

Psychological Impact on Design: Empirical Case Studies in City Regeneration of Post-Industrial Sites

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Abstract. Industry restructuring are pressures faced by cities in both the East and West. Some successful Chinese examples do not consider the distinctive characteristics of local and demand for experience from people. Nowadays, people expect more than just function in their chosen environment but benefit from interaction, connection and engaging the senses. Good Human-Centred Emotional Design (HCED) generates not only happiness and but also a sense of security and safety. Empirical case study was used as a means of human-centred research, to explore the contribution of psychological factors in post-industrial sites regeneration. Applying Norman's concept of three levels of design as a tool, this paper will examine whether the designs offered at current renovation projects satisfy visitors' expectation, in terms of visceral appearance, experience of interaction with environment and finally the psychological satisfaction of people. Thereby, to clarify how can architectural/environmental psychology and emotional design theory enhance the design.

Keywords: Human-centred design · Architectural psychology · Emotional design · Urban regeneration · Post-industrial sites · Qualitative research

1 Introduction

In the phase of human-centred design (HCD) driven industry, the design tends to concern higher level of human needs; architectural space is endowed with more senior psychology significance [1]. Fully satisfying people's demands increasingly becomes a focal point of design research; thus, an increasing number of architects and designers place great emphasis on HCD, in particular at the psychological and emotional level. Contemporary design expects to offer the user with advanced experience, where emotion appears to be a pervasive quality that serves to shape an experience [2]. In order to improve users experience, satisfying their psychological and emotional demands will be crucial. Therefore, designers need to establish the relationship amongst the architectural, environment and emotional experiences, and how to employ architectural function as an emotional lever in user experience. Many regeneration projects have done well commercially in providing retail and entertainment spaces and facilities, however, have performed poorly in satisfying visitors' experience expectation and psychological demands. Given the above, this paper focuses on exploring emotional and psychological impact on design, and construction issues in urban regeneration. Employing empirical case studies as a HCD method, the

redeveloped post-industrial site in Beijing, China and in Liverpool, the UK have been investigated, aimed to outline the psychological impact on the regeneration of post-industrial sites.

2 Aim and Objectives

The aim of this research is to inspect if environmental psychology and HCD inform the environmental/architectural design in city renewal projects. The focus emphasises on enhancement of visitors' experience through design. The aim will be achieved through, 1) understanding the principles of environmental psychology and emotional design and their applications in urban regeneration; 2) Outlining successful applications of environmental psychology in architectural design and urban planning/regeneration.

3 Human-Centred Emotional Design and Environmental Psychology

Shifting from the technology driven to human-centred design driven phase, design now has entered a new chapter. Increasingly, designers realise that satisfying people's the psychological demands is essential, as design services human beings rather than objects. Referring to usable, meaningful, and enjoyable design, HCD is defined as a group of methods and principles that emphasises on how to acquire/apply knowledge about people and their interactions with the environment, so as to design products that meet their needs and expectations [3]. Integrating user's perspective into the architectural design process to achieve better user experience [4], In general, industrial buildings appear being closed due to the single purpose of production and inherent stereotypes, showing an indifference temperament [5]. Therefore, it is necessary to break the stereotype of industrial buildings in the regeneration process by using HCD as a tool that enables the user to interact and communicate with the building and environment.

HCD is practised in its most basic form, making design physically, perceptually, cognitively, and emotionally intuitive [6], therefore, we describe the contemporary design as Human-Centred Emotional Design (HCED). HCED concerns how user perceive the design result, their interaction with the building and living experiences, rather than focusing on project developers, designers or other stakeholders. Current HCED tends to shift focusing from users' physical and cognitive characteristics to emotional engagement and pleasure experiences [7][8][9]. The research method of HCED aims to collect more data with a variety of backgrounds, such as cultural exploration, aimed at enlightening design practitioners [10]. Based on the analysis of the information process between the user and design outcome, Norman [8] introduces the concept of 'three levels of design' as: the visceral, behavioural and reflective designs. The visceral level refers to the physical attributes of the design, whereas the behaviour level inclined to human behaviours and focusing on the function and user experience. The reflective level is the function of the first two levels, which investigates deeper needs and aspirations of a human. It is a complex emotion intertwined with a variety of factors such as the product's personal consciousness, experience and cultural

background [8]. Likewise, understanding people's emotional demand in urban design, HCED expects to enhance users' experience.

The human-environment relationship is symbiotic which indicates that the environment influences humans' behaviours and humans in turn influence the environment [11]. Proshansky [12] defined Environmental Psychology as to study of the interaction and relationship between humans and their environment. The emergence of Environmental Psychology indicates that people begin to notice the significance of the physical context of human behaviour [13]. Architectural Psychology is a branch of Environmental Psychology, an interdisciplinary subject between psychology and architecture. Architectural Psychology does not only require human ideology to permeate every link of building formation, but also seeks to analyse the influence of quantitative factors such as architectural form, space and colour on human psychology [14]. Users' psychological demand is directly related to the quality of space. The core of architectural psychological research is to explore individual response to the environment and to create a desirable place to survive, so as to satisfy individual psychological demand. In this process, each person perceives the real built environment as a stimulus condition and reacts to it, after that, forms psychological activities and behaviours on the built environment, and finally evaluates the environment. The evaluation results provide a reliable basis for environmental design.

4 Methodology

In accordance with the objective and research questions raised in this study, location-based research method has been employed to form the basis of this research, to explore the contribution of psychological factors on post-industrial sites regeneration. The qualitative empirical case study has been utilised as a means of human-centred research approach, to achieve the research goal of gaining deeper insights into urban regeneration.

1. Location-based walking interviews. Several field trips have been made to the two locations seeking visitors' responses and expectations of the renovation. This immersive approach effectively helps the study of visitors' perception towards the targeted environments and captured the lived experience of users. Also, reviewing tourists' comments published on the specialized websites has been considered as an alternative research method in this study.
2. Customer' comments from published websites. After a comparative research in seeking reliable resources, 'TripAdvisor.com' was selected due to its reputation as one of the most popular sources of travel information in the world. 'Dianping.com' is a leading platform for local life information that holds a large number of users in China. Likewise, 'mafengwo.cn' is another Chinese travel social website, where users share travel strategies and experiences. Meanwhile, in order to undertake a proper and effective analysis in this study, a smart data analysis program was developed to focus particularly on generating statistical data based on the information published on these websites.
3. The assessment criteria. Norman's theory of three levels of design provided an assessment criterion that can examine if a product satisfies the users' expectation

and at certain levels. In this research, this concept was employed as an evaluation tool to measure whether the designs offered at the two renovation projects satisfy visitors' demand, in terms of its visceral appearance, experience of interaction between the users and the environment, and finally the reflective level of satisfaction of people. So as to clarify how can architectural/environmental psychology and emotional design theory enhance urban regeneration, in particular the redevelopment of aged factory site. Accordingly, the findings of these two case studies will be of great significance and value for future research, in terms of which provided a research exemplar of both cultures.

5 Comparative Case Studies

5.1 Beijing - 798 ArtDis

The 798 ArtDis is one of successful post-industrial regeneration projects that is featured as a typical Chinese example. As a former electronics factory, it was closed in 2001 due to economic decline. Now, 798 ArtDis has attracted many artists that are settled in the park due to its low rent and distinctive architectural style. Currently, 798 ArtDis is a home of art gallery, artist studios, design companies, restaurants, and bars. Having recently accessed the websites Dianping.com and Mafengwo.cn, there are total 19449 comments was reviewed, 2106 negative feedbacks that reveal some issues and expectations from the tourists' perspective. The redevelopment of 798 ArtDis appears to succeed at the visceral level, in terms of its architectural appearance design [15]. And efforts have been made in industrial heritage retention and distinctive concept creation. Featured with extensive spaces and widely positioned columns, most buildings retain the original Bauhaus style, for example the reservations of initial staleness slogans and abandoned facilities/instruments, so as offering visitors with a great visual impact and presenting a sense of the vicissitudes and changes of history. Following the Bauhaus style, namely the concise keynote, which is reflected in the spatial image, colour, material and other aspects. The abandoned pipes of former factory are set off by lighting and glass, so that creating a unique artistic atmosphere with the superposition of industry and art [16].

The data pinpoints that 798 ArtDis won an excellent reputation in retaining the industrial buildings successfully, showcasing its history and traditional Chinese culture. The park attracts tourists in providing innovative design solution to highlight its distinctive characteristics, supplying functional demands and commercial services. Being positioned as a cultural and creative industrial park, 798 ArtDis targets its audience are bourgeois and fashionista, therefore, most tourists enjoy taking photos and then uploading them to social media to manifest their artistic taste and identity. The deficiency of reflective design is mainly embodied its over-commercialisation and diluted cultural factors, which influence its targeted position. This has been proved by 584 negative reviews which is about 89% of the visitors blamed that 798 ArtDis like a shopping centre - full of restaurants, clothing stores, cafes and dessert shops. However, the artistic atmosphere is not strong [17].

Other negative comments such as the lack of spatial planning which results to heavy traffic flows appear to concern most visitors. There are no public signs to distinguish footpath, pedestrians and/or carriage road within the park, therefore creating serious safety issues during the visit. 71% visitors complain that it was dangerous when walking on the street, as people and vehicles share the same road and street within the park [18], thus tourists have to be aware of traffic safety at all times. Moreover, many sharing-bikes are left after use, which occupies public space [19]. Drivers also blame the traffic signs which are poorly designed, causing the driver, for example driving in from the west gate to follow the sign heading to car park, however losing direction and exiting out through the south gate accidentally [20]. In addition, many one-way streets do not present clear instructions, which is prone to traffic jams and led to honking. Consequently, noise pollution causes further problems that decline the level of visitors' satisfaction.

Weak infrastructure results to a number of public services offered in 798 ArtDis are insufficient. 68% visitors blame that the park does not have enough public toilets. Services for disabled appear to be even worse. "My grandmother has limited mobility, so that requires using a wheelchair. When we intended to enter the park, however the gate had restrictive barriers that blocked the wheelchair in getting through " [21]. People complain that as a famous scenic spot, 798 ArtDis attracts a large number of tourists each year, however the poor infrastructure created obstacles that impeded its business development.

5.2 Liverpool - Albert Dock

Officially opened by Prince Albert in 1846, Liverpool Albert Dock has been the largest port in Britain, and represented the successful implementation of urban regeneration [22]. The Dock was abandoned in 1920, due to its incapacity to meet the requirements of rapid development of commodity trade and shipbuilding technology. Albert Dock has become one of the most popular heritage sites in Britain, which is at the forefront of Liverpool's cultural consciousness [23].

On 28 December 2020, a total of 17,517 reviews displayed on TripAdvisor.com which consists of 16508 positive reviews and 1009 negative reviews. It is undeniable that Albert Dock has the inherent advantage of integrating the urban landscape and natural scenery. The vast Mersey River has endowed the dock with indescribable charm. The architecture of Albert dock is distinctive as well. The regenerated Albert Dock maintains the original layout, roof and colour of the original building [24]. The warehouse is enclosed along the dock and the layout is rectangular. The warehouse is topped with a cast-iron frame and a black roof. The bottom is cast iron Doric colonnade, which is red echoes the wall, and there are load-bearing arches between every 3 or 4 columns, some hydraulic machinery (fasteners, hydraulic arms, etc.) kept in place between colonnades [25]. The overall visual effect of the buildings is aesthetic and rhythmic. The boiler and winch preserved on the dock are part of the outdoor sculpture that is the constant reminder of the dock's bustling past.

Deferring from Beijing 798 ArtDis, the regeneration of Albert dock was well organised and planned in terms of traffic flows, construction of parking spaces and business services provision. Data indicates that 89% - a total 110 reviews, rated its public facilities and infrastructure positively. The dock's traffic flow is reasonably planned, where the pedestrian viewing path is not interfered by traffic. The pedestrian flow of different functional areas is not interwoven, and the common space and facilities are separated as far as possible in terms of time [26]. In addition, the dock area has convenient parking, rest and dining conditions, and a clear route indication system [27], which carefully considers the visitors' feeling and significantly improves visitors' experience. Meanwhile, there are 40 people which accounts for 70% of positive reviews for disability services. The dock has also constructed multiple toilets for the disabled [28] and wheelchair access [29]. As a tourist resort, the dock provides multiple tourist functions, such as boating, canoeing or surfing, and visiting museums, galleries, and souvenir shops.

The regeneration successfully integrated the city's history and culture into the dock [30]. The most successful aspect of Albert dock regeneration is transforming the industrial site becoming a part of the city and integrates it into lives of the locals. Furthermore, the regeneration of the docks embodies the spirit of urban, the project does not only promote the development of commercial but also fundamentally serves the locals. The Albert dock combines the cultural characteristics of old buildings with modern fashion, finding a way between historic heritage and new cities.

6 Discussion

The results of the secondary and primary research conducted in this project pinpoint that regeneration projects' user value local history, industrial heritage, and art activities. People enjoy innovative, fashion and distinctive design solution, and desire the opportunities to interact with objects and the environment they are living. They also expect the regeneration projects can create extra entertainment recourses and public facilities in city transformation. Contemporary HCED can create new demands on public services, not only helps people in articulating their functional needs and behavioural/interactive demands, but also achieving their best sense of living - 'the reflective goals' as efficiently and effectively as possible. The finding of the comparative case study indicates that both two projects appear to satisfy users' demand at the visceral level, in terms of providing innovative design solutions, respecting/preserving industrial heritage and cultural value. However, 798 ArtDis seems dissatisfy visitors' infrastructural needs in terms of smooth traffic, easy parking, pedestrian safety, and disability assistance; therefore, failed at the behavioural consideration and further the reflective level of design. In contrast, Albert Dock not only performs well commercially in supplying a variety of new public services and cultural heritage places of interest but also offers satisfying infrastructural facilities. The renovation immerses audiences into its history, which triggers the human senior psychology and reflective experience.

The statistical data collected based on the source of TripAdvisor.com, Dianping.com and Mafengwo.com certified that the positive feedback rate (94%) of Albert Dock is higher than 798 ArtDis (89%). This is due to the fact that the redevelopment of the Albert Dock was carried out under the guidance of MDC and thus had a consistent purpose [24]. Diversity of development does not mean clutter, planning/organisation of the dock was finalised by the developers after a series of feasibility analyses such as entertainment and transportation. In contrast, the development of the 798 ArtDis is spontaneous without unified planning, which lacks behavioural design. In addition, the Albert Dock takes geographical advantage of the waterfront to preserve the dockyard group and warehouse completely, turning it into a huge outdoor exhibition hall, successfully continuing the maritime culture and incorporating more cultural elements. The successful experience of the Albert Dock provides new ideas for the preservation and regeneration of the industrial heritage.

7 Conclusions

Given the discussions, it can be concluded that human psychology & emotion influence design. Architectural/spatial design have undergone rapid change in terms of renovation expectation from multiple stakeholders. People not only fancy the physical appearance of an environment and enjoy its cultural experience provision, but also expect interactive opportunities offered at the renovation, which clearly reflects the expectation of the full three levels of HCED design. Utilising psychological and emotional knowledge as factors in environmental design will inform the design of an urban regeneration project and to enhance user experience. With the continuous improvement of people's life, monotonous design is no longer enough and will be upgraded by something of a higher level, namely emotion [8]. To meet people's spiritual needs, design is endowed with more emotional significance. The methodologies employed in this study for gathering data are thought to be reliable based on its consistency. However, the results of the research may not be generalised due to which only two case studies have been undertaken. A future research into a larger sample size will benefit the research to ensure obtaining a more solid conclusion. This project investigated the psychosocial impact on urban design, especially redevelopment of aged industrial zones. The findings expect to contribute a broad scope of beneficiary, i.e., the architectural/environmental designers, to create distinctive & advanced design solutions in urban regeneration that to break the existing cookie-cutter design.

Acknowledgements

This research has been partially supported by AHRC-Newton Fund, grant agreement number AH/S003517/1.

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