1.0 Introduction

High density low rise housing developments are considered as an integral part of sustainable cities and the sustainable development agenda in the UK. In line with this agenda, there are five housing problems that need to be addressed acutely. Firstly, the quality of housing – the results of the survey conducted by the ODPM in 2003 show that the majority of people consider housing developments till 2003 as not well designed (ODPM 2004). Secondly, over the last 3 decades, the availability of housing decreased by 50 per cent although the demand increased by 30 per cent; thirdly, 61.2 per cent of people in the UK live in suburban areas due to the affordability and availability of individual houses. Conversely, the affordability of the first time house buyer dropped to only 37 per cent as compared with 46 per cent as in the late 1980s (ODPM, 2005). In addition to this, the issue of density was raised as the average overall housing density in year 2000 was only 25 dwellings per hectare (dph). Further to the publication of the report ‘Towards an Urban Renaissance’ in 1999, Planning Policy Guidance No. 3, Housing (PPG3) stated that all housing developments should be designed to achieve a density of at least 30 or more dph (120 person per hectare) while 40 is the preferred housing density and 50 is the minimum for all urban locations. In the year 2006, the new housing average density has increased to 41 dph. A report published by the DCLG shows that 3 millions new homes are required by 2020 (DCLG, July 2007). Consequently, if development density is aimed at an average of only 50 dph, by 2014 all new homes will have to be built on green field land. Additionally, to support a good bus service, a density of 40 to 50 dph (Local Government Management Board, 1995) or 5,000 dwellings within 10 minutes walk needs to be achieved; and finally, the mandatory standard for the design and construction of all new homes to meet the criteria outlined in the new Code for Sustainable Homes (published in May 2008) need to be fulfilled.
2.0 Literature Review

2.1 History

The courtyard house typology is argued to possibly be the most common found housing type in history. It seems to suggest that the advantages of court garden house form were agreed and used by urban dwellers since ancient civilizations. This house form also influenced urban house design during Macedonian, Roman and Arab Empires. There are four main reasons for the sustainability of this house form for at least 6,000 years: firstly, it can provide privacy to the dwellers to perform daily activities within a dense urban fabric; secondly, limitation of building technology and materials in ancient time that may only permit low rise development within the fortified cities, this house form demonstrated the best use of limited land; thirdly, the adaptability of this house form to suit different climate conditions; and finally, the adaptability of this house form to suit different cultural background (Schoenauer, 2002 and Edward, B. et al., 2006).

The modern movement in Europe has initiated the design and development of various courtyard house plans in the northern regions. Macintosh (1973) argued that it was developed out of the Garden City movement as a new type of mass housing for lower-income groups to minimize the house-keeping needed. The first contemporary courtyard house, designed by Hugo Häring in 1928 (see Fig. 2), was detached and looked south over its private garden. The plan was then developed into an L-shaped plan by Hannes Meyer and Ludwig Hilbersemer at the Bauhaus (see Fig. 3). Furthermore, in 1931 Hilberseimer produced an improved L-shaped courtyard house with sleeping and living rooms grouped in 2 wings of the block. Then, it is Ludwig Mies van der Rohe who has made the house type elegant and spacious by opening up the courtyard house and making the indoor and outdoor spaces flow together (see Fig. 4). The L-shaped type developed by the Hilberseimer is most used in the northern regions (Macintosh: 1973 and Schoenauer, 2000). Additionally, Macintosh (1973) suggested that the L-shaped detached courtyard house at Whipsnade and the U-shaped detached courtyard house, developed in 1935, at Churt in Surrey were the earliest contemporary detached courtyard houses found in the UK. Furthermore, the wide spread of the design of the L-shaped 1-storey and 2-storey contemporary courtyard house form in the UK were likely to be the consequence of the publication of Walter Segal in the 1948 (see Fig. 5).

Fig. 2   Fig. 3   Fig. 4   Fig. 5
This house form has been explored and experimented with in mass housing schemes in the UK after the Second World War. The experimentation of this house forms since the late 1950s is the result of a combination of many factors. These include acute housing shortages after the war, scarcity of labour and building materials, high cost and large housing subsidies, and more importantly the depression and low living standards for working classes as the result of the industrial revolution. Its exploration and experimentation involved development of new building technologies and housing systems for new housing in order to reduce cost and increase speed of construction. In addition, new houses were designed with emphasis on minima housekeeping, higher density yet provide privacy, air and light for the users (Tweddell, 1961; Macintosh, 1973, Schoenauer, 2000 and Bianca, 2000).

2.2 Architecture configurations and Characteristics

As mentioned earlier, the adaptability of the courtyard house form makes it respond well to different cultures and climates. In the UK, the courtyard is used to provide privacy to its dwellers, yet permit penetration of natural sunlight into the house and allows for its adequate ventilation. Therefore, ideally, courtyard houses in this region should have their private courtyard facing south and west in order to maximise sun exposure. However, not all courtyard house schemes developed in the UK were exploiting these benefits, for instance some of the courtyard houses within the early schemes have a north facing private courtyard, preventing their occupants from one of the main benefit of this house type.

The experimental nature of the courtyard house form in the UK has initiated the development of various architectural configurations. These can be divided into four main categories: L-, I-, Internal- and Z-shaped (see Fig. 6). This study agrees with that of from Macintosh and Schoenauer in the fact that the L-shaped house type is the most commonly used in the northern regions. Findings show that in the UK, 60.4 per cent of the courtyard house schemes have adopted the L-shaped house plan, followed by the I-shaped house plan (20.8 per cent), internal court house plan (12.5 per cent) and Z-shaped house plan (6.3 per cent).

![Various Courtyard Houses Configurations in the UK](Source: (a) AJ 20.08.75, p. 373, (b) AJ 18.06.75, p.1290 (c) Architecture Review Vol.152, 1972/2 (d) AJ 14.01.70, p.91)
2.3 Density

The courtyard house typology offers an important relationship between density and building form, where high density does not necessarily mean building high-rise blocks (Edward, B., et.al: 2006). In ancient civilizations, this typology has demonstrated its capacity to achieve that high density with low-rise developments (Schoenauer, 2000). In 1966, a study by Martin and March (Martin and March, 1972) investigating which built forms make the most effective use of ground area further substantiated that courtyard house form is the best performing urban type in term of efficiency in site coverage compared with the towers or horizontal blocks types buildings. Furthermore, when comparing between the courtyard house form and tower block, with the same site area, volume of building, internal depth of room and amount of floor space, Martin and March demonstrated that the same density can be achieved with the courtyard block form while maintaining exactly one third of the total height of a seven storey block.

A comparative study between Le Corbusier’s 15-storey tower blocks in Ville Radieuse (The Radiant City) and the German Samper Gnecco’s low-rise high-density prototype has demonstrated that both schemes can achieve a housing density of 1,000 persons per hectare (see Organization of American States publication Normas Minimas de Urbanizacion y Servicios Publicos or Minimum Standards of Urban Design and Public Services). Additionally, the low-rise high-density schemes developed by Peter Land were able to achieve up to 600 persons per hectare although each unit is designed with a private outdoor patio space and car parking (Poster, 1989).

Despite the call for higher density housing developments in the UK since the late 1950s, this study confirms that of Macintosh (1973) where medium density rather than high density courtyard housing schemes were developed in the UK (see Fig. 7). Hitherto, the potential of ‘high-density low rise’ living offers by courtyard house typology has not yet been fully explored for housing schemes in the UK. The courtyard housing schemes developed in the UK that achieved a density above 250 persons per hectare are very encouraging and further exploration on its potential is essential.
In 1968, a comparative study between terrace houses (narrow-, medium- and wide-frontage), courtyard houses and cluster houses by the Ministry of Housing and Local Government (MHLG) suggested that the main characteristics of the contemporary courtyard house developed in the UK are firstly, it is shaped to give privacy to the house itself; secondly, it can be grouped into clusters achieving medium or high density housing developments; third, it can join together in a variety of ways to suit different conditions of access and orientation; and easy to provide adequate through access, space for car, and natural lighting to kitchen and living areas. However, there are few drawbacks of this house form: first, it is usually more expensive than the terraced house; secondly, circulation and services are often less compact; and finally, single-storey courtyard houses are more suitable for small families than for large ones because ground coverage and internal circulation becomes excessive if designed for large families. The double-storey courtyard house though costly, is usually more suitable for large families because of economy of scale.

2.4 Social Acceptability

In the 1962, a social survey was carried out by the Ministry of Housing and Local Government (MHLG) on courtyard house in Gleadless, Sheffield. The study concluded that one third of the tenants commented that the private courtyard is one of the things they liked best about the house.

Social surveys were also being carried out for courtyard housing at Inchview, Prestonpans and Ardler, Dundee by Architecture Research Unit (ARU), Edinburgh University, between the 1962 and 1965. Both studies have dispelled the doubts held by some people on the general suitability of the courtyard house typology. The enclosed outdoor space was particularly successful and well liked by most of the families (90 per cent) except the housebound people, and the prevention of over-looking from surrounding dwellings, by neighbours and passers-by into the house and garden, is well justified. This would seem to be particularly important where outdoor space is provided for each dwelling. Those studies seem to suggest that most people are prepared to accept a more limited outlook from their dwellings in exchange for greater privacy.

Another survey (unpublished) on the same courtyard housing scheme developed in Prestonpans was carried out by School of Architecture, University of Liverpool in 2003, 40 years after it was developed, to re-check on its suitability and level of acceptability by the users. Although, the responds rate was only 24.4 per cent (11 out of 45 houses), the results were very encouraging. All respondents were happy staying at the courtyard house scheme and none of them were planning to move to another house type mainly because of the reason of privacy and the one level house.
Surveys on courtyard housing schemes have also been carried out by others and results were published in Architects’ Journal. These include courtyard housing schemes in Thornaby-on-Tees in Yorkshire (1966), Pitsea in Basildon (1970), Rushey Close in Leicester (1976), Dibleys in Oxfordshire (1976) and Ashbourne in Ireland (1979). Apart from residents’ criticism of the limited outlook, their findings are very encouraging. Users’ comments include “accepted the form and very pleased with it because of the privacy its can offer”, “maximum use of small areas and opportunity for individual gardening.”, “the outside looks like barracks but the inside is pleasant”. Additionally, in both Pitsea and Dibley schemes, the respondents praised the community feeling of the schemes.

3.0 Perspectives and Challenges of the Courtyard House Form

Despite the fact that the study on courtyard housing scheme at Ardler, Dundee by ARU in 1965 revealed that double courtyards as experimented in Z-shaped house plan have marked a significant improvement in the courtyard house plan design (as it allows the separation between recreation and services) nevertheless it is not a type that is widely used in the UK. Hence, a comprehensive study on the merits and the disadvantages of various courtyard plan types is to be further examined. Additionally, ARU also suggested that the size of the courtyard should be related consistently to the size of the house types. To determine the sizes of courtyards, sun lighting and day lighting studies should be supplemented by at least some assessment of the external space requirements of each household. However, the optimum size of courtyards for various household sizes and how it relates to the changing needs of the current social structure remain unexplored.

This study also reveals that 86 per cent of the courtyard housing schemes were designed and developed in the 1960s and 1970s. Five main reasons for this trend include: firstly, the peak in inflation and rise in oil prices in the 1973 have resulted a shift of priority in house design where energy efficiency is the prime criteria; secondly, reduced construction skilled labour has resulted in an increase in construction cost, thus cost has became one of the main criteria in order to ensure its affordability; thirdly, the cancellation of Parker Morris Standard and cost yardstick in 1980 has resulted in the end of higher density development. The transfer of power from central government to local authority on issues relating to house demand and supply since the 1980 coupled with the lack of enthusiasm for local authority to build houses for rent have resulted in the package deal contractors or house builders becoming once again the key players in housing supply that has become more profit oriented with different definitions of ‘value for money’.

World oil crisis in the early 1970s had resulted in the 1980’s in the development of courtyard housing schemes focusing on energy efficiency design (passive solar gain, i.e. Paxton Court in Sheffield). Edward, B. and et. al (2006) stated that “Courtyard house is a model of low-energy design...support social activity of a house...when clustered together may form a sustainable city”. Furthermore, with
the increasing importance of density and sustainability in the 1990s, the courtyard house form is once again being considered as one of the potential solution, as noted by Sir Richard MacCormac (2007) - “courtyard housing: potential solution for urban housing in the UK – Best of Both Worlds - Community and Privacy.”. Yet, courtyard housing schemes developed in the 2000s were mainly small scale and mixed-tenure (courtyard, terrace and apartment) urban infill development. Visits to those courtyard housing schemes built in the 2000s reveal that their design failed to provide adequate privacy to its dwellers as compared to those developed by local authorities in the year 1960s and 1970s.

The popularity of the courtyard house may be increased if its design is aimed at enhancing the compactness in its internal circulation and grouping the houses in order to reduce the construction cost (by reducing the amount of external walls) and running cost (heating load). Additionally, the advantage of this house form is that it enables increasing the housing development density while maintaining privacy (if careful design is imposed to prevent overlooking problems) and this may prevent building high rise blocks. This may further reduce the construction cost and running cost.

With the advancement in building materials and technologies, future studies on how to improve the energy performance of a courtyard house is crucial. For example, a house with a south facing courtyard allows for passive solar gain that can be used for general space heating requirement for the house. Furthermore, if appropriate architectural and environment strategies are incorporated this house form may provide it users with potentially zero energy consumption for their space heating.

4.0 Research Aim, Hypothesis, Questions, Methodology and Potential Outcomes

The literature review on courtyard housing schemes in the UK has provided an overview of the background and perspectives of this house form. Thus, the research aim is to find out the potential of high density low rise courtyard house model for creating sustainable urban housing that can adapt to the changing needs of households in the UK.

4.1 Research hypothesis

The hypothesis of the study is high density low rise courtyard house is the best typology to provide ‘quality home’ for urban dwellers and promote ‘sustainable development’.

(see Fig. 8)
4.2 Research Questions and Research Methodologies

There are three main questions being formulated: firstly, what is the potential of the courtyard house type in fulfilling the contemporary and changing needs of the users and to further develop towards idea of ‘quality home’? To answer this question, a detailed evaluation of its principles, architectural configurations, potential range of development densities and trade offs are vital (see Fig. 9). Secondly, what is the Level of social Acceptance of this house form? A survey will be carried out in order to find out the views of local councils, developers and users (see Fig. 10). Finally, what are the latest building materials, technologies and techniques that can help to improve the energy performance of a building? How to incorporate these and how to measure their benefits in the case of courtyard housing? (see Fig. 11)

4.3 Potential Outcomes

On this basis, one can suggest that this study may contribute to knowledge of housing design for urban areas in the UK as follows:

i. Develop a matrix of courtyard houses in the UK, which allows designers to have a better understanding of the potential and pitfall of this house form.

ii. The collection of data for courtyard housing schemes developed in the UK is gathered through the literature review of architecture journals (Architect’s Journal and Architecture Review) over 50 years, from 1955 until 2005. Thus, the data collected may act as a useful resource for future housing research.

iii. The study will use building energy software (i.e., Ecotect) to test on the energy performance of the courtyard house (existing and new design) and other house types. This is to prove that the courtyard house plan may not necessarily require more energy for space heating if adequate architecture and environmental strategies are adopted.
iv. The courtyard house shape gives privacy to its users, and when it is grouped with other courtyard houses, it forms medium to high density layouts with only low rise buildings. Thus, it will directly reduce the construction cost (i.e less expensive sub-structure and super structure work) while providing each house with an enclosed private garden space. The flexibility of access design, space for car and natural lighting for living areas give added quality to this house form. When density is increased, it will directly increase the level of affordability. Therefore, the study will provide design of courtyard house plans with reference to the potential development density as a guidance for potential future developments.

v. Last but not least, this study will suggest a number of planning guidelines and design strategies for creating ‘Quality Homes’ for the UK.

5.0 Summary

It is believed that the juxtaposition of the courtyard house type with sustainable building features can create high density low-rise sustainable courtyard housing for urban areas and can adapt to changing needs over time. To date, most of the courtyard housing developments in UK are located at suburban areas or outskirts, therefore, one of the important advantages of the courtyard house plan typology, low-rise high-density without sacrificing privacy to their dwellers cannot yet be truly appreciated by urban dwellers in the UK. Social studies on the acceptability of this house form to their users from the 1960s to the 1970s have given much promise to the potential of its future developments. However, the combination of many factors have discouraged its development. With the advancement in building technologies and materials, it is vital to evaluate and examine the potential of this house form to create low-rise high-density sustainable courtyard housing for the urban area in the UK in the future.

‘...as the pace of modern life becomes hectic everywhere, the peace and seclusion that courtyard house can offer; no doubt, this type of dwelling will be more and more acceptable by urban dwellers.’

Macintosh, 1973: 44

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Fig. 12 Users of Courtyard Housing in the UK
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