chinese cultural and creative products, enhancing users' sense of satisfaction and pleasure. Users can experience a profound understanding of cultural value and derive enjoyment from using these silk scarf products that incorporate elements of Dunhuang murals.

Overall, this research will positively influence the innovative transformation of China's cultural and creative products. It will promote the harmonious integration of tradition and modernity, meeting the needs of a broader market.

6.6 Limitations of the Study

The limitations of this study are mainly in the following areas, and these limitations provide room for improvement in future research directions.

6.6.1 Limitations of Data Collection Methods

This study relies on offline questionnaire surveys and demographic information as the primary means of data collection. Although these methods ensure the validity and reliability of the data to a certain extent, the subjectivity and inherent limitations must be addressed. Future studies should consider incorporating more diverse data collection techniques to reduce subjective bias and enhance the comprehensiveness and depth of the study.

6.6.2 Potential Bias in Sample Selection

During the sampling process, this study mainly used non-probability sampling techniques, which are easy to operate but may also lead to sample selection bias. As the selected respondents were not randomly chosen, this may have limited the general applicability of the findings and failed to represent the views and preferences of all target groups fully. Future studies should adopt more scientific sampling methods to improve the sample's representativeness and the study's general applicability.

6.6.3 Limitations During Data Analysis

Although SPSS software was used in the study to conduct multivariate comparative analyses to obtain more in-depth insights, it is essential to note that there may have been instances where certain variables or confounders were overlooked. The method may affect the findings' accuracy and the depth of interpretation. Therefore, it is recommended that more advanced statistical analyses be used in subsequent studies to

integrate various potential confounding factors to ensure the accuracy and reliability of the analyses.

Although this study has revealed to a certain extent the application of Dunhuang mural elements in contemporary silk scarf design and its significance from the perspective of cognitive ergonomics, the above limitations suggest that the study needs to adopt a more comprehensive and unbiased approach to improve the scientific validity and accuracy of the study in future research, which will not only enhance the credibility of the findings but also offer richer and deeper insights for the academic community.

6.7 Recommendations For Future Research

The findings of this study highlight significant opportunities for further research to deepen the understanding and application of Dunhuang mural elements in silk scarf design and related fields. Addressing existing gaps and limitations will enhance the practical and theoretical contributions of this research. Future research can explore the following directions:

a) Expanding Cultural Symbolism in Product Design

Further studies should examine the broader impact of cultural symbols on product design by expanding the research scope beyond Dunhuang murals. Investigating how various traditional Chinese cultural elements—such as embroidery motifs, porcelain patterns, or calligraphy—interact with contemporary fashion trends will offer valuable insights into integrating heritage with innovation. Additionally, researchers should analyze how different cultural elements influence consumer perception, emotional

response, and purchase intention, ensuring that cultural and creative products balance aesthetic appeal, practicality, and cultural connotation.

b) Promoting Interdisciplinary Research and Empirical Validation

Interdisciplinary research should be encouraged to gain a more holistic understanding of Dunhuang mural elements in silk scarf design. Collaboration between experts in cognitive ergonomics, psychology, cultural studies, textile design, and artificial intelligence (AI)-driven design tools can provide new perspectives on the usability, emotional impact, and market feasibility of cultural products. Furthermore, empirical studies should be expanded to validate theoretical frameworks by conducting user-centered experiments, large-scale consumer surveys, and case studies of existing brands. Real-world testing in retail environments and social media platforms, such as TikTok and Xiaohongshu, will provide insights into how Dunhuang-inspired designs perform in competitive markets.

c) Enhancing User Experience and Cognitive Ergonomics in Design

Since cognitive ergonomics plays a vital role in user satisfaction, future research should explore how Dunhuang mural elements influence consumer emotions, cognition, and decision-making processes. Researchers should investigate which specific mural colors, patterns, and compositions evoke the strongest emotional resonance—such as joy, healing, and relaxation—and how these insights can be translated into more effective silk scarf designs. Additionally, virtual reality (VR) and augmented reality (AR) technologies can be employed to simulate user interactions with Dunhuang-inspired fashion products, offering deeper insights into consumer preferences.

d) Conducting Cross-Cultural Comparative Studies

Given the growing global interest in cultural and creative industries, cross-cultural studies are essential to understanding the reception and adaptability of Dunhuang-inspired designs in international markets. Future research should compare consumer attitudes, purchasing behaviors, and cultural interpretations of Dunhuang mural elements in different countries. Exploring how these elements are perceived in Western luxury fashion, Southeast Asian traditional textiles, or Middle Eastern silk craftsmanship will facilitate cultural exchange and collaboration in global fashion markets. Such comparative studies will also help Chinese designers adapt their designs for international appeal while preserving cultural authenticity.

e) Integrating Market Trends and Digital Marketing Strategies

To ensure the practical application of research findings, scholars must align their studies with market trends, digital marketing strategies, and industry feedback. Future research should explore how social media, e-commerce, and influencer marketing impact consumer engagement with Dunhuang-inspired silk scarves. By analyzing real-time data from platforms like TikTok, WeChat, and Instagram, researchers can identify trending design elements, consumer preferences, and effective promotional strategies. Moreover, collaborations with textile industries and luxury brands can provide direct insights into sustainable production methods and innovative fabric technologies that enhance the appeal and durability of Dunhuang-inspired scarves.

By addressing these research directions, scholars can further refine the theoretical framework, improve the market applicability of Dunhuang mural elements in contemporary design, and contribute to the global appreciation of Chinese cultural heritage in fashion.

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APPENDICES

Appendix A

Designer Survey



UPM
UNIVERSITI PUTRA MALAYSIA
BERILMU BERAKSI

**FAKULTI REKABENTUK
DAN SENIBINA**
FACULTY OF DESIGN AND ARCHITECTURE
فاكولتي ريك بنتوق دان سني بينا

Dear Interviewee

This is part of my PhD research at the School of Design and Architecture, Universiti Putra Malaysia. The survey aims to develop a new contemporary silk scarf design framework for young Chinese women incorporating elements of Dunhuang mural paintings from a cognitive ergonomics perspective. I would be very grateful if you could complete this survey. Any information related to this study related to your identity will be kept confidential. No identity will be revealed in written reports or publications; only the data will be shown.

Thank you.

亲爱的受访者

这是我在马来西亚博特拉大学设计与建筑学院博士研究的一部分。调查的目的是为了开发一个认知工效学视角下融入敦煌壁画元素的中国年轻女性丝巾设计新框架，如果您能完成这项调查，我将非常感激。任何与本研究有关的、与您身份相关的信息都将被保密。在任何书面报告或出版物中都不会透露任何人的身份，只显示数据。

谢谢。

SECTION 1/1 部分

Respondents' Background /受访者的背景

Please tick the option you agree with(√) or answer the underlined question.

请在您认可的选项打勾(√) 或者回答划线中的问题。

1. Name (full name or nickname)

2. Gender 性别

☐ Male/ 男 ☐ Female /女

3. Contact information (phone / WeChat / QQ) to facilitate the second phase of the study _____ (voluntary completion) /联系信息 (电话/微信/ QQ)，以促进第二阶段的研究（自愿完成）

4. Please select the province or city where you live/请选择您所居住的省份或城市。

☐ Shandong province/山东省 ☐ Other provinces/其他省份

5. You were born in: _____ 你出生在：_____

- ☐ Big cities 大城市
☐ Second big cities 第二大城市
☐ Town cities 城镇城市
☐ Rural area 农村地区

6. How old are you? (As at 1 May 2023)_____你多大了？（截至 2023 年 5 月 1 日）

7. Marital status

☐ Single/单身 ☐ Married/已婚 ☐ Divorce/离异

8. Educational background (highest level of education)/教育背景（最高教育水平）

- ☐ Junior high school and below/初中及以下学历
☐ High school/中学
☐ Junior college/大专
☐ Bachelor's degree or above/本科及以上学历

9. What is your monthly income? (Average)/你的月收入是多少? (平均数)

() No income 无收入

Section 2 Knowledge of designers 2 部分 设计师的知识

Strongly disagree 强烈不同意	Basically disagree 基本不同意	Neutral 中立	Basically agree 基本同意	Strongly agree 非常同意
1	2	3	4	5

Item	1	2	3	4	5
1. The shape and pattern of the scarf is an important element in product design./围巾的形状和图案是产品设计中的一个重要组成部分					
2. Traditional Chinese cultural elements contribute to innovative product design./中国传统文化元素有助于创新的产品设计。					
3. Dunhuang mural elements can innovate modern silk scarf design./敦煌壁画元素可以创新现代丝巾设计					
4. A good way to innovate contemporary silk scarf design is to utilize the elements of Dunhuang murals./创新当代丝巾设计的一个好方法是利用敦煌壁画的元素。					
5. Cognitive ergonomics is useful for innovative product design../认知人体工程学对创新的产品设计很有用。					
6. You have used theories related to cognitive ergonomics in your product design./你在你的产品设计中使用了与认知效能相关的理论。					

7. Please rate the design value of the following Dunhuang mural elements.

1=very little value. 2=basically no value, 3=partially no value, 4=neutral, 5=partially valuable, 6=basically valuable, 7=very valuable./请评价以下敦煌壁画元素的设计值。 1.=价值很小。2=基本无价值, 3=部分无价值, 4=中立, 5=部分有价值, 6=基本有价值, 7=非常有价值。

Item 词汇	价值很小 very little valuable		中立 value-----Nneutrality-----		非常有价值 very		
	1	2	3	4	5	6	7
a.Character Pattern 人物图案	☐	☐	☐	☐	☐	☐	☐
b.Animal Pattern 动物图案	☐	☐	☐	☐	☐	☐	☐
c.Landscape Pattern 风景图案	☐	☐	☐	☐	☐	☐	☐
d.Decorative Patterns 装饰图案	☐	☐	☐	☐	☐	☐	☐

Section 2

User Cognitive Ergonomics evaluation of silk scarf products 丝巾产品的使用者认知与人体工程学评价

1. Product image evaluation 产品图像评估

Vision 视觉

Please tick (✓) the option you agree with 请勾选 (✓) 您同意的选项

1=Strongly disagree. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree. 1.=强烈不同意。 2.=基本不同意。 3.=部分不同意, 4=中立, 5=部分同意, 6=基本同意, 7=强烈同意。

No./ 序号	Sample/样本	Product Description/产品说明	Question / 问题						
a		This is a silk scarf designed using Dunhuang fresco patterns and tones. 这是运用敦煌壁画图案和色调设计的丝巾。	The design of this silk scarf is innovative. 这款丝巾的设计具有创新性						
b		This silk scarf has no traditional cultural elements and uses a repeating pattern design. 这款丝巾没有传统文化元素，采用重复图案设计。							
c		This silk scarf is based on a combination of the Feitian of the Dunhuang frescoes and the caisson pattern. 这款丝巾根据敦煌壁画的 飞天 女图案及藻井图案结合设计而成。	The colour of this silk scarf has an auspicious meaning. 这款丝巾的颜色有吉祥含义。						

2. Product image evaluation 产品图像评估

Attention 注意

Please tick (✓) the option you agree with 请在您同意的选项上打勾 (✓)

1=Strongly disagree. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree.

1=非常不同意 2=基本不同意, 3=部分不同意, 4=中立, 5=部分同意, 6=基本同意, 7=非常同意。

No.	Sample 样本	Product Description/产品说明	Question/问题	1	2	3	4	5	6	7
a		This silk scarf features the image of a double Feitian being from a Dunhuang mural. 这款丝巾采用了敦煌壁画双飞天形象。	This silk scarf will get your attention. 这条丝巾会引起你的注意。							
b		This silk scarf has no traditional cultural elements. 这款丝巾没有传统文化元素。								
c		The scarf is based on the nine-color deer pattern in the Dunhuang murals design. 这款丝巾根据敦煌壁画的祥云九色鹿图案进行设计。	This silk scarf grabs your attention more often. 这款丝巾引发你关注的次数更多。							

3. Product image evaluation 产品图像评价

Perception 感知

Please tick (✓) the option you agree with 请在你认可的选项打钩(✓)

1=Strongly disagree. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree.

1=非常不同意。 2=基本不同意, 3=部分不同意, 4=中立, 5=部分同意, 6=基本同意, 7=非常同意。

No.	Sample	Product Description	Question	1	2	3	4	5	6	7
a		This silk scarf is designed using the image of the nine-coloured deer from the Dunhuang mural and the auspicious cloud motif. 这款丝巾运用了敦煌壁画中九色鹿形象和祥云图案进行设计。								
b		This silk scarf uses cartoonish flowers that do not reflect traditional Chinese cultural elements. 这款丝巾使用了卡通花卉,不体现中国传统文化元素。	This silk scarf is even more striking and prominent. 这款丝巾更加醒目突出。							

4. Which style of silk scarf do you prefer to buy? /您日常比较偏向于购买哪一种风格丝巾?

- ☐ Casual and sporty/休闲运动
- ☐ Ladylike and feminine/淑女名媛
- ☐ College and age-defying/学院减龄
- ☐ Punk and heavy/朋克重工
- ☐ Simple and fashionable/简约时尚
- ☐ Cultural creativity/文化创意

5. Which colour of silk scarf do you prefer for everyday use?

- | | | | |
|-----------------------------------|-----------------------------------|----------------------------------|------------------------------------|
| ☐ White/白色 | ☐ Black 黑色 | ☐ Blue/蓝色 | ☐ Red/红色 |
| ☐ Pink/粉色 | ☐ Green/绿色 | ☐ Grey 灰色 | ☐ Yellow/黄色 |

6. Which style of silk scarf design do you think would attract your attention more?

(Single choice)您认为丝巾设计哪种风格更能够吸引你的注意? (单选)

- ☐ Traditional and stable 传统稳重
- ☐ Fashionable and dynamic 时尚动感
- ☐ warm and cordial 热情亲和
- ☐ Ethnic characteristics 民族特色
- ☐ International style 国际化风格
- ☐ Other (please fill in)其他 (请填写)

7. What do you think needs to be improved about contemporary silk scarf products?
您认为当代丝巾产品哪方面需要改进

- ☐ Colour style 颜色风格
- ☐ Pattern style 图案样式
- ☐ Texture of material 材料质感
- ☐ Size and shape 大小形状
- ☐ Other(please specify)其他 (请注明)

8. What is the purpose of your purchasing silk scarves? [Multiple choice]/您购买丝巾的目的是什么? [多选题]

- ☐ To collect as a tourist souvenir 作为旅游纪念品收藏
- ☐ To give to others 赠送他人
- ☐ For your own use 自己使用
- ☐ Interesting design 设计有趣
- ☐ Other 其他

9. What would you look for in a cultural and creative silk scarf product? [Multiple choice]/您会关注文创丝巾产品的哪些方面?[多选题]

- ☐ Appearance features 外观特征
- ☐ Cultural connotation 文化内涵
- ☐ Creativity 创意性
- ☐ Brand 品牌
- ☐ Collection value 收藏价值
- ☐ Commemorative meaning 纪念意义
- ☐ practicality 实用性
- ☐ Materials and quality 材料质量
- ☐ Packaging 包装

10. What do you think are the problems with the current cultural and creative silkscarf products? (Multiple choice)/ 您觉得目前文创丝巾产品有哪些问题? (多选题)

- ☐ monotonous style 类型单一
- ☐ Poor product quality 产品质量差
- ☐ Lack of functionality and practicality 缺乏功能和实用性
- ☐ Lack of innovation in design 设计不够创新
- ☐ Cultural connotation is lost 文化内涵丢失
- ☐ Too expensive 价格太贵
- ☐ Unbalanced audience 受众人群不平衡
- ☐ Less access to purchase 购买途径较少
- ☐ No well-known brands 没有知名品牌
- ☐ Inadequate market system 市场体制不健全
- ☐ Other 其他

11. Which element of the Dunhuang mural elements in the Cultural Creation Silk Scarf would most inspire you to buy it? [Multiple choice]敦煌壁画元素的文创丝巾中哪个元素最能激起你的购买意愿？ [单选题]

- ☐ Religious story elements 宗教故事元素
- ☐ Color scheme 色彩搭配元素
- ☐ Pattern design elements 图案设计元素
- ☐ Function of the product itself 产品本身的功能

12. Which channel do you usually use to learn about Dunhuang Element silk scarf products [Multiple Choice]您平时从哪个渠道了解敦煌元素的丝巾产品讯息 [多选题]

- ☐ Microblogging 微博
- ☐ WeChat public website 微信公众号
- ☐ TikTok 抖音短视频软件
- ☐ Advertising 广告宣传
- ☐ Other 其他

13. In terms of the emotional experience of the silk scarf product, please rate the importance of the following keywords.在丝巾产品的情感体验方面，请您为以下关键词的重要性打分。

1=Strongly disagree. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree.

1=非常不同意。 2=基本不同意， 3=部分不同意， 4=中立， 5=部分同意， 6=基本同意， 7=非常同意。

Words 词汇	Strongly disagree 非常不同意		Neutral 中立		Strongly agree 非常同意		
	1	2	3	4	5	6	7
a. Affinity 亲情感	☐	☐	☐	☐	☐	☐	☐
b. Affinity 亲和力	☐	☐	☐	☐	☐	☐	☐
c. A sense of Joy 愉悦感	☐	☐	☐	☐	☐	☐	☐
d. Healing 治愈性	☐	☐	☐	☐	☐	☐	☐
e. Relaxed Feeling 轻松感	☐	☐	☐	☐	☐	☐	☐
f. Pressure Relief 减压感	☐	☐	☐	☐	☐	☐	☐
g. Emotional Resonance 情感共鸣	☐	☐	☐	☐	☐	☐	☐

End of Questionnaire, Thank you
问卷结束，非常感谢

Appendix B

User Survey



**FAKULTI REKABENTUK
DAN SENIBINA**
FACULTY OF DESIGN AND ARCHITECTURE
فاكولتي ريك بنتوق دان سني بينا

Dear Interviewee

This is part of my PhD research at the School of Design and Architecture, Universiti Putra Malaysia. The survey aims to develop a new contemporary silk scarf design framework for young Chinese women incorporating elements of Dunhuang mural paintings from a cognitive ergonomics perspective. I would be very grateful if you could complete this survey. Any information related to this study related to your identity will be kept confidential. No identity will be revealed in written reports or publications; only the data will be shown.

Thank you.

亲爱的受访者

这是我在马来西亚博特拉大学设计与建筑学院博士研究的一部分。调查的目的是为了开发一个认知工效学视角下融入敦煌壁画元素的中国年轻女性丝巾设计新框架，如果您能完成这项调查，我将非常感激。任何与本研究有关的、与您身份相关的信息都将被保密。在任何书面报告或出版物中都不会透露任何人的身份，只显示数据。

谢谢。

SECTION 1 /1 部分

Respondents' Background /受访者的背景

Please tick the option you agree with(√) or answer the underlined question.

请在您认可的选项打勾(√) 或者回答划线中的问题。

1. Name (full name or nickname)

2. Gender 性别

☐ Male/ 男 ☐ Female /女

3. Contact information (phone / WeChat / QQ) to facilitate the second phase of the study _____ (voluntary completion)联系信息 (电话/微信/ QQ), 以促进第二阶段的研究 (自愿完成)

4. Please select the province or city where you live.请选择您所居住的省份或城市。

☐ Shandong province 山东省 ☐ Other provinces 其他省份

5. You were born in: 你出生在 :

☐ Big cities 大城市
☐ Second big cities 第二大城市
☐ Town cities 城镇城市
☐ Rural area 农村地区

6. How old are you? (As at 1 May 2023)_____你多大了? (截至 2023 年 5 月 1 日)

7. Marital status

☐ Single/单身 ☐ Married/已婚 ☐ Divorce/离异

8. Your current occupation (if retired, please fill in your pre-retirement job) Please select:如果已退休, 请填写退您当前的职业休前的工作) 请选择 :

☐ Civil servants 公务员
☐ Private sectors 私营部门
☐ Student 学生
☐ Unemployed 失业

9. Educational background (highest level of education)教育背景 (最高教育水平)

- ☐ Junior high school and below 初中及以下学历
- ☐ High school 中学
- ☐ Junior college 大专
- ☐ Bachelor's degree or above 本科及以上学历

10. What is your monthly income? (Average)你的月收入是多少? (平均数) ()

No income 无收入



Section 3: User Cognitive Ergonomics evaluation of silk scarf products 丝巾产品的使用者认知工效学评价

1. Product image evaluation 产品图像评估

Vision 视觉

Please tick (✓) the option you agree with 请勾选 (✓) 您同意的选项

1=Strongly disagree; 2=Basically disagree; 3=Partially disagree; 4=Neutral; 5=Partially agree; 6=Basically agree; 7=Strongly agree. 1.=强烈不同意; 2=基本不同意; 3=部分不同意; 4=中立; 5=部分同意; 6=基本同意; 7=强烈同意。

No.序号	Sample 样本	Product Description/产品说明	Question/问题	1	2	3	4	5	6	7
a		This is a silk scarf designed using Dunhuang fresco patterns and tones. 这是运用敦煌壁画图案和色调设计的丝巾。	The design of this silk scarf is innovative. 这款丝巾的设计具有创新性							
b		This silk scarf has no traditional cultural elements and uses a repeating pattern design. 这款丝巾没有传统文化元素，采用重复图案设计。								
c		This silk scarf is based on a combination of the Feitian of the Dunhuang frescoes and the caisson pattern. 这款丝巾根据敦煌壁画的飞天仙女图案及藻井图案结合设计而成。	The colour of this silk scarf has an auspicious meaning. 这款丝巾的颜色有吉祥含义。							

d		This silk scarf features a combination of square and round cases that do not have traditional Chinese cultural Elements 这款丝巾采用了方形和圆 形案的结合，不具有中国传统文化元素。	
e		This silk scarf is based on the flying apsaras and caisson pattern from Cave 329 of the early Tang Dynasty in the Mogao Caves at Dunhuang. 本丝巾是根据敦煌莫高窟 初唐第329窟莲花飞天藻井图案设计的。	This silk scarf showcases traditional culture. 这款丝巾彰显传统文化。
f		This silk scarf features a repeating square pattern design. 这款丝巾采用了方形和圆 形案的结合，不具有中国传统文化元素。	
g		This silk scarf is a Dunhuang three rabbits and Feitian pattern silk scarf. 本丝巾为敦煌三兔飞天藻井图案丝巾。	This silk scarf has a distinctive pattern. 这款丝巾图案很有特色。
h		This silk scarf is designed using a combination of abstract and square motifs. 本丝巾采用抽象和方形图案结合的方式设计。	

2. Product image evaluation 产品图像评估

Attention 注意

Please tick (✓) the option you agree with 请在您同意的选项上打勾 (✓)

1=Strongly disagree. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree.

1=非常不同意 2=基本不同意, 3=部分不同意, 4=中立, 5=部分同意, 6=基本同意, 7=非常同意。

No.	Sample 样本	Product Description/产品说明	Question/问题	1	2	3	4	5	6	7
a		This silk scarf features the image of a double Feitian being from a Dunhuang mural. 这款丝巾采用了敦煌壁画双飞天形象。	This silk scarf will get your attention. 这条丝巾会引起你的注意。 This silk scarf grabs your attention more often. 这款丝巾引发你关注的次数更多。							
b		This silk scarf has no traditional cultural elements. 这款丝巾没有传统文化元素。								
c		The scarf is based on the nine-color deer pattern in the Dunhuang murals design. 这款丝巾根据敦煌壁画的祥云九色鹿图案进行设计。								

h		A hand-painted design of two birds is printed on this scarf. 这款丝巾印制了两只小鸟的手绘图案。								
i		This silk scarf is a reference to the Dunhuang mural image of the Nine-Coloured Deer. 这款丝巾是参考敦煌壁画九色鹿形象而设计。	This silk scarf is very attractive. 这款丝巾很有吸引力。							
j		This silk scarf is printed with cartoon patterned character portraits and flowers, without reference to traditional cultural elements. 这款丝巾印制了卡通图案人物肖像和花卉，没有参考传统文化元素。								
k		This silk scarf is a reference to the Dunhuang frescoes of the flying sky, lotus flower and caisson pattern. 这款丝巾是参考敦煌壁画飞天、莲花和藻井图案而设计。	This is the silk scarf you are more interested in. 这款丝巾您更加关注。							
l		This silk scarf is an abstract painted motif without traditional cultural elements. 这款丝巾是印制的抽象绘画图案，没有传统文化元素。								

3. Product image evaluation 产品图像评价

Perception 感知

Please tick (√) the option you agree with 请在你认可的选项打钩(√)

1=Strongly disagree. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree.

1=非常不同意。 2=基本不同意, 3=部分不同意, 4=中立, 5=部分同意, 6=基本同意, 7=非常同意。

No.	Sample	Product Description	Question	1	2	3	4	5	6	7
a		This silk scarf is designed using the image of the nine-coloured deer from the Dunhuang mural and the auspicious cloud motif. 这款丝巾运用了敦煌壁画中九色鹿形象和祥云图案进行设计。								
b		This silk scarf uses cartoonish flowers that do not reflect traditional Chinese cultural elements. 这款丝巾使用了卡通花卉,不体现中国传统文化元素。	This silk scarf is even more striking and prominent. 这款丝巾更加醒目突出。							
c		This scarf is designed using the caisson pattern from Dunhuang murals. 这条围巾的设计采用了敦煌壁画中的藻井图案。	This silk scarf conveys traditional auspiciousness. 这款丝巾传达传统吉祥如意。							

4. Which style of silk scarf do you prefer to buy? 您日常比较偏向于购买哪一种风格丝巾?

- ☐ Casual and sporty 休闲运动
- ☐ Ladylike and feminine 淑女名媛
- ☐ College and age-defying 学院减龄
- ☐ Punk and heavy 朋克重工
- ☐ Simple and fashionable 简约时尚
- ☐ Cultural creativity 文化创意

5. Which colour of silk scarf do you prefer for everyday use?

- ☐ White/白色
- ☐ Black 黑色
- ☐ Blue/蓝色
- ☐ Red/红色
- ☐ Pink/粉色
- ☐ Green/绿色
- ☐ Grey 灰色
- ☐ Yellow/黄色

6. Which style of silk scarf design do you think would attract your attention more?

(Single choice)您认为丝巾设计哪种风格更能够吸引你的注意? (单选)

- ☐ Traditional and stable 传统稳重
- ☐ Fashionable and dynamic 时尚动感
- ☐ warm and cordial 热情亲和
- ☐ Ethnic characteristics 民族特色
- ☐ International style 国际化风格
- ☐ Other (please fill in) 其他 (请填写)

7. What do you think needs to be improved about contemporary silk scarf products?
您认为当代丝巾产品哪方面需要改进

- ☐ Colour style/ 颜色 风格
- ☐ Pattern style/图案 样式
- ☐ Texture of material/ 材料质感
- ☐ Size and shape/大小 形状
- ☐ Other (please specify) /其他 (请注明)

8. What is the purpose of your purchasing silk scarves? [Multiple choice]您购买丝巾的目的是什么? [多选题]

- ☐ To collect as a tourist souvenir 作为旅游纪念品收藏
- ☐ To give to others 赠送他人
- ☐ For your own use 自己使用
- ☐ Interesting design 设计有趣
- ☐ Other 其他

9. What would you look for in a cultural and creative silk scarf product? [Multiple choice] /您会关注文创丝巾产品的哪些方面? [多选题]

- ☐ Appearance features 外观特征
- ☐ Cultural connotation 文化内涵
- ☐ Creativity 创意性
- ☐ Brand 品牌
- ☐ Collection value 收藏价值
- ☐ Commemorative meaning 纪念意义
- ☐ practicality 实用性
- ☐ Materials and quality 材料质量
- ☐ Packaging 包装

10. What do you think are the problems with the current cultural and creative silk scarf products? (Multiple choice) 您觉得目前文创丝巾产品有哪些问题? (多选题)

- ☐ monotonous style 类型单一
- ☐ Poor product quality 产品质量差
- ☐ Lack of functionality and practicality 缺乏功能和实用性
- ☐ Lack of innovation in design 设计不够创新
- ☐ Cultural connotation is lost 文化内涵丢失
- ☐ Too expensive 价格太贵
- ☐ Unbalanced audience 受众人群不平衡
- ☐ Less access to purchase 购买途径较少
- ☐ No well-known brands 没有知名品牌
- ☐ Inadequate market system 市场体制不健全
- ☐ Other 其他

11. Which element of the Dunhuang mural elements in the Cultural Creation Silk Scarf would most inspire you to buy it? [Multiple choice] 敦煌壁画元素的文创丝巾中哪个元素最能激起你的购买意愿？ [单选题]

- ☐ Religious story elements 宗教故事元素
- ☐ Color scheme 色彩搭配元素
- ☐ Pattern design elements 图案设计元素
- ☐ Function of the product itself 产品本身的功能

12. Which channel do you usually use to learn about Dunhuang Element silk scarf products [Multiple Choice]您平时从哪个渠道了解敦煌元素的丝巾产品讯息 [多选题]

- ☐ Microblogging 微博
- ☐ WeChat public website 微信公众号
- ☐ TikTok 抖音短视频软件
- ☐ Advertising 广告宣传
- ☐ Other 其他

13. In terms of the emotional experience of the silk scarf product, please rate the importance of the following keywords. 在丝巾产品的情感体验方面，请您为以下关键词的重要性打分。

1=Strongly disagree. 2=Basically disagree, 3=Partially disagree, 4=Neutral, 5=Partially agree, 6=Basically agree, 7=Strongly agree.

1=非常不同意。 2=基本不同意， 3=部分不同意， 4=中立， 5=部分同意， 6=基本同意， 7=非常同意。

Words 词汇	Strongly disagree 非常不同意		Neutral 中立		Strongly agree 非常同意		
	1	2	3	4	5	6	7
a. Affinity 亲情感	☐	☐	☐	☐	☐	☐	☐
b. Affinity 亲和力	☐	☐	☐	☐	☐	☐	☐
c. A sense of Joy 愉悦感	☐	☐	☐	☐	☐	☐	☐
d. Healing 治愈性	☐	☐	☐	☐	☐	☐	☐
e. Relaxed Feeling 轻松感	☐	☐	☐	☐	☐	☐	☐
f. Pressure Relief 减压感	☐	☐	☐	☐	☐	☐	☐
g. Emotional Resonance 情感共鸣	☐	☐	☐	☐	☐	☐	☐

End of Questionnaire, Thank you
问卷结束，非常感谢

Appendix C

Expert Validation Survey



UPM
UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI

**FAKULTI REKABENTUK
DAN SENIBINA**
FACULTY OF DESIGN AND ARCHITECTURE
فاكولتي ريك بنتوق دان سني بينا

Dear Interviewee

This is part of my PhD research at the School of Design and Architecture, Universiti Putra Malaysia. The survey aims to develop a new contemporary silk scarf design framework for young Chinese women incorporating elements of Dunhuang mural paintings from a cognitive ergonomics perspective. I would be very grateful if you could complete this survey. Any information related to this study related to your identity will be kept confidential. No identity will be revealed in written reports or publications; only the data will be shown.

亲爱的受访者

这是我在马来西亚博特拉大学设计与建筑学院博士研究的一部分。调查的目的是为了开发一个认知工效学视角下融入敦煌壁画元素的中国年轻女性丝巾设计新框架，如果您能完成这项调查，我将非常感激。任何与本研究有关的、与您身份相关的信息都将被保密。在任何书面报告或出版物中都不会透露任何人的身份，只显示数据。

Thank you for your cooperation
谢谢您的合作。

SECTION A/ A 部分

Respondents' Background /受访者的背景

Please tick (✓) the options you recognise or answer the underlined questions.

请在您认可的选项打勾(✓) 或者回答划线中的问题。

A1. Gender: Single choice] * 性别: [单选题] *

☐ Male/ 男 ☐ Female /女

A2. Age (as of 01 May 2023) _____ 年龄 (截至时间: 2023 年 5 月 1 日)

A3. Educational background (the highest degree) [Multiple choice] *

教育背景 (最高学历) [单选题] *

1. No formal education 没有受过正规教育
2. High school education or below 高中及以下学历
3. Vocational education 职业教育
4. Higher education (bachelor degree or above) 高等教育 (大学本科以上)
5. Others (please indicate) 其他 (请注明)

A4. Monthly income 月收入

1. Yes (mean) 有(平均数)
2. No income 没有收入

SECTION B / B 部分

Respondents' Knowledge 受访者的知识

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B1. Do you recognise the design value of Dunhuang mural elements?

您是否认可敦煌壁画元素的设计价值?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B2. Is applying cognitive ergonomics to product design a good idea?

您是否认为将认知工效学应用于产品设计是一个好办法?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B3. Do you think Dunhuang fresco elements suit the design of the silk scarf product?

您认为敦煌壁画元素适合用于丝巾产品设计吗?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B4. Do you think Dunhuang frescoes are essential in the design of silk scarves?

您是否认为敦煌壁画元素在丝巾产品设计中具有重要性?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B5 Do you think the three main categories of Dunhuang fresco elements suitable for silk scarf design are line, pattern and colour?

您是否认为适用于丝巾设计的敦煌壁画元素主要包括了线条、图案和色彩三大类别。

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B6. Do you agree with combining Dunhuang fresco elements with cognitive ergonomics in silk scarf design?

您是否认同将敦煌壁画元素与认知工效学相结合的丝巾设计理念?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B7. Can the use of Dunhuang fresco elements in silk scarf product design attract consumers? 您认为在丝巾产品设计中运用敦煌壁画元素是否能够吸引消费者?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B8. Do you think the contemporary design framework for silk scarves can enhance the competitiveness of the products?

您认为当代丝巾产品设计框架是否能提升产品的市场竞争力?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B9. Is the contemporary silk scarf product design framework incorporating Dunhuang fresco elements innovative?

您是否认为融入了敦煌壁画元素的当代丝巾产品设计框架具有创新性?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

B10. Can the design principles mentioned in the design framework for silk scarves with Dunhuang fresco elements effectively guide the product design?

您认为敦煌壁画元素丝巾产品设计框架中所提及的设计原则能否有效指导产品设计?

Strongly disagree	Basically disagree	Partially disagree	Neutral	Partially agree	Basically agree	Strongly agree
1	2	3	4	5	6	7

BIODATA OF STUDENT

Liu Fei, the student of this thesis, was born in March 1978 in Shandong Province, China, and graduated from Shandong Normal University in 2000 and 2003 with Bachelor's and Master's degrees. She is motivated to continue researching to gain in-depth knowledge and insights into cultural and creative product design studies. Therefore, she pursued her PhD in Industrial Design under Dr. Irwan Syah MD Yusoff of the Faculty of Design and Architecture. She will continue to pursue her PhD in Industrial Design under the supervision of Dr. Irwan Syah MD Yusoff.

LIST OF PUBLICATIONS

- Liu, F., Yusoff, I. S. M., & Hassan, A. (2024). Exploring shape and colors from existing silk scarf by integrating Chinese Dunhuang mural elements to contemporary perception from historical evolution and cultural perspective in China. *Herança*.
- Liu, F., Yusoff, I. S. M., & Hassan, A. (2024). The strategic path and policy consideration of trade of cultural products among WTO member countries: taking the circulation of cultural products derived from Dunhuang murals as an example. *China and WTO Review (CWR)*.

