

The impacts of distributed lighting in the public space of Chinese shopping centres on customer behaviour

Abstract: Chinese shopping centres are facing operational challenges, and they are resorting to lighting design and effects to attract and retain customers. This study aims to explore how lighting in public space of Chinese shopping centres on customer behaviour. The study used a non-random sampling method to collect and analyse data from 607 participants. The study revealed that distributed lighting influenced customer behaviour and customer synaesthesia(customer emotional and psychological responses to lighting), which further impacted customer behaviour. The results of the study show that customer synaesthesia accounts for 75% of the total impact of lighting and plays a key role in mediating between lighting and customer behaviour. This study filled the gap of lacking researches into lighting in public spaces and its impacts on customer behaviour. Its innovative contribution is linking synaesthesia with customer behaviour via a strong mediating effect. The practical implications, limitations, and areas for further studies are given.

Keywords: light; synaesthesia; customer behaviour; shopping centres; public space

1. Introduction

Along with China's fast economic expansion and urbanization, shopping centres have become a mushrooming and even dominant retailing format in Chinese cities (Li, Mason and Gan, 2022), and they differ from conventional retailing formats in that they're able to offer customers a one-stop solution for shopping, leisure, entertainment, and food and beverages. Customer experience is stressed in designing shopping centres, where customers not only buy but also experience. As a result of China's economy slowing down, dropping customer purchase power due to the Covid pandemic, and negative impacts from e-commerce, Chinese shopping centres are faced with strong competition, declining customer traffic and increasing vacancy rate (Fast Company, 2024). Thus, they have to devise effective methods to attract customers.

Lighting as a critical element of servicescape has been widely adopted in shopping malls and shops to attract and retain customers via creating agreeable and appealing shopping environment for enabling enjoyable and unforgettable experiences for customers. Servicescape is the collection of physical elements and cues that influence customer behaviour where service occurs and is delivered to customers, and it includes store design, layout, lighting, music and temperature (Mari and Poggesi, 2013). Servicescape including lighting is found to have significant impacts on customer loyalty for shopping malls (Shashikala and Suresh, 2013). The impact of lighting has widely examined as a critical cue in servicescape for stores and shops. Quartier, Vanrie and Van Cleempoel (2014) found that lighting communicated brand image and had subtle impacts on customer emotions. Currently, most studies about the impacts of lighting on customer behaviour are focused on the in-store environment. Shopping centres usually have not only varied types of shops and stores but also a large area of public space connecting these shops, serving varied functions such as providing space for customers to leisure, socialize, and even rest (Giampino, Picone and Schilleci, 2017). Thus, there is an urgent need for examining the public area and space in shopping centres. What is more, lighting usually generates varied emotional and psychological associations or synaesthesia among customers. For instance, some colours are perceived by people as cold colours and warm colours (Strik Lievers, 2017). Red and yellow colour make people feel warmth (Fenko, Schifferstein and Hekkert, 2010), which is a form of synaesthesia according to Marks (1990) and Rouw and Root (2019). Different colours and combinations of colour tend to generate varied impacts on customers emotions and feelings. Few studies have combine shopping centre lighting, synaesthesia with customer behaviour, which is a gap that should be examined from the theoretical perspective.

Based on these contexts, this study seeks to critically evaluate the impacts of distributed lighting in the public space of Chinese shopping centres on customer behaviour and test whether synaesthesia exercises a mediating effect on customer behaviour. The key research questions are given as below:

How does distributed lighting in the public space of Chinese shopping centres on customer behaviour? What are the role of synaesthesia in the relationship between lighting and customer behaviour for Chinese shopping centres?

This study has both practical values and theoretical implications. Practically, this study's findings offer guidance for shopping centres in China to enhance competitive advantage from the perspective of lighting design. Theoretically, it fills the gap of lacking studies exploring the relationships between lighting and customer behaviour from the perspective of synaesthesia.

2. Literature review

This literature review focuses on key concepts adopted in this study, including lighting design, synaesthesia, and key models such as Stimulus-Response Theory. Current researches pertinent to this topic are reviewed critically.

2.1. Distributed lighting in the public space of shopping centres

Shopping centres are large built environment where varied types of shops and stores from food, drinking, entertainment and retailing are connected via public space (Howard, 2007, Giampino et al., 2017, Gosseye and Avermaete, 2020). Public space within shopping centres refer to an open area which could be accessed via customers and visitors, mainly including passages, hallways, and corridors and atriums (Kusumowidagdo, Sachari and Widodo, 2013, 2015). Such space does not permission of entry and is intended for customers to entertain, meet, rest and socialize (Kusumowidagdo et al., 2013), and such space usually has seats, benches and chairs for customers to rest. Such space are public and multi-functional, and usually spacious with carefully designed lighting to create an attractive, comfortable and appealing environment for attracting and retaining customers.

Since public spaces are usually large and spacious, concentrated lighting with one light source and fixture is usually not sufficient for providing intended lighting effects. So, distributed lighting is usually adopted, where a set of light sources are strategically designed and positioned across the public space to create a pre-designed lighting environment and effects (Karlen, Spangler and Benya, 2017). Lighting design is interdisciplinary, covering engineering, arts and science, and aims at creating an tailored lighting environment and effects via reasonable combinations light layout, selection of light sources and control technologies (Cuttle, 2015). Distributed lighting has varied advantages such as offering uniform and sufficient lighting for the entire public space, and reducing and even eliminating shadows. Cuttle (2015) stresses using the special layout of lighting and light sources to create the intended 'sharpness' of illumination, which is critical for generating intended feelings among users and viewers. Sharper lighting usually generates far more distinct and clear boundaries between light and shadows, while softer lighting tends to produce smoother transition between different lighted areas. Thus, the sharpness of lighting has significant impacts of visual experiences of users (Cuttle, 2008). Distributed lighting is fulfilled by a distributed lighting system that consists of carefully positioned light sources and control units used to coordinate the lighting effects of these sources. Distributed lighting systems appears to users as a single and coherent system (van Steen and Tanenbaum, 2016), creating intended lighting effects.

2.2. Synaesthesia

Synaesthesia is a common sensory perception phenomenon, which refers to the cross-reactivity between human sensory organs, where one sensory stimulus triggers multiple sensorial responses (Spector and Maurer, 2013). Normally, a stimulus in one sensory channel should theoretically only elicit a response in the corresponding

channel. However, when synaesthesia occurs, a stimulus in one sensory channel can elicit responses in several other channels (Hubbard and Ramachandran, 2005). Synaesthesia represents a blending and crossing of different human sensory organs. Common examples include seeing colours while tasting flavours, or feeling touch when hearing sounds. For instance, people often feel warmth when they see red or yellow, while they feel coolness and tranquillity when seeing blue or green (Shahidi et al., 2021).

Synaesthesia is usually classified into two forms, namely strong form and weak form (Martino and Marks, 2001). Martino and Marks (2001) compared these two forms, and found that the strong form is usually not common by the weak form is far more common. The strong form is absolute correspondence between sensory organs while the weak form is more contextual. The weak form of synaesthesia could be learned and unlearned.

Currently, the academia is not so uniform about whether regarding the feelings of colour imposed on viewers as a weak form of synaesthesia. Ou et al. (2012) found that customers' emotional and psychological feelings to specific colours are a result of cultural conditioning, and that human reactions to colours are conditioned by learned experiences, which is supported by this study of Hardin (2000). By contrast, Amin et al. (2011) found that "green and warm colours are associated with cheerfulness and energy". This study adopted the general practice of regarding such emotional responses as a form of synaesthesia, which is common among Chinese scholars such as Chen and Xiong (2011). It could be regarded as a weak form of synaesthesia. As demonstrated by Martino and Marks (2001), it is contextual and depends on cultural conditioning and learning. Synaesthesia is framed as customer feelings and responses under specific lighting conditions in this study.

2.3. Customer behaviour and related theories

Customer behaviour has been widely examined because of huge practical implications. Both academia and marketing practitioners are obsessed with studying customer behaviour so that more goods and services can be sold with stronger effectiveness and efficiency. There have been many definitions to this concept. Customer behaviour is defined a set of interrelated actions, decisions, and responses involved when customers including both individuals and groups purchase, use, evaluate and dispose goods and services, including information acquisition before purchasing, information evaluation, purchase decision making, and post-purchase evaluation, re-purchase (Solomon, 2015, Solomon et al., 2016). It is defined as a set of value-seeking activities for meeting personal demands and needs by Babin and Harris (2010).

Schiffman, Kanuk, and Hansen (2012) define customer behaviour as the collection of behaviour that customers demonstrate when they search for, buy, use, evaluate, and dispose of products that could satisfy their needs and demands. From a decision-making perspective, Hoyer, MacInnis and Pieters (2013) define customer behaviour as the collection of decisions made by human decision-making units during obtaining, consuming and disposing of products; such units could be individual customers, families, groups, firms, governments, and even non-profit organizations. Hoyer, MacInnis and Pieters (2013) stress that customer behaviour involves many facets including products, services, activities, experiences, ideas, and people, and it is far more than the purchase behaviour, and that customer behaviour is not static but highly fluid and changeable. Mothersbaugh and Hawkins (2016) also support that customer behaviour is complex and multi-dimensional.

A variety of models have been developed to theorize and understand customer behaviour. Customer decision making model is widely adopted. This model identifies five major processes involved in consumption, including recognition of need, information search, evaluation of alternatives, purchase decision and post-purchase evaluation (Lunn, 2001). This model has advantages such as a structured framework, insights into customer needs, predictive power evidenced by marketing practices, and certain downsides, such as being too simplistic, and failing to account for individual variability (Solomon, 2015). It presents customer decision making as linear processes, which may conflict with practices.

Solomon et al. (2016) hold that customer behaviour is highly correlated with their emotional states when making

consumption decisions, and identify a set of common emotional states, such as arousing, pleasant, exciting, relaxing, distressing, and gloomy. Customers are more likely to make purchase decisions when they are aroused and holding positive emotions (Consoli, 2009). This has strong implications for marketing practices. Marketers and branding practitioners have been making their best efforts to suggest to customers that when they buy certain goods, they are to have certain emotions (Guo, Wang and Wu, 2020, Magids, Zorfas and Leemon, 2015); they are seeking to build a mental and emotional connections between brands and positive emotions that are desired by customers (Manthiou, Hickman and Klaus, 2020). Magids et al. (2015) identify common emotional motivations, including standing out from the crowd, building confidence in the future, a sense of well-being, a sense of thrill, and a sense of self-actualization, and security.

Apart from these theories, there are a wide variety of theories and models applied to explain and predict customer behaviour, including Activity Theory, Maslow's Hierarchy of Needs, Self-Determination Theory, Expectancy Theory, and Stimulus-Response Theory. Activity Theory frames consumption as an activity engaged under specific social contexts that has a purpose (Kaptelinin and Nardi, 1997), stresses the role of artifact and mediation in influencing and even determining activities (Engeström, 1999), and the sociality, cultural and historical context (Bakhurst, 2009) under which consumption is made. Maslow's 'Hierarchy of Needs Theory' suggests that human needs drive customers to make purchases and therefore basic needs should be met first before higher needs. (McLeod, 2007). Similarly, self-determination theory emphasises three basic human needs, namely autonomy, competence and relevance. (Deci and Ryan, 2012). This theory holds that customers are more likely to consume and purchase when they have options and control over their decisions. Expectancy Theory hold that customers buy and consume because they believe in that their purchase will create desired outcomes (Lloyd and Mertens, 2018).

Stimulus-Response Theory assumes human behaviour as a result of external stimulus. Individuals can establish a conditioned responses via learning and conditioning. This theory has wide applications in marketing and branding (Rescorla, 1988). Brands are seeking to build mental associations in the minds of customers via sustained and consistence advertising. Marketing elements are perceived as stimulus while customer purchase is responses under this theory.

2.4. Relationships between lighting, synaesthesia and customer behaviour

Studies about the impacts of colour and lighting on customers are divided. This section's review focuses on colour since public spaces at shopping malls are usually lighted with specific colours to create an ambient environment for customers. These spaces are generally lighted without disruptions. With brighter lighting, customers are found to be more likely to handle products but it had no impact on increasing sales, as found by Areni and Kim (1994), who had studied a large US retailer via doing experiments comparing soft versus bright lighting conditions. Quartier et al. (2014) found that lighting has no significant impact on customer behaviour, and they only found that lighting has subtle influences on perceived store atmosphere and experienced emotions. Similarly, Saeed (2015) found that lighting is effective in directing shopper traffic toward illuminated areas and products, but this does not necessarily increase sales of illuminated products.

By contrast, Bellizzi and Hite (1992) found that customers tend to demonstrate higher purchase intentions under a blue retain environment. Similarly, Babin, Hardesty and Suter (2003) combined interior colour with lighting in their study about the relationship between lighting and purchase intentions, and they found that customers prefer blue interiors for fashion shops and demonstrate higher purchasing intention and that customers experience the highest pricing fairness in backgrounds of orange interior and soft lighting. Their study demonstrated that lighting and colour had substantial impacts on both customer experience and purchase intention. White et al. (2021) confirmed the role of blue colours in driving up positive customer attitude and purchase intentions via carrying out experiments about colour and customer purchase under web banner advertising. However, Broeder

and Scherp (2017) did not find the significant relationships between blue colour and customer purchase intention after studying 552 participants from the West and Asia with three common colours, namely red, yellow and blue. They confirmed that yellow is positively correlated with customer purchase intention. Moreover, Martinez et al. (2021) found that colour alone could not be regarded as a significant determinant of customer purchase intentions since it has complex relationships with many other variables including product type and contexts. Martinez et al. (2021) confirmed that the store colour alone does not have significant impacts on customer purchase intention, but it does when it is combined with the product colour.

Tantanatewin and Inkarojrit (2016) found that colour and lighting had significant impacts on customer impression of space and perception of retail identity. Moreover, Barlı et al. (2012) examined the influences of five common colours, and found that green colour is positively correlated with a product purchase, and that with soft lighting conditions, customers generally have longer time stay in stores. Red indoor colour is found to drive customers away. Bilgili, Ozkul and Koc (2020) found that when restaurants adopt green colours, customers tend to feel that their waiting time is shorter compared to other colours. By contrast, Zielke and Schielke (2016) found that brightness in lighting resulted in high purchase intention, which is contracting with Barlı et al. (2012).

As for store satisfaction, Reddy, Reddy and Azeem (2011) found that store lighting influences store images perceived by customers, and thus influence store satisfaction. This agrees with Schielke and Leudesdorff (2015), who found that store lighting has strong impacts on how customers perceive a store's brand image from perspectives of social status and value orientation and its brand personality. Leudesdorff and Schielke (2012) found that store lighting is highly correlated with the store's brand image perceived by customers.

From these reviews, research hypothesis H1 is developed as:

H1: Distributed lighting at the public space in Chinese shopping centres has significant impacts on customer behaviour.

As for the impacts of lighting and colour on customer emotions and feelings, Pullman and Gross (2004) argued that lighting and colour of environment could be designed to elicit specific customer emotions and responses. Park and Farr (2007) found that customers are aroused and satisfied by certain lighting effects under retained environment. Similarly, Bigdeli and Bigdeli (2014) confirmed that lighting has positive impacts on customer emotions. Gharib and Shohdy (2023) summed up the complex relationship between lighting and emotions. This results in Research Hypothesis H2.

H2: Distributed lighting at the public space in Chinese shopping centres has significant impacts on customer synaesthesia, including feeling pleasant, aroused and warm.

As for the influences of warm colour and cold colours, Beneke et al. (2015) examined how packaging colour influences purchase intentions of bottled water, and found that colour is not relevant, and that customers may prefer neutral colours slightly. By contrast, Zielke and Schielke (2016) found that warm orange colour incurs higher purchase intentions via adding pressure, which is applicable for colours that are saturated rather than pastel colours. Ozkul et al. (2019) confirmed that colour and lighting are critical atmospheric elements, and that they influence customer attention, interest, liking and satisfaction. However, Shah (2018) found that ambient colour does not significantly influence both customer purchase intention and satisfaction. From these conflicting studies, Research Hypothesis H3 is developed.

H3: Customer synaesthesia experienced under the public space in Chinese shopping centres has a significant impacts on customer behaviour.

2.5. Research gap and framework

From the above review, it could be seen that most current studies are not focused on the public space of shopping centres, though they are studies lighting, colour, customer emotions and responses due to lighting and colour, and customer purchase behaviour. This is the major gap this study aimed to fill. Figure 1 presents the theoretical

framework adopted with three research hypotheses developed.

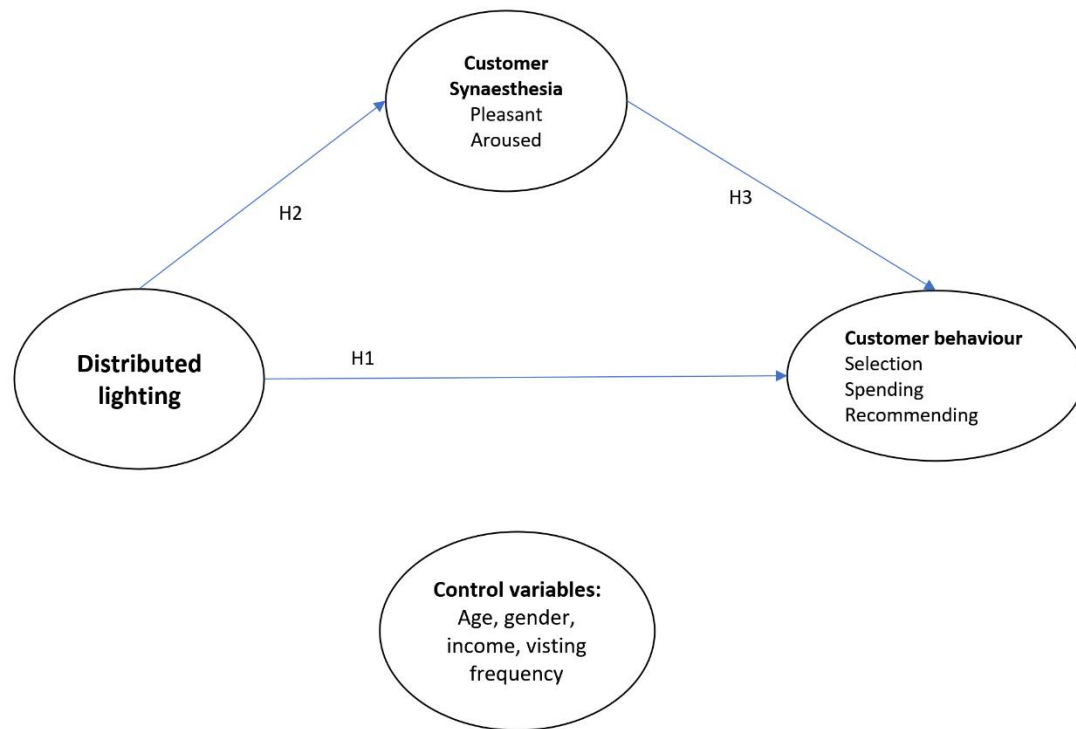


Figure 1. The theoretical framework adopted in this study.

3. Methodology

This study adopted an online questionnaire survey as the core strategy for data collection. Shopping centres were selected from Zhengzhou, a major city in northern China. The survey participants were customers for these shopping centres, and they were accessed via online shopping communities such as WeChat groups and QQ groups, where customers exchanged local news and information about shopping. In total, 607 valid responses were collected from participants who were accessed via purposive and volunteer sampling. According to Saunders, Lewis and Thornhill (2019), when the population is large, the non-random sample size should be above 400 to have reasonable representativeness. This study had 607 participants to enhance representativeness as possible.

The quality of data collected via questionnaire survey depends on the quality of measurement scales used in the survey design (Snijkers et al., 2013). The measurement scales are developed and adapted from mature scales from published studies for enhancing data validity and reliability. The measurement scale of customer behaviour is adapted from Bitner (1992), Solomon (2015) and White et al. (2021), including items such as “*as a consumer, I prefer to spend more time in well-lit shopping centres.*”. The measurement scale of distributed lighting is adapted from Odabaşioğlu and Olguntürk (2015), featuring items such as “*upon entering a shopping centre, the lighting in public areas is spacious and bright*”. The scale of customer synaesthesia is adapted from Lee and Gong (2022) and Odabaşioğlu and Olguntürk (2015), featuring items such as “*in a shopping centre, the lighting effects make me happy and often remind me of my family or friends*”. All these scales adopted the Likert’s five-point scale for quantifying customer attitudes and responses. These measurement scales are presented in Appendix 1. After data collection, invalid data with incomplete responses were deleted and then data was loaded into SPSS and Amos for quantitative analysis. The sample’s demographical major descriptive results are given in Table 1.

The sample is slightly biased toward female shoppers, with 54.9% females. The majority of the sample is aged below 41, featuring young shoppers. The most common income range is 5000-8000 RMBs, accounting for 37.1% of the sample. Only 38.1% frequently visited shopping centres, and the sample is most likely to visit shopping centres in the afternoon (40.9%) and at night (38.1%). From the demographic perspective, the sample was generally representative of shopping centre shoppers at Zhengzhou.

Table 1. Demographics of the sample..

Questions	Items	Percent %
1. Please indicate your gender.	A) Male	45.1%
	B) Female	54.9%
2. Please indicate your age	A) 18-24	16.5%
	B) 25-30	32.3%
	C) 31-40	39.4%
	D) 41 and above	11.9%
3. Please indicate the range of your monthly income in RMBs?	A) Below 3000	11.2%
	B) 3000-5000	24.7%
	C) 5000-8000	37.1%
	D) Above 8000	27.0%
4. How often do you visit shopping centres?	A) Rarely	7.1%
	B) Occasionally	54.9%
	C) Frequently	38.1%
5. What is the most common time period for you to visit shopping centres?	A) Morning	8.7%
	B) Noon	12.4%
	C) Afternoon	40.9%
	D) Evening	38.1%

As for data reliability, Cronbach's alpha was calculated for distributed lighting, customer synaesthesia and customer behaviour respectively at 0.861, 0.856 and 0.899, all of which are bigger than 0.8, indicating good internal consistency (Vaske, Beaman and Sponarski, 2017).

4. Results and discussions

The mean values of distributed lighting(LD), customer synaesthesia (CS) and customer behaviour(CB) are 3.944, 3.757 and 3.782, respectively on a scale of 1 to 5, where 3 indicates “neither disagree nor agree” to the given statements. Thus, the group generally have positive evaluations of the shopping centres' distributed lighting design and effects, and they have positive emotions feeling moderately pleasant, aroused and warm, demonstrating positive shopper behaviour.

These three variables are correlated in a statistically significant manner, and the coefficients of correlation are from 0.73 to 0.83, indicating moderate to strong correlation among these variables. However, these correlations are not sufficient to verify the research hypotheses, which were confirmed by structural equation modelling(SEM) analysis carried out with Amos 24.

Figure 2 presents the SEM results with standardized loadings of each path for the research framework presented in Figure 1, and all paths are statistically significant(see Appendix 3). This SEM model captures the relationships among three core variables and their measurement items. The indicators demonstrated the model has good

fitness(Appendix 2); CMIN/DF is 3.456, lower than 5; RMR is 0.049, less than 0.05; AGFI is 0.861, bigger than 0.8. The total effects, direct effects and indirect effects are presented in Table 2. The path coefficients have been standardized and quantified the strength of the relationships between two variables.

Table 2. Standardized effects among LD, CS and CB.

Total Effects				Direct Effects				Indirect Effects			
	LD	CS	CB		LD	CS	CB		LD	CS	CB
CS	.863	.000	.000	CS	.863	.000	.000	CS	.000	.000	.000
CB	.873	.763	.000	CB	.215	.763	.000	CB	.658	.000	.000

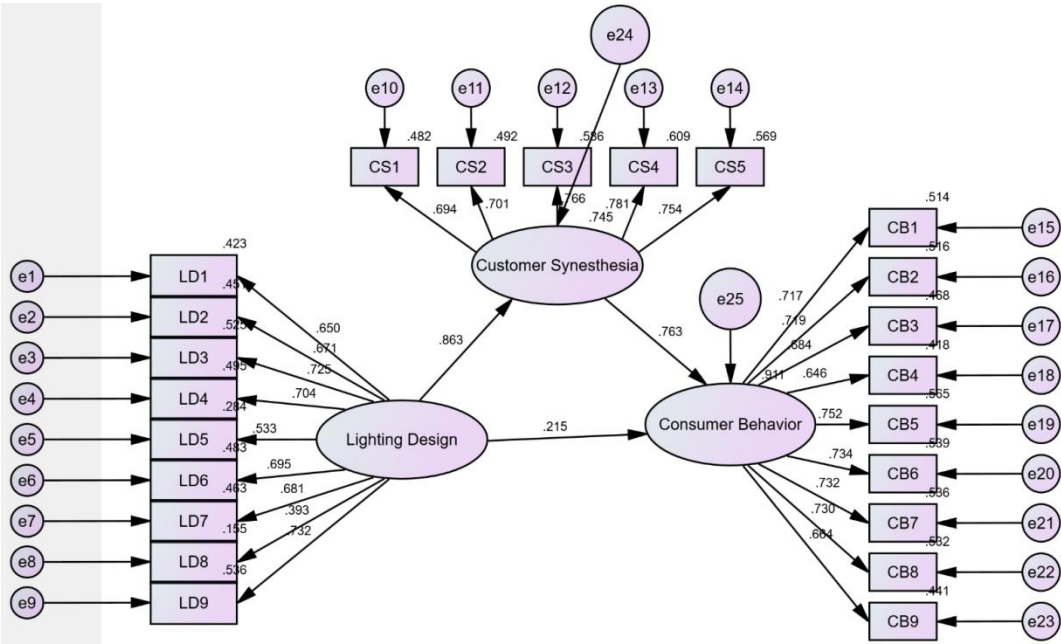


Figure 2. SEM model results.

As the for impacts of lighting on customer behaviour, this model found that the direct impact of lighting is 0.215, and the indirect impact is 0.658. This verified research hypothesis H1. This agrees with certain previous studies supporting the effects of colour and lighting on customer behaviour, including Bellizzi and Hite (1992), Babin, Hardesty and Suter (2003) and White et al. (2021). This finding may be explained from the perspective of the consumption pattern transformation Chinese urban customers have been experiencing. Conventionally, Chinese customers stressed quality and pricing, but now modern and growingly rich urban Chinese customers have been stressing “experience” in consumption. Shopping centres enable them to experience modern urban life with leisure and entertainment, especially by offering them attractive lighting effects. In fact, many shopping centres have become landmarks for local cities attracting customers to experience modern urban life and leisure. The public space with lighting effects and strong interior design is found highly attractive to customers and visitors (Bernadetta, 2022). Li, Cheung and Tse (2023) found that the shopping centre’s retail environment should be designed with a customer-centric approach to attract and retain customers.

H2 is verified since distributed lighting is found to have direct effects of 0.863 on customer synaesthesia with SEM analysis. The influences of lighting, especially distributed lighting, on customer synaesthesia and emotions, have been identified via a set of studies, including Bigdeli and Bigdeli (2014) and Gharib and Shohdy (2023). This study’s finding agrees with them.

Similarly, H3 is confirmed since customer synaesthesia is found to have direct effects of 0.763 on customer behaviour. When customers have positive emotions upon seeing beautiful and amazing lighting effects at shopping centres, it is highly likely that they will stay longer to see and enjoy such lighting effects, and buy more. Das and Varshneya (2017) confirmed when customers are in a highly aroused and pleasant emotional states, they are more likely to consume. As found by Rahadhini, Wibowo and Lukiyanto (2020), positive emotions enhance hedonic shopping by customers.

With data presented in Table 2, it is easy to calculate that customer synaesthesia plays a critical role in the relationship between distributed lighting and customer behaviour. Around 75.3% ($=0.658/0.873$) of the distributed lighting's total effects on customer behaviour is exerted via customer synaesthesia. Only 24.6% is direct effects as demonstrated by Table 2. This demonstrates that customer synaesthesia has a strong mediating effect. This is the major innovation and contribution of this study. This find stresses the central role of customer emotions in influencing customer shopping behaviour.

Positive emotions incurred by viewing beautiful lighting effects influence how customers perceive the shopping malls offering such lighting effects. When customers have positive emotions because of lighting effects at a shopping centre, they tend to have higher and improved evaluations of this shopping centre, including improved brand image and higher trust. Customer trust is critical for customers to spend, especially for expensive goods and services (Djan and Adawiyyah, 2020). Without trust, consumption, especially of high-value products, is risky due to product quality, post-sales services and even pricing. When customers are in a state of positive emotions, it is likely that they are less alert and more likely to be influenced by marketing campaigns and develop trust in both shopping centres and stores within, thus staying longer and buying more.

What is more, customers tend to evaluate a shopping centre via its interiors. Lighting effect is a critical element of interiors. Attracting and engaging lighting effects demonstrates the strengths and resourcefulness of the shopping centre, which enhances customer trusts. Designing, installing, operating and maintaining engaging lighting effects incurs various types of costs (Gaston et al., 2015), which could be not undertaken by weak shopping centres. This is partly why shopping centres are increasingly using lighting effects to differentiate themselves and attract customers. Lighting effects at public space along with other interiors demonstrate the power and trustworthiness of shopping centres. This is highly beneficial for building customer trusts. Moreover, engaging lighting effects may promote impulsive consumption (Massie, 2006, Ilicic and Baxter, 2021). Iyer et al. (2020) have identified lighting as a contributing factor to impulsive consumption.

5. Conclusion, Implications and Limitations

Under the context that Chinese shopping centres are facing operational challenges, they are resorting to lighting design and effects for attracting and retaining customers. All research questions are answered effectively with SEM analysis. This study fills the gap about the influences of distributed lighting at public space in shopping centres on customer behaviour. It confirms that distributed lighting has positive impact on both customer behaviour and customer synaesthesia, which further impacts customer behaviour. This study enriches the literature pool about lighting and colour and customer behaviour.

This study is innovative in that it confirms the strong mediating role of customer synaesthesia, namely customer emotional and psychological responses to lighting, in the relationships between lighting and customer behaviour. This is the major theoretical contribution of this study. This study explains this mediating effect from perspectives such as customer decision making processing, customer trust, and impulsive consumption. This study stresses the role of emotions in customer purchasing and recommendation, and identifies that lighting effects at shopping centre public space as a major effective tool for creating and shaping customer emotions.

Apart from theoretical contributions, it has various practical implications. First, lighting should receive sufficient attention, especially for public space at shopping centres. Most retailers have put sufficient attention and energy

in in-store lighting design, and many of them ignores lighting design in the public space. Second, lighting usually does not functions alone, and it should be adopted and well-integrated with various other servicescape elements such as colour, music, and decorations to attract and retain customers. Third, marketing practitioners should place influencing customer emotions at their first priority. Customers are highly emotional rather than reasonable under most cases. Marketing and retailing should create environments where customers could relax and arouse, and enjoy.

This study has various advantages. It has a sufficiently big sample and it adopted SEM analysis, increasing the validity and reliability of its findings. It still has certain limitations. First, the concept of customer synaesthesia is controversial. Certain scholars disagree that customer responses to certain colours as warm colours are a form of synaesthesia, such as Ou et al. (2012) and Hardin (2000). They hold them as the result of cultural and social conditioning. Second, this study is over-simplified since it does not further explore the various dimensions of these three key variables. For instance, it does not explore which elements of distributed lighting such as brightness, warmth, and pleasantness, have most impact on customer synaesthesia and behaviour. Third, this study is based on quantitative data alone. It lacks details about how and why lighting influences customer synaesthesia and purchase behaviour.

These limitations point out areas for further studies. Future studies could further focus on specific dimensions of lighting design and customer behaviour, or a type of customer emotions incurred by lighting. Further studies may adopt a qualitative approach to explore and interpret why lighting influences customer feelings and purchase behaviour via gathering data with in-depth interviews and focus groups.

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489 **Appendix 1: Survey instruments**

Questions	Variables
1. Please indicate your gender.	Gender
2. Please indicate your age	Age
3. Please indicate the range of your monthly income in RMBs?	Income
4. How often do you visit shopping centres?	Frequency of visiting shopping centres
5. What is the most common time period for you to visit shopping centres?	Time of visiting shopping centres
6. Upon entering a shopping centre, the lighting in public areas is spacious and bright.	Distributed Lighting
7. Upon entering a shopping centre, the lighting in the product display area is uniform and distinctive.	
8. Upon entering a shopping centre, I am often attracted by the lighting effects in the public space.	
9. Upon entering a shopping centre, I often subconsciously walk or stroll along the illuminated paths.	
10. Upon entering a shopping centre, I try to avoid places with obviously dim lighting.	
11. Upon entering a shopping centre, I prefer warm and cozy lighting colours.	
12. Upon entering a shopping centre, products illuminated by lighting attract my attention.	
13. Upon entering a shopping centre, I quickly avoid constantly flickering lights.	
14. Upon entering a shopping centre, seeing exquisite and unique lighting makes it unforgettable.	
15. In a shopping centre, the lighting effects often make me feel at home.	Customer Synesthesia
16. In a shopping centre, the lighting effects make me happy and often remind me of my family or friends.	
17. In a shopping centre, the lighting effects make me happy and often trigger my impulse to spend.	
18. In a shopping centre, the lighting effects make me happy and create a leisurely feeling from consumption.	
19. In a shopping centre, the lighting effects make me happy and continually enhance and enrich my shopping experience.	
20. As a consumer, I prefer to follow the guidance of lighting to find merchants and shops.	Consumer Behavior
21. As a consumer, I am more likely to choose products at booths focused and highlighted by lighting.	
22. As a consumer, I prefer to spend more time in well-lit shopping centres.	
23. As a consumer, the longer I stay in well-lit shopping centres, the more likely my spending will exceed my budget.	
24. As a consumer, my shopping behavior is often closely related to the leisure and entertainment lighting show in the shopping centre.	
25. As a consumer, I am willing to increase the frequency and number of times I consume in shopping centres with attractive lighting effects.	
26. As a consumer, my shopping experience is often inseparable from the lighting experience in the shopping centre.	
27. As a consumer, I am happy to introduce shopping centres with unique and characteristic lighting effects to friends.	
28. As a consumer, I am willing to share my shopping centre consumption experience on social media.	

Appendix 2: Model fitness summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	49	784.471	227	.000	3.456
Saturated model	276	.000	0		
Independence model	23	7617.387	253	.000	30.108

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.049	.882	.857	.726
Saturated model	.000	1.000		
Independence model	.447	.184	.109	.168

Baseline Comparisons

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Default model	.897	.885	.925	.916	.924
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

494 **Appendix 3: Path Regression Weight**

			Estimate	S.E.	C.R.	P	Label
CS	<---	LD	.927	.057	16.385	***	par_21
CB	<---	CS	.800	.081	9.863	***	par_22
CB	<---	LD	.242	.075	3.232	.001	par_23
LD1	<---	LD	.746	.049	15.294	***	par_1
LD2	<---	LD	.800	.050	15.932	***	par_2
LD3	<---	LD	1.000				
LD4	<---	LD	.975	.058	16.810	***	par_3
LD5	<---	LD	.723	.058	12.518	***	par_4
LD6	<---	LD	.801	.049	16.318	***	par_5
LD7	<---	LD	.809	.050	16.056	***	par_6
LD8	<---	LD	.567	.062	9.157	***	par_7
LD9	<---	LD	.957	.055	17.372	***	par_8
CS1	<---	CS	.893	.051	17.426	***	par_9
CS2	<---	CS	.990	.056	17.691	***	par_10
CS3	<---	CS	1.000				
CS4	<---	CS	.950	.047	20.140	***	par_11
CS5	<---	CS	.896	.047	19.260	***	par_12
CB1	<---	CB	.893	.050	18.007	***	par_13
CB2	<---	CB	.787	.044	17.884	***	par_14
CB3	<---	CB	.770	.046	16.871	***	par_15
CB4	<---	CB	.868	.053	16.296	***	par_16
CB5	<---	CB	1.000				
CB6	<---	CB	.821	.045	18.445	***	par_17
CB7	<---	CB	.886	.048	18.587	***	par_18
CB8	<---	CB	.936	.051	18.435	***	par_19
CB9	<---	CB	.880	.053	16.566	***	par_20