A smart future housing in Egypt for all- a challenge or an opportunity?

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Abstract

Egypt's population has recently reached 90 Million inhabitants. A figure that is expected to double in the coming 20-30 years. With around 60% of the population less than 30 years old and the anticipation of demographic change; Egypt should be prepared to accommodate the various needs. Nevertheless, the current built environment in Egypt does not seem to accommodate people's current socio-economic needs; and no plans are evident that the anticipated demographic change is taken into consideration.

This paper is part of an ongoing research project[1] to investigate current built environment challenges and opportunities in Egypt, with particular emphasis on housing. Literature review, supported by an exploratory case study, was adopted to define current challenges and potentials, in an attempt to define ingredients needed for a smart future housing for all. An informal area was selected for the case study to demonstrate the functional interventions by individuals to fulfil their day-to-day needs.

For 60 years now, public housing in Egypt has always adopted a top-down approach. However, housing supply by the Government and private sector combined, to date, is failing to meet market housing demand. The consequences of which are illegal informal developments and/or illegal transformation of the original 'formal' developments. This would not only burden the infra-structure and consequently affect people's physical health, but may also elevate psychological distress and aggression. Nevertheless, despite the negative impacts, informal developments' interventions seem to, unintentionally, bear basic principles of universal design such as multi-use of residential spaces and mixed-use buildings. Hence, could be considered 'smart'. A building does not necessarily require sophisticated technologies to be 'smart' as long as it adapts to people's current and future needs. Therefore, there is an opportunity to achieve smart housing for all, if current informal interventions could be capitalised on and deployed properly and legitimately in housing projects.

Keywords: Adaptability, demographic change, Egypt, smart housing, universal design,

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1. Background

In light of the rapid change and transformation of social, political, economic aspects, in addition to the technological advancement; urban planning approaches and techniques should cope with and govern the unprecedented pace of change in the Egyptian society. Hence, the call for smart urban planning (reinventing planning, 2006) to prevent chaotic developments to take over formal planning.

Egypt population density is reported to be 1,066 per km^2; whereas in Cairo, the capital, the density exceeds 46,000 per km^2. With the increased number of population in Egypt, currently more than 90 Million, the Government is being challenged to alleviate a complex problem that has never been resolved since the 1950s; namely the provision of housing that is affordable, and yet adapts to people's various needs.

While there is no official figure confirming the number of housing units needed annually, it is argued that at least 300,000 units are needed (Real Estate, 2012). In comparison to the UK, housing market demand is estimated around 232,000 – 300,000 units/year (Gorgolewski, 2003; Barlow et al., 2002; Parliament, 2015). However, considering cultural, social, and demographic variations among Egypt and the UK; the estimated annual need of 300,000 units in Egypt do not seem to be a relevant figure. Even if this anticipated figure was true, Egypt is far from being able to meet this market demand. According to CAPMAS (2015) housing units achieved in the year 2013/14, by both public and private sectors, account for around 146,000 units in comparison to 136,000 units back in 2012/13 which is less than half of the estimated need. The distribution of the supplied units includes 55% economic housing; whereas low cost housing was only 3.2%. Nevertheless, the definition of low cost and economic housing is not clear in the CAPMAS report.

In Greater Cairo, according to Colliers (2015), an average of 90,000 – 100,000 units are required annually to meet the demand generated by new households. Though, it was recorded that only 45,000 units enter the market every year, i.e. only half of what is required could barely be met. Thus, suggesting the already existing gap to amount to 6 Million households and the annual demand to rise to 500,000 units by 2020 (Figure 1).

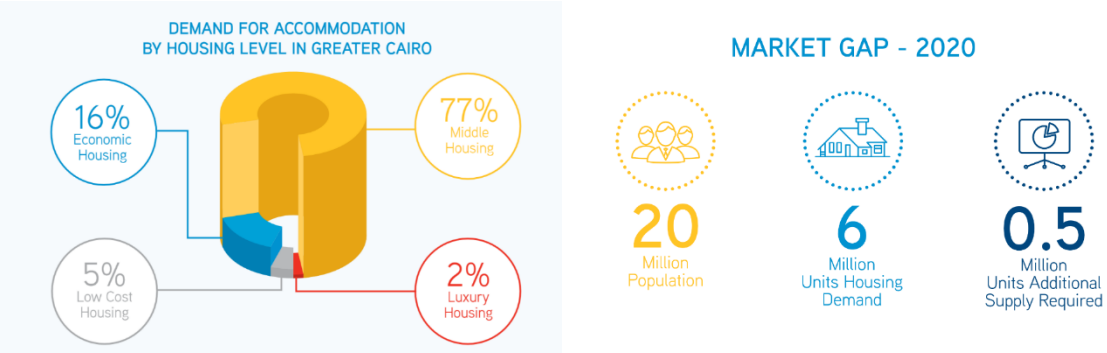

Figure 1: Demand for accommodation by housing level in greater Cairo (Colliers, 2015)

The persistent inability of successive Governments to meet housing demand may have arguably resulted in the unprecedented pace of informal developments continuously taking place.

2. Housing challenges in Egypt

The main focus of extant literature over the past decades was, to a large extent, mainly concerned with the affordability of units and financial capabilities of households (which undoubtedly is very important). There is, however, no clear evidence on investigating the reciprocal effect of the built environment, in general and informal developments in particular, with regards to not only the physical but also the psychological health of Egyptians, the anticipated demographic change, and impaired mobility.

2.1 Chaotic development and impact on health

Due to the inability of successive Governments to meet housing demand and further provide affordable and adaptable housing; individual chaotic interventions has taken over planned development throughout the past 60 years to date. Chaos is manifested in residential buildings being built illegally and informally in any space available with no attention to regulation, to building codes, nor to health and safety measures. The illegal construction is arguably spreading at a pace unprecedented in the past five years (Nadim et al., 2014). The ramification of this blatant infringement of public spaces, the crowdness, and poor environmental conditions in housing projects are serious implications not only on the physical but also on the mental health of individuals. No empirical studies could be identified within the Egyptian context; however, several international literatures investigated the association of built environments with mental health (Evans, 2003; Guite et al., 2006). According to Evans (2003) for example, the number of people per room, and noise may elevate psychological distress, hypertension, high blood pressure, heart disease, hearing impairment, stress levels, reduced ability on concentration, and disturbed sleep (Stansfeld and Matheson, 2003). Furthermore, malodorous air pollutants intensify negative impact; and some toxins (e.g. lead and solvents) may cause behavioural disorders such as self-regulatory ability and aggression (Stansfeld and Matheson, 2003; Evans, 2003). Notwithstanding these issues, Evans (2003) argues that insufficient daylight is strongly associated with increased depressive symptoms. This is further supported by Guite et al. (2006) who confirmed the association between the physical environment and mental well-being attributing the important negative impacts to noise, sense of over-crowding at home and in open spaces, in addition to fear of crime.

2.2 Demographic change and impaired mobility

The population growth rate in Egypt has been decreasing since the period 1980-1985, where it stood at 2.28 per cent. Then it reached 1.56 per cent in the period 1995-2000 and slightly increased afterwards to 1.68 per cent in the period 2005-2010. Currently, the growth rate is being reported at around 2%. However, this is expected to decline to reach 1.4% in the period 2020-2025 and reaches 1.1% in 2045-2050 (UN, 2015). Furthermore, the proportion of the elderly population (65+) has been increasing and was estimated to be 5.9% in 2015 and anticipated to double to reach 12.3% by 2050 suggesting a demographic change (Figure 2). However, according to CPAMAS (2015), the percentage in 2015 has already reached 6.9% (6 Million people equally distributed among both genders), i.e. is 1% more than estimated. In the same context, UNFPA (2015)

demographic report concluded that Egypt should get prepared to deal with an aging population and the consequent increase in the dependency ratio.

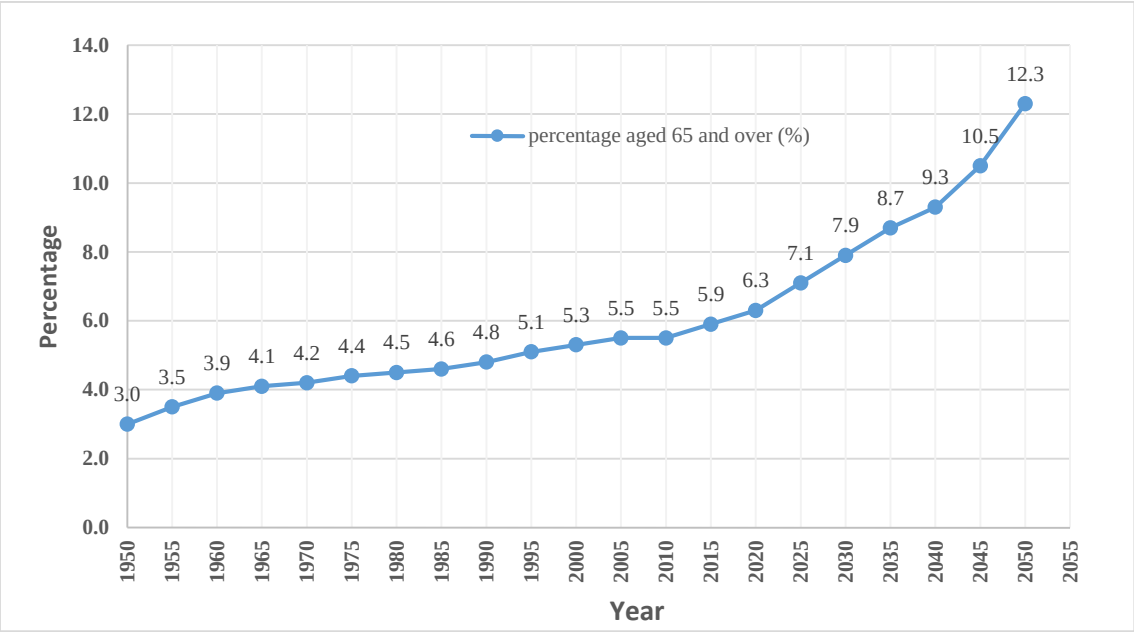

Figure 2: Trend of Egypt's Elderly Population, 1950-2050 (UN, 2015)

In addition to the increased number of elderly (CAPMAS,2015), another 7% of the population - amounting to around 6 million - have some sort of impairment CAPMAS (2006). Thus, there is a considerable percentage of Egyptians who are not taken into consideration when planning and designing the built environment. These, currently, underprivileged segments of the society, are not the only ones suffering, but their families and friends as well; a figure that could easily impact 20 Million people who may have relatives or friends not being able to move around freely, neither indoors or outdoors.

The Egyptian built environment in general arguably needs houses, neighbourhoods, and whole communities to accommodate all abilities across the lifespan. This requires better planning and arrangement of uses, streets, paths, public spaces, and transportation systems (Nasar and Evans-Cowley, 2007). The impairment law in Egypt (chapter five, clause 27 and 28) requires that all new builds and open spaces, in addition to the existing environment, to be adjusted to be friendly to people with all different impairments. Furthermore, 5% of the subsidised housing is set to be made available for those with different abilities. Nevertheless, no real evidence on ground could be recorded with regards to adjusting current and/or new build.

While in Egypt there is no evidence of any proactive measures to deal with the aging population, the developed world is being very active in this respect. In the UK, for example, and as a response to the demographic change, a policy goal has been put to meet the housing needs of an ageing society. In this context, the UK regards population aging as an opportunity rather than a threat as

it is anticipated to boost the social, civic, and economic capital of the community (ILC, 2008). Furthermore, the US consider the future design, structure, and function of their housing, neighbourhoods, and communities as a central issue to an aging population. The strategy is therefore to develop healthy communities that would engage everyone and foster intergenerational experiences (Cisneros et al., 2012). One of the innovations suggested for older people who wish to continue working in a small, self-employed setting is the live-work concept (Kallash and Kruse, 2012); where the dwelling would include a workspace. Suggesting that mixed uses create settings were older people can comfortably pursue careers (Cisneros et al., 2012).

According to the World Health Organisation (WHO) an age friendly city is ‘friendly for all ages’ and not just 'elderly-friendly'. It should be clean, have well-maintained (green) spaces with adequate toilet facilities, pedestrian-friendly walkways, outdoor seating, smooth well-maintained pavements, sufficient pedestrian crossings and street lighting, etc. (Smedley, 2015). It is argued that making homes and the environment safe for the elderly would arguable make them safer for the younger people as well (Cisneros et al., 2012).

3. Universal design and smart buildings

Universal design is a concept aimed to make daily functioning easy for the general population. The key principles to universal design can be categorised under equitable use, flexibility in use, simple and intuitive products, tolerance of error, low physical effort, and size and space (Cisneros, 2012). These may be further interpreted to address accessibility, visibility, functionality, and movement in a space (Figure 3). Another important term associated with ‘universal design’ is ‘visitability’; a movement, that investigates components and minimum features and standards to make buildings accessible to people with mobility impairment (Cisneros, 2012) such as:

- open floor plans, i.e. minimising subdivisions,
- reducing number of hallways,
- making rooms more open to accommodate a variety of abilities.
- a front door to accommodate a wheelchair
- a sink with a knee space for independent use of the kitchen
- plenty of under cabinet and task lighting,
- accessible lighting outlets, and electrical switches
- front-loading washing machines
- bathroom accessible shower design

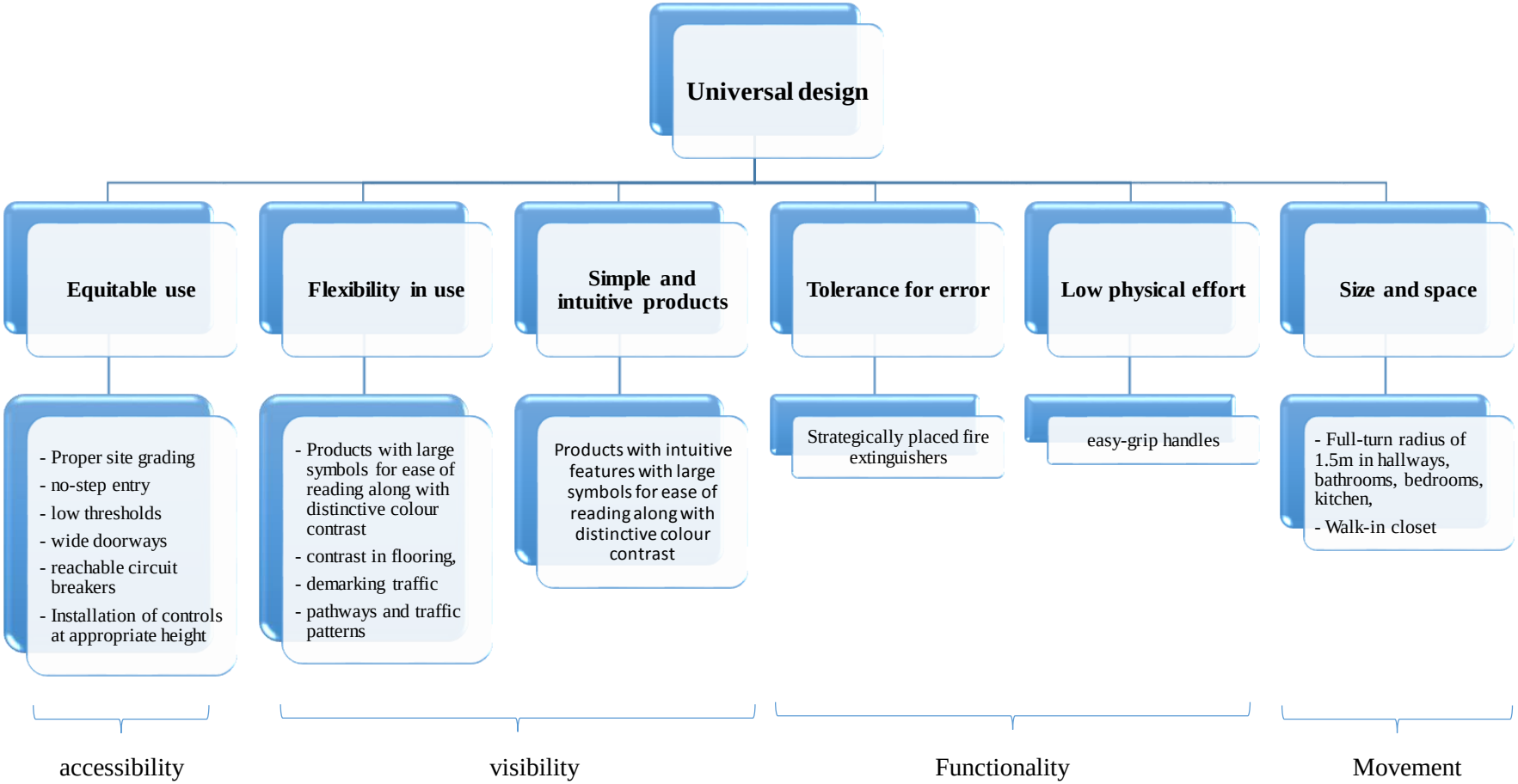

Figure 3: Universal Design principles (adapted from Cisneros, 2012)

4. Informal housing in Egypt – The exploratory case study

This exploratory study investigates an informal area in Greater Cairo in order to define major dwelling and the immediate surroundings concerns, and the respective interventions to accommodate basic needs. The reason for selecting an informal area, is that informal areas represent two thirds of Greater Cairo's built environment; hence, may be considered a representative exemplar for pure functional solutions to people's everyday needs. The investigation took a form of semi-structured meetings, to define, in depth, people's perceptions with regards to the area they live in, in general, with particular emphasis on their dwellings and the immediate surroundings. The aim was to have various age groups and different physical abilities. An announcement of the meetings was made through an active NGO in the area, and the participants are those who voluntarily joined the meetings. In total, four groups were represented, the elderly (6, three with severe joint problems), youth (4), university students (4), and contractors (2). The meetings aimed to conclude dwelling spatial organisation (plan) and the various associated functions, the vertical circulation (entrances, stairs, and roofs), and any informal transformation that took place on ground floors.

The informal area, under investigation, encompasses both residential blocks built by the Government back in the 1970's and informal buildings that are being built to date. It is an old area and was originally an agricultural land with a few houses; which along the years, gradually became an informal urban settlement with multi-storey buildings, and the agricultural area eventually disappeared (GIZ, 2013). The Family average size is six including both parents; where women largely work in various jobs to contribute to family income (GIZ, 2013). A study published by an NGO in the area, while not confirming the number of people with impaired mobility in the area, concluded that 72% of people with some kind of impairment are illiterate, and only 6% managed to get higher education. Unemployment rate, furthermore, reached 87% arguing that current local work market is 'repelling' 1/3 of the people with some kind of impairment (Abdelbaki, 2015).

The Government built blocks' areas range between 60-70m^2 including two to three rooms, constituting of a ground floor and four typical floors. Informal buildings, however, provide a bigger range of areas in order to accommodate the different financial abilities. There are those that may exceed 100 m^2 and those even smaller than 40m^2. Some of these informal buildings may have 12 typical floors. As a result of the relatively small unit areas and the large number of family members; spaces are used for multi-functions particularly the reception/entrance, children bedrooms, and even the corridors/halls (Figure 4).

4.1 The residential unit

Egyptian families are generally conservative, therefore a complete separation between family private spaces and spaces to receive guests has to be achieved in the unit. In some cases, areas to receive guests are never used by family members to keep them in good condition. There is no clear pattern between the different participants with regards to the multi-use of spaces. In some cases, the entrance may be used for eating, receiving guests, watching TV, and even studying. The hall/corridor may house the washing machine, storage spaces, and the fridge. Furthermore, the children bedroom may be used as a family living space and a reception for close relatives. The kitchen and toilets are relatively small to accommodate any other activities. There was a case where cooking could take place in the main bedroom; however, in most cases main bedrooms are not used for any other functions. In general, the

type of functions used depends on the size of the individual rooms as well as the overall dwelling area, i.e. depends on the financial capabilities of households.

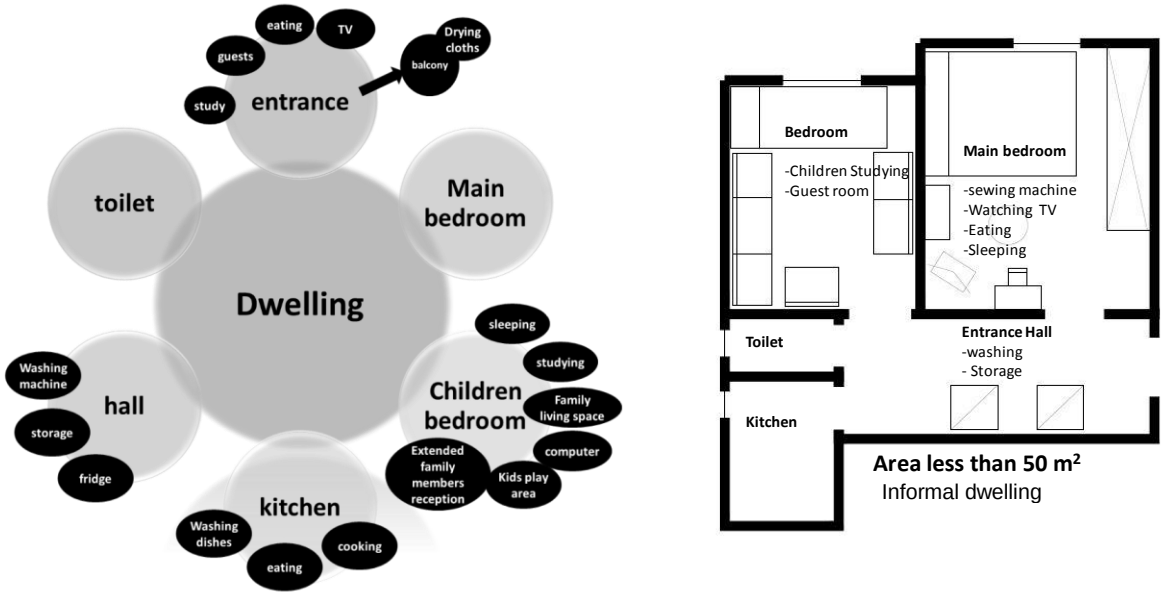

Figure 4: Dwelling spaces various multi-uses to accommodate every day needs in small areas

4.2 Mixed-use transformation/ developments

Another prominent feature in informal developments, is the transformation of primarily ground floors in Government built buildings into other non-residential activities, whether these are commercial, industrial, or even raising livestock. The informal buildings on the other hand, include a four-meter-high ground floor reserved for non-residential activities from the outset. This, while is intended for generating income and employment, is perhaps more importantly intended for raising the first residential unit at least four meters above the street level for not to be accessible from the street level for security reasons. In addition, the building entrance is raised one meter above street level, to ensure that when Government pave streets, the entrance would not 'sink' below street level. This is intended to protect the building entrance from sewage overflow that is common in the area. Nevertheless, the increasing number of steps at the entrance, puts further burden on the elderly, and those with impaired mobility; especially that the riser could be as high as 50cm. The roofs in general, are used for ditching scraps, and in very limited cases are used for raising chicken or sheep, or planting vegetables.

These non-residential activities (largely on ground floors), while generating income to owners and create jobs; they nevertheless, burden the infra-structure such as water, sewer, and congest streets etc. In addition, the different activities may result in bad odour due to the different industrial and/or organic waste. Nevertheless, the majority of participants did not mind non-residential activities on the ground floor, as long as it did not harm the residents wellbeing and comfort, and did not cause higher rental fees for residents.

5. Discussion

Egypt has always been challenged by the provision of affordable housing; while seeming to overlook, or neglect the provision of adaptable housing that would respond to various socio-economic needs for the past 60 years. In addition, it is not evident that plans are set to accommodate anticipated demographic change and the increased dependency ratio.

While housing provided by the Government promote complete functional separation of uses; informal interventions are largely based on mixing residential and non-residential functions. Despite the negative impact on infra-structure and people's physical and mental wellbeing (section 2.1), benefits could also be recorded. Mixed-uses may have the benefits of enabling people with a range of incomes and backgrounds to reside side by side; and thus, help foster greater social equity and integration (Friedman, 2012). In addition, building homes for seniors along with dwellings for young households may further attract extended families and create a mutual support system. Notwithstanding this, design approaches adapting to changing demographics and lifestyles arguably include live-work dwellings, support aging in place, and multigenerational, small size, and adaptable housing (Friedman, 2012).

In light of the above, an important question should be raised, namely: are smart buildings exclusive to developed countries; or could buildings still be 'smart' with less or no sophisticated technology? Before attempting to answer this question two terms are investigated, namely 'smart building' and 'technology'.

Smart building, is usually referring to a building being intelligent i.e. it encompasses various technologies, such as data network, voice network, power management, video surveillance, fire alarm, HVAC control, lighting control, access control etc. with the different systems having the capability to communicate for a much efficient use of the building (Sinopoli, 2006). Other interpretation of smart building may encompass (although still associated with the integrated systems) responsive and adaptive envelopes and material that respond to the internal and external environment, green roofs, inclusion of Photo Voltaic, etc. It is, however, important to investigate the extent to which homes could be smart, without the inclusion of sophisticated technologies (Friedman, 2012). This is of particular importance to developing countries.

'Smart', as an adjective, is usually associated with either intelligent people or a technology that is intelligent i.e. responds to the end users' needs and make their experience as efficient as possible. The term 'technology' may refer to a new product and/or a process (Laborde and Sanvido, 1994). In this context, it can be argued that a 'design' may refer to a product (if it is noun) or to a process (if it is a verb); and in both cases a 'design' is associated with a new 'creation'. Therefore, a design may be considered a 'technology' that could be 'smart', as long as it is able to respond and adapt to current as well as to future dwellers' needs. Since, universal design principles aim at a design that could be easily adapted to current as well as to future needs, accommodating all ages and mobility; it could result in 'smart' buildings. Thus, it could be concluded that 'smart' buildings could be achieved by simply achieving a universal design; and not necessarily to encompass sophisticated technologies.

6. Conclusion

Egypt is currently facing huge housing challenges to solve a problem that successive Government failed to solve for the past 60 years. Currently, with more than 90 Million inhabitants, and around 300,000 housing units needed annually, the anticipated 6 Million gap in housing provision by 2020, and the expected demographic change; the housing problem seem to exacerbate due to the multi-variate complexity. The inability to provide affordable and adaptable housing, has led to individual chaotic developments that do not pay attention to or abide by building codes and regulations. This may lead to physical as well as mental/psychological implications.

This paper investigated the housing challenge in Egypt, and the implication of informal developments on people's health and well-being. The paper acknowledges the importance of informal developments to satisfy socio-economic needs; but also highlighted the negative impacts of such informal chaotic development. However, it was concluded, that despite the negative implications of informal developments, they imply some sort of 'smartness', particularly that these depend on the provision of mixed-uses, include extended families, are small in size, and allow adaptability of spaces.

In conclusion, there is an opportunity to provide a smart future housing in Egypt by mitigating negative challenges of informal developments and capitalise on the positive. The result of this paper will feed into the second phase of the research to provide scenarios for future housing that takes into account the socio-economic, demographic change, as well as technological advancements.

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