The Users' Perspectives of Performance of Courtyard House Type in the UK

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ABSTRACT: The aim of this paper is to examine users' perspective on the acceptability of the courtyard house type in the UK through a post occupancy evaluation of Accordia, Cambridge Phase 1 Development (completed in April 2006), the winner of RIBA Stirling Prize 2008. Users' behaviour and perceptions in term of the performances of this house type as a solution for creating family house for urban areas in the UK are investigated. Five themes were examined in the study which are the estate, the home, open spaces, privacy and, energy consumption and conservation. The paper focuses on findings from perceptions of four households, each selected from different blocks within the study. The selection of households are based on the first return survey form received from each of the block within the study. The house plans of all four households are different in design with long-narrow courtyard configuration, front to depth ratios of 1:1.5 to 1:4.8. Triangulation in this study is applied: postal questionnaire survey, semi-structured face-to-face interview and overt non-participation observation. A number of key findings are presented as the result of this study.
Keywords: courtyard house, open spaces, privacy, energy consumption and conservation

INTRODUCTION

The courtyard house is an indigenous urban house form that has evolved at least 6,000 years ago in various regions of the world with different climates, cultures and building materials. The advantages of this house form were recognized and used by urban dwellers in ancient civilizations, including urban houses designed during Macedonian, Roman and Arab Empires [1, 2]. This house type was introduced into the UK in the late 1940s as one of the new attempts to respond to a housing crisis after the Second World War [3]. The implementation of the Parker Morris standard and cost yardstick in the 1960s to 1970s, the result of mathematical studies of built form by Leslie Martin and Lionel March in the 1960s, and dissatisfaction with high-rise building as housing solution family house and others factors became a driving force for the development of low-rise high density housing that provide light, air and privacy to its dwellers [4,5,6,7]. Conversely, the majority of the courtyard housing schemes built in the UK were regarded as low-, low-medium and medium density developments. The L-shaped courtyard house type is the most commonly found configuration in the UK [8]. The strategy adopted in the indigenous courtyard houses to reduce heat loss in winter is to incorporate the maximum volume internally while exposing the minimum surface area externally. However, the lower development density coupled with L-shaped courtyard house configuration had caused higher heat loss through its fabric and became a major drawback for development of this house form in the UK since the 1980's. Yannas showed that the energy performance of a well insulated compact semi-detached house with minimum window opening (e.g. Calewen, Milton Keynes) is better than L-shaped courtyard house in Milton Keynes. Nonetheless, the conservatory space in Paxton Court, Sheffield offered spatial and thermal interactions between the house and flexibility to the user in term of seasonal adaptation; users are satisfied with the thermal performance of the courtyard house in Milton Keynes [9]. In the UK, the courtyard form is used as sun collector, and allows adequate ventilation. Raydan, D., et al confirmed that the potential to improve the environmental performance by adopting court forms in cold climate regions exists but with lower height to width ratio [10]. High density low rise urban planning is an energy conserving concept with efficient utilization of land and sun at the same time. Land noted that courtyard house form uses only 50 per cent of the area of the conventional garden to entrap the same amount of sun. The 21 hypothetical schemes with front to depth ratios of 2:1 through 1:1 to 1:6 plus demonstrated that as the lot ratio increases, economy in infrastructure and density increases. Additionally, the long-house type has demonstrated the ability to accommodate for car assess yet able to achieve highest residential density (71.50 units/ ha) [11]. Study made by Chermayeff, S. and Alexander, C. on housing design in the perspective of community and privacy concluded

that long narrow multi-court house appeared to be successful in providing the community and privacy [12]. With the increasing importance of density and sustainability in the late 1990s, the courtyard house form is once again being considered as one of the potential solution to high density urban housing in the UK. As noted by Sir Richard MacCormac, *"courtyard housing: potential solution for urban housing in the UK – Best of Both Worlds - Community and Privacy"* [13].

METHODOLOGY

A bibliography review carried out on courtyard housing schemes built in the UK since the 1950s indicate that there are only six schemes adopted this long-narrow courtyard configuration: The Ryde in Hatfield (1966), Forestfield in Furnace Green, Sussex (1972), The Colonnades in Porchester Street, London (1973), Setchell Estate in London (1978), Swiss Cottage in London (2001) and Accordia in Cambridge (Phase 1: 2006, total development target on 2010). Colquhoun noted that the Ryde is one of the great housing schemes of the 20th century while Setchell Estate is one of the most successful of the 1970s high-density low rise housing developments in the UK [14]. Accordia Cambridge (Phase 1) was selected for this study (see Fig. 1) because it illustrates the current debate about the densification of cities in the UK, and has won a number of Awards including Building for Life Gold 2006 and the RIBA Stirling Prize 2008. The houses were designed by three different architects: Feilden Clegg Bradley Architects (master planners and led architect), Maccreanor Lavington and Alison Brooks Architects. The whole development comprises of 212 houses and 166 apartments on a 9.5 hectare site when is completed in 2010. The scheme achieved net residential density of 65 dwellings per hectare or overall development density of 47 dwellings per hectare. A holistic approach was adopted in dealing with sustainable issue: 3 hectares site was dedicated for community purposes, all homes received very good rating under the Eco-Homes environmental performance standard; houses have been planned to be adaptable to the changing needs of the users; U-values of building fabrics were exceeding the 2002 Building Regulations (walls 0.27 W/m^{2}k, roof 0.2 W/m^{2}K, windows 1.7 W/m^{2}K) and with high SAP ratings; and good standards of air tightness and careful detailing to avoid cold bridging [15, 16]. The study investigates all the courtyard houses (44 units, excluding the show unit) completed in April 2006. All houses were the long-narrow courtyard configuration, ten (10) design variations (excluding handed) with front to depth ratios ranging from 1:2 to 1:4.8. Triangulation in research is applied in this study. It is achieved by having direct observation of the inhabited units recorded during the face-to-face interview and site visit, both of which act as a checklist to verify the data collected from postal questionnaire surveys. The paper focuses on findings from perceptions of four households, each from different blocks within the study. The selection of households presented in this paper are based on the first return survey form received from each of the block within the study. The house plans of all four households are different in design (*see Table 1*).

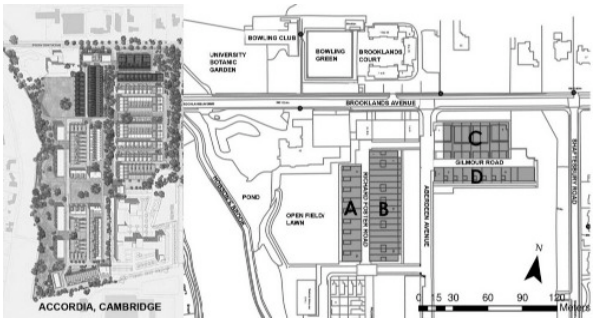

Figure 1: Accordia Cambridge (Phase 1).

Table 1: Information for Selected House Types

Type	Ratio (W/L)	Frontage, Width (m)	Home Orietation	Home Size (m2)	Length Stay (mth)	Household (person)
A	1 : 2.0	9.00	East-West	200.55	32	3
B	1 : 4.8	5.20	East-West	235.50	27	2
C	1 : 4.5	6.52	North-South	305.95	27	2
D	1 : 1.5	8.80	North-South	222.30	36	4

Source: Main author's questionnaire survey result

The questionnaire survey forms (with different house plans inserted in the survey form that corespondence with the house design) were mailed to the 44 households in early-Dec 2008. This was followed with interview session with the respondents, held within a month of the return of the survey form.

Five themes were outlined in the questionnaire which are: the 'estate'; the 'home'; open space(s); privacy and; energy conservation and consumption. Two types of questions were asked in the questionnaire survey, open-ended questions where respondents need to answer in their own words (answers were highlighted in Italic in the paper) and closed questions where respondents need to select one or more answer(s) from the given list. In the case for questions related to level of satisfaction with a particular aspect of the study, the Likert scale of 1 to 6 is used where, 1 means 'Not satisfied at all' and 6 means 'extremely satisfied. The structure of the face-to-face interview with respondents was follows the sequence of themes outlined in the questionnaire survey form: firstly, to ensure systematic go through the remarks made by the respondents and; secondly, respondents are familier with the questions and may prepare to discuss on specific issue(s) relating to the themes outlined in the survey form. Note or sketch books, thermometer, voice recoder device and camera (with respondents' consent) were used during

the interview sessions. Room temperatures where interview sessions were carried out were recorded during the interview. The semi-structured face-to-face interview with respondents are carried out only when respondents' contact details are provided in the return survey form.

KEY FINDINGS

The study is still ongoing. This paper presents only the results of the study of four (4) house types, each type was from each block of the study, for instance Type B from Block B (one block may has more than one house type). Only respondents from house type A, C and D have participated to the interview sessions. The general levels of satisfaction of the five themes discussed in the study are summarised in table 2. The Home (5.75) received the highest level of satisfaction followed by private open space (5.50), semi-private and public open spaces (5.25), estate and privacy (5.00), energy conservation and consumption (4.50). With the limited sample of this study in the paper, generalisation cannot be concluded at this stage of the study. However, the 'Estate' is well liked by all respondents because of its open design/ spaces, lot of green areas, efficient use of space and aesthetic quality. Although only one household (occupying type D house) has children (adolescent), all respondents confirm that the estate is well suitable for children because of its mixed community, lots of green areas, semi-enclosed location, relatively little traffic, quality of housing and safety. 'Open Spaces' within the 'Home' were perceived by the respondents as being both private and semi-private outdoor courtyard(s), terrace(s) and/ or winter garden. All respondents confirmed the need for more than one type of open space in the 'Home' giving reasons such as '*flexibility of different uses and outlooks'*, '*direction of sun', 'personal sp*ace is *relaxing*' and '*like open spaces*'. The open spaces were used for domestic and leisure purposes, private exercise (*Tai Chi*) and part of access to the 'Home'. Things placed in the open space(s) include washing line, landscape/ plants, tables and chairs, storage boxes. The respondents defined 'Privacy' as '*Not being on view to others, able to move around not feeling on view/ show'*, '*Able to pass in front of windows without being seen by others*', '*Not being overlooked or overheard. Separate private accesses'* and *'Alone or undisturbed'*. Under the latest UK Government Guidance (Planning out Crime), one of the secure by design principles is natural surveillance to public spaces including galleries, communal areas, drying areas, landscaping, and garages and parking areas [17]. Accordingly, most respondents replied as there are places in the 'Home' that are overlooked, for instance, '*from the adjacent houses into courtyard'*, '*from neighbour to bedroom 5 and in kitchen from path' and 'from houses either side and opposite'*. However, no noise problem is experienced by the respondents. Thus, the general level of satisfaction with 'Privacy' was rated as 5 out of 6 (see Table 2). This answer was supported by the answers to question related to the meaning of privacy (sound, space, sight and security) [18], where security (5.88) is rated as the highest level of importance by the respondents followed by space (5.75), sound (5.63) and sight (5.25), (see Table 3). The appearance of the 'Home' is well liked by the respondents. The most liked features include the modern design quality, the light and airy spaces, the location, the sound proofing, the energy efficiency, the sunny courtyard, the views onto trees and the availability of a double garage. However, lack of storage spaces (internal and external), insufficient workspace and cupboard spaces in the kitchen and the size and location of the utility room; as well as the lack of enough space for a fridge/freezer have inevitably reduced the level of satisfaction of its home. This problem has caused the users to utilize part of the garage space to place the additional fridge/freezer, tumble drier, storage etc. (see Fig. 2).

Table 2:General Level of Satisfaction

		Type			
Themes		A	B	C	D
The Estate		6	4	5	5
Home		6	6	5	6
Open space(s)	Public	6	6	4	5
	Semi-private	6	6	4	5
	Private	6	6	5	5
Privacy		5	5	5	5
Energy Conservation		4	5	5	4

Table 3: Privacy

		Type			
Meaning of Privacy		A	B	C	D
Sound	Not overheard	5	6	6	6
	Protected from outside noise	5	6	6	5
Space	Having enough room	6	6	6	5
	Not encroaches on by others	6	6	6	5
Sight	Not overlooked	5	6	4	6
	Protected from unwanted sights	4	6	6	5
Security	Feeling safe in the home	5	6	6	6
	Protected from break-in	6	6	6	6

(a) (b) (c)

Figure 2:

(a) Shortage of cupboard spaces in the Kitchen
(b) Shortage of space in the utility room for Washer/ Drier
(c) Garage used as a storage space

The strategies adopted by the respondents to reduce energy consumption in their 'home' include naturally drying clothes and minimise use of electric drier, followed by use of A++ white goods and low energy fittings, external light on sensor, sunlight as space heating, turn off heating thermostat, not to use dishwasher and turn off lights when is not in use. As the result of different in design for the house plans discussed in this paper, the level of satisfaction for rooms design and thermal comfort within the home are discussed separately as follows:

Type A (see Fig. 3): It is a privately owned house occupied by a married white couple (both aged 51) with a son (aged 20). The respondents are with two cars and previously stayed in a terraced house. In term of level of satisfaction, all rooms are rated 5 and 6 except bedroom 4/ studio and garage. The respondent comments that there is no window overlooking the open field in front of the house for Bedroom 4 and the door opening system took too much space of the garage area and no screening device between the courtyard garden and garage. Additionally, it is also lack of external storage particularly for bicycles, tools, gardening items. Besides, larger freezer is preferred by the respondent. There is comment about the location of door and switches in family room which reduced the flexibility of the room (see Fig. 4). The room temperature during the interview (Living) is at 20°C. The central space heating system operates nine (9) hours a day in winter months and turn off during summer months. Initially, during winter months, there is draught in Living caused by the chimney design (artificial fireplace), but it is resolved by changing of the artificial heating system (see Fig. 5). In summer months, bedroom 1 and terrace 2 reported to be very hot. The problem at terrace 2 was resolved by having shading devices over terrace 2 and this further improve the thermal comfort at the family. The respondent is planning to install some device to improve the thermal performance of the bedroom 1, i.e. solar panels on roof above bedroom 1 to act as shading at the same time provide hot water supply for 'home'.

Figure 3: Type A Floor Plans

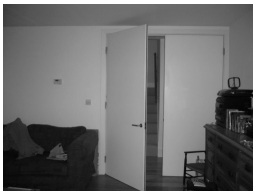

Figure 4: Type A- Family room switches location

Figure 5: Artificial fireplace (Living) to prevent draught

Type B (see Fig. 6): It is a privately owned house occupied by a married white couple (aged 35 and 40). The respondents have two cars and were previously living in a terraced house. In term of level of satisfaction, all rooms are rated as 6. The room temperature is set at 18-19°C during the winter months. The central space heating system operates one to two (1-2) hours a day in the winter months and is turned off during the summer months. In terms of thermal comfort: in the winter months, Bedroom 5 was reported to be very cold, and all the other rooms were reported as being slightly warm. In the summer months, Bedroom 5/ study was reported as being very hot, and all the other rooms were reported as being just right.

Figure 6: Type B Floor Plans

Type C (see Fig. 7): It is a privately owned house occupied by a married white couple (both aged 61) with 2 children (aged 24 and 30). The children have their own houses but do occasionally stay at home during weekend. The respondents own two cars and were previously living in a detached house. In terms of level of satisfaction, all rooms were rated 5 and 6 except the toilet, terrace and the utility room rated 4, Bedroom 6/ study, kitchen, entrance lobby, bins store/ meter, circulation were all rated 3 and the general storage was rated 2. The serious lack of internal and external storage spaces, the size of the utility room and kitchen have resulted in part of the garage space being used as a storage area and the location of the tumble drier and the

freezer. Furthermore, the respondent has added a door to access to potential storage space under the stairs (see Fig. 8). Additionally, the lack of natural light in the hall 3 and entrance lobby has resulted in the users turning on the light even during daytime. For the utility area, the respondent has changed the solid door with a door with a vision panel in order to introduce natural light to the space and improve security (see Fig. 9). Bedroom 6 needed to be more self-contained (i.e. to include a kitchenette) in order to increase the flexibility of its use in the future, for instance as a granny flat or an office. The room temperature in the living room (during the interview) was at 21°C. The central space heating system operates six (6) hours a day in the winter months and is turned off during the summer months. In terms of thermal comfort: in the winter months, all rooms are reported as being just right except for bath 2, bath 3, the utility room and the entrance lobby which are rated as very cold; and in the summer months, all bedrooms, kitchen, dining, living, family, garage, bath 1, bath 2 and bath 5 are reported as being slightly warm. The rest of the rooms are reported as being just right. The respondent highlighted that his current house has almost the same floor area as his previous house (which was built in 1994), however, the energy bills for this house is almost half of that of the previous house (Gas £500, Electricity £500 and water £350 per annum), despite its large amount of glazing areas and the double volume space that make this house more light and spacious.

Figure 7: Type C Floor Plans

Type D (see Fig. 10): It is a privately owned house occupied by a married Chinese couple (aged 50 and 43) with 2 children (aged 14 and 17). The respondents are with two cars and previously stayed in detached house. In term of level of satisfaction, all rooms are rated as level 5 and 6 except kitchen, dining, garage, bath 3, terrace 1, terrace 2, entrance lobby, bin store/ meter, general storage as level 4 and utility as level 3. The serious lack of storage spaces, space in the utility room and kitchen have caused part of garage space is used as storage space and space for tumble drier and freezer. The flexibility of expanding the use of space in dining and living using double leaf doors were well liked (see Fig. 11). Privacy in the terrace 1 and terrace 2 is maintained by using plants act as screening devices (see Fig. 12). The room temperature during the interview (Dining) is at 20°C. The central space heating system operates six and a half (6.5) hours a day in the winter months and is turned off during the summer months. In term of thermal comfort: in winter months, all rooms are just right except general storage and circulation areas which is slightly cold and garage which is very cold; and in summer months, all rooms are just right except the utility and toilet which is reported as being slightly warm.

Figure 8: Add door storage space under stair.

Figure 9: New utility door with vision panel.

Figure 10: Type D Floor Plans

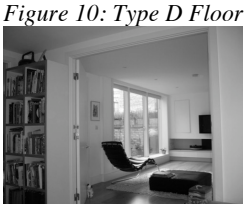

Figure 11: Double leaf door to increase flexibility

Figure 12: Plants act as screening devices

DISCUSSIONS AND CONCLUSION

The paper has discussed the results of a post-occupancy evaluation on four selected courtyard house types for the Accordia housing project (Phase 1) in Cambridge. Post occupancy evaluation through postal questionnaire survey, semi-structured face-to-face interview and overt non-participation observation is one of the very effective methodologies to obtain insight information of the performance of the 'home'. Privacy is the main advantage of this house form. Privacy refers to balance between the sound, space, sight and security. In exchange for better security, limited overlooking into the house is acceptable to the respondents. This long

narrow courtyard house with a double garage configuration is very well liked by the respondents. However, when designing for a long narrow configuration, care to ensure good use of natural daylight within the long narrow corridor space is vital. The 'home' received the highest level of satisfaction compared with the 'estate', open space(s), privacy, and energy conservation and consumption. 'Quality home' means '*good layout/ material, location, good design, economical'*, '*well built, high specification fittings (kitchen/ bathroom/ flooring), good location, private*' and '*top quality design, materials, workmanship*'. The performance of this house type can be improved by having adequate space for a large fridge/freezer, more worktop area and cupboards in the kitchen, and storage spaces for items such as bicycles and gardening tools. This issue was highlighted by Sir Parker Morris where if to have the minimum size standard implemented again, it is vital to increase the net floor area and storage space of the house [19]. Additionally, the use of garage as space for tumbler drier and additional fridge and freezer has caused inconvenience to the users. Besides, this reduces the thermal comfort experienced by the users during the winter months particularly when users need to access to garage regularly for using the tumbler drier or fridge and freezer. Flexibility in room layout was appreciated and was perceived as added value by the respondents. Detail coordination between position of services and room layout to enhance its flexibility of usage is vital. Besides, it may improve the general storage space of the 'home', for instance usable storage space underneath the stairs. Additionally, flexibility can be improved by having the internal floor plan altered to suit users' requirement before the completion of the house. This approach is being used by the current developer of the scheme. The study is still ongoing; therefore generalisation for the users' perception of their housing estate, open spaces, privacy and various features of their house cannot be treated as conclusive. However, key findings were presented to provide some glimpses of users' perception of this recently built courtyard house type.

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