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Innovation Diffusion in Housing: A Conceptual Probe in Saudi Arabia

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Abstract. The purpose of this paper is two-fold: First, to probe into the nature and salient aspects of innovation diffusion in housing in the context of Saudi Arabian climatic and cultural conditions, and second, to explore ways and means for optimising the level of innovation diffusion in housing which is most befitting to the climatic and cultural conditions of Saudi Arabia.

In its mechanics, the paper is comprised of six parts. Part one briefly deals with the introductory and historical aspects of innovation diffusion in housing. Part two describes the salient aspects of the Saudi Arabian climate and culture. Part three highlights the impact of climate and culture on housing. Part four assesses the influence of cultural imperatives on innovation diffusion in Saudi Arabian housing. Part five probes into the locational, attitudinal, and operational aspects of innovation diffusion in Saudi Arabian housing. Finally, part six deals with the major conclusions and recommendations of the study.

Introduction

The history of innovation@, their informal diffusion(2), adoption and non-adoption is perhaps as old as the history of human civilization. However, the formal research on the subject by social scientists was not initiated until the early 1900's [1,p.5]. Notwithstanding the fact that a number of disciplines such as anthropology, economics, marketing, political science and communications have been engaged in research on the various aspects of innovations, the locational aspect of innovation diffusion has specifically been investigated by the geographers [1 ,p. 15].

(1) Innovation, according to the Webster's unabridged dictionary, means an act effecting a change in the established order or introducing something new.

(2) Innovation diffusion signifies the spreading of innovation through a process of social acceptance which may' lead to a partial or total adoption of an innovation by a community.

Innovation diffusion in housing takes precedence over other types of land-uses not only because the residential land-use occupies the largest percentage of land in any human settlement, but also due to the fact that the maximum part of the lives of human beings is spent in the dwelling units. The dwelling unit was perhaps the first innovative element of the built environment which came into being as a result of sedentarization of the nomadic man. Since then, the dwelling unit has been getting innovatively modified in an effort to achieve maximum climatic comfort and cultural compatibility. During the days of low technology, the rate of development of innovations in housing was rather slow and mainly depended on the availability of indigenous materials and the ingenuity of the residents of a human settlement. As a consequence, the fabric of the residential areas remained predominantly homogeneous. However, the residential patterns have been getting increasingly differentiated during the last two centuries due to the increaseing rate of innovation diffusion prompted by the technological revolution. Technology appears to have influenced the residential fabric of developed and fast developing countries quite differently. In developed countries the advancement of technology and the innovation diffusion in housing went hand in glove within the dictates of their climatic conditions and cultural values, whereas in fast developing countries, the technology transfer also brought in its wake the innovations conceived in the context of the western culture.

The architects and urban planners, being primarily concerned with the applied aspects of spatial development, deal with the innovation diffusion or non-diffusion in housing from the vantage point of identifying cultural conflicts in the urban patterns [2,pp. 71-77] or alleviating the cultural conflicts within them [3,pp. 251-253]. Cultural conflicts in urban patterns could, in broad terms, be reckoned as physical manifestations of the existence of adopters and non-adopters of innovations in a society. A greater number of cultural conflicts in an urban pattern would perhaps indicate higher competing tendencies between the adopters and the non-adopters. The sporadic or ubiquitous occurance of cultural conflicts in urban patterns also provide an idea about the locational and the distributional patterns of the two groups in space. Likewise, a homogeneous spatial fabric would indicate the predominance of either the adopters or non-adopters of innovations depending upon the prevalence of contemporary or traditional styles of the urban pattern in a, social system.

This study, being part of an ongoing investigation, mainly probes into the locational, attitudinal and operational correlates of innovation diffusion in Saudi Arabian housing in a limited topical and geographic context. It does not explicitly go into the innovations dealing with the housing designs and layouts in various climatic zones and varying cultural orientations in different parts of Saudi Arabia. The study therefore, needs to be further progressed both cross-sectionally as well as temporally, and sets a tone for further research on various aspects on innovation diffusion in Saudi Arabian housing.

The ensuing sections of this study successively deal with the climatic and cultural profile of Saudi Arabia, its impact on housing; the influence of cultural imperatives on innovation diffusion; and finally probes into some of the salient aspects of innovation diffusion in housing in Saudi Arabia.

A climatic and cultural profile of Saudi Arabia

Climatically, Saudi Arabia can be divided into four distinctly different regions: the coastal region, the northern region,, the southwestern mountainous region and the central region. Thecoastal region remains warm and humid during summers and becomes very pleasant during winters whereas the summers in the southwestern mountainous region are very pleasant and the winters become very cold. The central region has a dry climate 'with temperature extremes during the winters and summers. The climate of the northern region is somewhat similar to that of the central region with the exception that the winters are more severe and the summers are less hot.

Culturally, the movement of population from rural areas to urban areas along with the economic take off in Saudi Arabia, has had a great impact on the life style of people. The bedouins have been fast quitting their traditional pastoral wanderings, exchanging the camel caravan for the mercedes truck and tent for a block house on the out-skirts of urban centers [4,p. 52]. The rural population migrating to the cities and having an easy access to education, is improving the quality of their life as a result of higher paid urban jobs. The modem means of communication and technological advancement has brought a flow of new ideas in young Saudis which is 'transforming the whole social structure of the country. Extended families are being fragmented into small nuclear families. Women are going more and more for higher education and taking important positions as doctors, teachers and social workers. Also modem physical comforts have brought significant changes in peoples' way of living.

Inspite of all the above mentioned impact of modernism in Saudi Arabia, it is an accepted fact that the Saudis are still preserving their traditional values. Hospitality remains the virtue of Arab families. Respect of elders, taking care of old people and love for children are dominant features of Arab life style. Sexual segregation in all walks of life, including schools, colleges, hospitals and other public places, is a unique example of cultural preservation in Saudi Arabia. Privacy and cohesion of family life is embedded in Arab culture. The family structure clearly defines the role of each family member. The adult male members are responsible for providing the economic security to the family while the females perform domestic duties of bringing up the children and working in the houses. The life of women in Saudi Arabia may appear to the outsiders as restricted but it has brought a remarkable strength to the family unit. The family alliances are very strong and marriages are still arranged by the parents.

The impact of climate and culture on housing

Housing, being the basic need of people, is often identified with the word "shelter". It fulfills two of the most important requirements of human beings, viz., the physical protection and the psychological security. Both of these aspects are inevitably related to climatic conditions and cultural values. Throughout the history of Saudi Arabia, both the culture and climate of the country have played a significant role in the design and construction of dwelling units.

The design and building materials of the traditional houses of Saudi Arabia depict highly efficient methods of protection from harsh weather. The unfired clay bricks finished in plaster, which provide the basic material for housing, give excellent insulation against the heat of the sun. The triangular decorations of the door-way moulding, crenellations and finials [4,p. 46] beautifying the exterior of the houses are some of the aesthetic values of the old Arab culture, which can be seen in the traditional houses throughout Saudi Arabia. The influence of Islamic culture on these houses can be observed in the form of windows, air-vents, peep-holes and hatches by which the occupants of the houses can look out but can not be seen from outside. Also the provision of the courtyard, an open space around which the traditional house is built, keeps the family life alive and intact. The other physical manifestations of Islamic culture can be observed by the segregation of male and female reception quarters; and also by the importance given to privacy of family life by opening the entrance door into a blank wall to obstruct the inside view of the house.

The popularity of traditional houses in the Saudi society preserved itself until 1945. In the late 1950's the rural urban migration started, resulting in a cultural upheaval which simultaneously brought a change in the housing requirements of people. The fragmentation of extended family into nuclear families influenced the structural pattern of the house and two courtyards became a prefered feature of the urban house. One of the main differences between the traditional and the transformed two courtyard houses was that the latter was more regular in shape, and conformed better with the emerging rectlinear street pattern in the saudi cities [5,p. 74]. The oil boom of 1970's, with the adoption of new ideas and building techniques from the west, changed the aspirations of people in terms of housing. The dwelling units began to increase in size and grandeur, revealing the economic prosperity and educational uplift of their inhabitants. The modem version of houses appeared in the form of 'villa' - basically a detached house with a garden compound. The influence of western ideas promoted the need for a specific use of each room of the villa, namely, sitting room, dining room, bedroom etc. which did not exist in the traditional house.

The modem villa could not keep the required standards of privacy, reduced the private outdoor space and lacked the efficient use of indoor space demanded by Saudi culture; but it still kept the basic cultural values in some form or the other. For example, instead of a courtyard, a saloon is made inside the house for informal family

gatherings. Also, separate male and female reception rooms on the front part of each villa are provided to retain the traditional hospitality. High boundary walls around the garden are built to lessen the loss of privacy created by windows opening towards the exterior of the house. Not only this, but even the most modem sanitary fittings in the bath rooms could not curtail the need of a biddett and a water sprinkler beside the toilet paper. All these steps towards the adaptation of villa highlight the deep commitment of Saudis to their cultural values and their pride in the religious and social norms.

The influence of cultural imperatives on innovation diffusion in Saudi Arabian housing

The cultural imperatives are of parametric significance in a society. Just as "necessity" is the mother of invention, similarly in an ideal situation, "invovations" in housing in any society evolve out of its cultural requirements. Although innovations in housing, developed in a different cultural context, do often get adopted in developing countires, only those innovations which evolve out of the prevalent cultural values of a society have any chance of grass-root adoption on a sustained basis. Therefore, it appears highly appropriate to reemphasize some of the salient aspects of Saudi Arabian cultural traits which are distinctly different from its western counterparts and other secular nations. First, and perhaps the foremost, is the deep societal commitment to Islam which subscribes to a single rather than pluralistic value system. It advocates for socially integrated residential neighbourhoods rather than segregated housing for the people with different ethnic backgrounds. Also, as discussed in the previous section, the desirability of restrained intermixing of sexes in Islam has resulted in a high emphasis on privacy in homes. This introverted tendency in family life coupled by an extremely extrovert tradition of receiving and entertaining guests, gets reflected either in the provision of separate guest houses or reception rooms in the male as well as female sections of the house. Second, unlike many other nations, government and religion in Saudi Arabia are considered part of the same package rather than two independent streams. Third, due to the post 1973 oil boom and acute shortage of manpower, Saudi Arabia had to employ capital intensive techniques and underwent a phase of very rapid and unprecedented develop ment. Although the fast rate of development brought in its wake exemplary wastages and socio-economic changes, the Saudi society is showing a great resilience in getting readjusted to the current economic changes in the international oil market.

Single and pluralistic value systems and the factors implicitly associated with them, have far reaching socio-economic and physical planning implications. Whereas, the monolithic social systems, like in Saudi Arabia, have to satisfy only one central tendency, the pluralistic societies like in U.S.A., have to deal with many differentiated and even conflicting value systems which tentamount to dealing with an envelope of many "normal distributions" having distinctly different central tendencies [6,pp. 13-14].

Salient aspects of innovation diffusion in Saudi Arabian housing

A conceptual probe into the housing developments in Saudi Arabia leads to the following postulations:

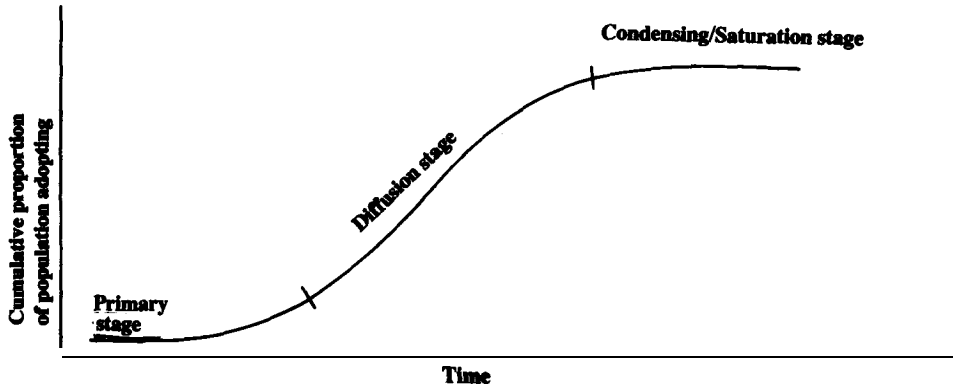
1. Diffusion of innovation in housing appears to be directly related to: (i) the size of human settlement, and (ii) the proximity of a settlement to large urban centre(s).
2. The innovation diffusion processes of housing in Saudi Arabia appear to be a dual phenomenon comprising of a differential mix of "adoption" and "adaptation" processes; and that there are tendencies of revival of liousing innovations which are best suited to Saudi climate and culture.
3. The process of innovation diffusion in housing thrives best with the collaborative partnership of the public and private sectors.

The above mentioned three postulations generally deal with the locational, attitudinal and operational aspects of innovation diffusion in Saudi Arabian housing, and need conceptual as well as empirical verification in order to fully appreciate them in the context of innovation diffusion in Saudi Arabian housing. However, due to the time consuming nature of pragmatic research, this study adopts two approaches for the conceptual and empirical grounding of these conceptualizations. The first approach broadly resorts to the already established empirical facts, found in the relevant literature, and attempts to rationalize the postulation(s) through deductive logic; the second approach utilizes inductive method by precisely investigating into a case study of King Khalid International Airport housing in Riyadh and then generalizing the findings to reflect some of the pertinent aspects of innovation diffusion in housing in Saudi Arabia.

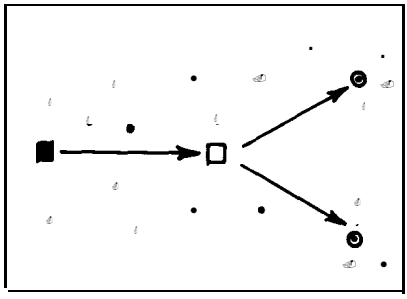
The locational aspect of innovation diiusion in housing in Saudi Arabia

The first postulation, viz., the diffusion of innovation in housing appears to be directly related to the size of human settlement and proximity of a settlement to large urban center(s), is best substantiated by Hagerstrand's research(3) [1,pp. 17-25] carried out in early 1950's. Hagerstrand, apart from conceptualizing the process of innovation diffusion and developing a technique to operationalize it, also identified empirical regularities (Fig. 1). Three types of conformities have been associated with the diffusion processes. The first deals with the temporal dimension of innovation diffusion. As shown in Fig. l-a, the cumulative level of adoption of an innovation is represented by an S-curve. The second and third regularities deal with the physical aspects of diffusion as illustrated by Fig. l-b and l-c. Spatially, the diffusion proceeds from larger urban centers to smaller centers. This phenomenon has been termed as "hierarchy effect". Also within the hinterland of an urban center, the diffusion appears to proceed in a wave-like pattern from the urban center, first reaching the nearby rather than distant locations. This regularity has been termed as "neighborhood or contagion effect" of diffusion.

(3) Attention of the reader is also invited to Hagerstrand T. [7]



(a) The S-curve of diffusion through time [7]



(b) The hierarchy effect of diffusion in space

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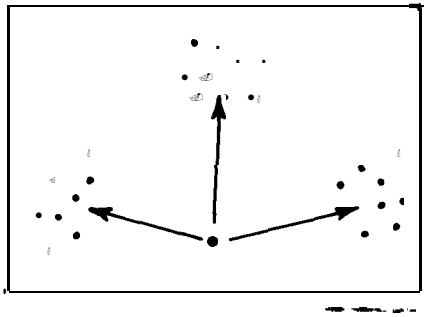
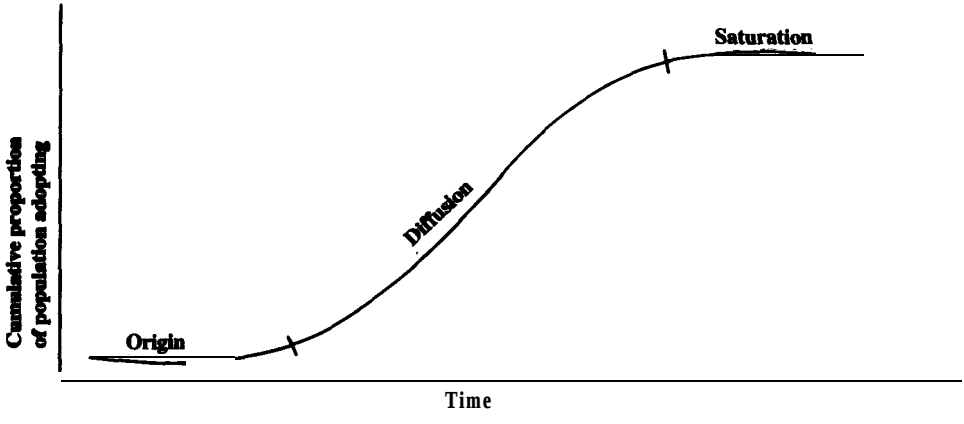


(c) The neighborhood effect of diffusion in space [7]



(d) Stages of diffusion [8]

Fig. 1. Empirical regularities in innovation diffusion.
Source: Brown Hagerstrand and Griliche [1,7,8]

Hagerstrand also attempted to interrelate these empirical regularities. He postulated three stages: (i) a primary stage during which initial diffusion centers are established; (ii) a diffusion stage during which neighborhood-type diffusion occurs in areas near diffusion centers and secondary diffusion centers are established in lower order urban places; and (iii) a condensing or saturation stage during which filling-in happens (Fig. l-a). At a later date Griliches [8], an economist, apparently working independently, also proposed three stages of diffusion which are remarkably similar to those suggested by Hagerstrand (Fig. l-d). Brown, pointing out the congruence between Griliches and Hagerstrand has made an excellent synthesis [1,pp. 21-22]:

> **"This framework thus illustrates the complementarity of the hierarchy and neighborhood effects and their temporal positioning within the diffusion process. It also implies that, if the locales of adopters were tabulated, higher order urban places would characterize the left tail of the S-curve of adoption; lower order urban places would characterise the middle, sharply rising portion of the S-curve, along** with rural hinterlands in proximity to urban centers; **and remote rural hinterlands would characterize the right tail of the S-curve."**

Diffusion of innovation in housing in Saudi Arabia appears to be in conformity with the empirical regularities identified by Hagerstrand, Griliches and Brown that the innovation diffusion proceeds from larger urban centers to the smaller centers. This contention is borne out by the fact that the housing innovations were first adopted in the three largest cities of Saudi Arabia (Riyadh, Jeddah and Dammam) by the various agencies in the public, semi-public and private sectors. Some of the examples in sight are the Planned Unit Developments (PUDs) and residential projects carried out by the Ministries of Foreign Affairs, Defence, and National Guards in Riyadh. Diplomatic Quarters Scheme in Riyadh may be cited as another effort in this direction which is being implemented currently in collaboration with the Embassies of various countries. Apart from these projects in the public sector, there are numerous stray examples in the three cities reflecting the innovative talent of Saudi architects in the private sectors. For instance, in case of Jeddah M.S. Farsi and H.I. Amer have pointed out [9,pp. 184-190]:

> **"... residents began to revive the long tradition of Islamic architecture in the** shape of **beautiful white buildings intended for private single family use. The Nassif family, for example, build their housing compound of 'mangabi' rock (and cement) and screened its openings with modem original wooden 'rawashins'. They did not use air conditioners and replaced them by air shafts and domes which gave the hot air currents a chance to rise and be replaced by pleasanter cooling currents. The Assuleirnan family built a strikingly beautiful white home on Desalination Street, as did several other old Jeddah families. In all such houses, the swimming pool replaced the pond or** the old fountain and **also** provided an expanse of water in the garden to help the **flow** of cooler breezes during the summer nights".

In Riyadh, some of the builders in the private sector have even resorted to the use of solar energy and insulated exterior walls in the residential buildings. In a coun-

try where gas is cheaper than water, the use of such energy conservation measures were unthinkable just a few years ago. All these developments, having been conceived within the context of Saudi cultural and climatic imperatives, are further elaborted in the following paragraphs with the help of a pilot case study of King Khalid International Airport (KKIA) housing.

The King Khalid International Airport was conceived as a completely new project with all the support buildings and ancillary uses such as passenger terminal complex, housing and community facilities. The site occupies an area of 12 by 25 km (7.4 x 15.5 miles), approximately 35 km (21.7 miles) north of Riyadh. The KKIA housing is located about three kilometers south of the airport perimeter road. According to the original scheme, two residential areas were envisaged, namely, the community and the village I (Fig. 2). The "community" was planned to house the Saudis working at the airport or its related services; whereas, village I was basically developed as temporary housing for the expatriates. Only the first phase of the community was completed providing for a population of 3000 persons. The site measures 650 x 650 m and provides for 171 villas and 219 apartments. Besides these residential units, the community provides for a central mosque, four schools a recreation complex including a theatre, and allied medical, commercial and government facilities.

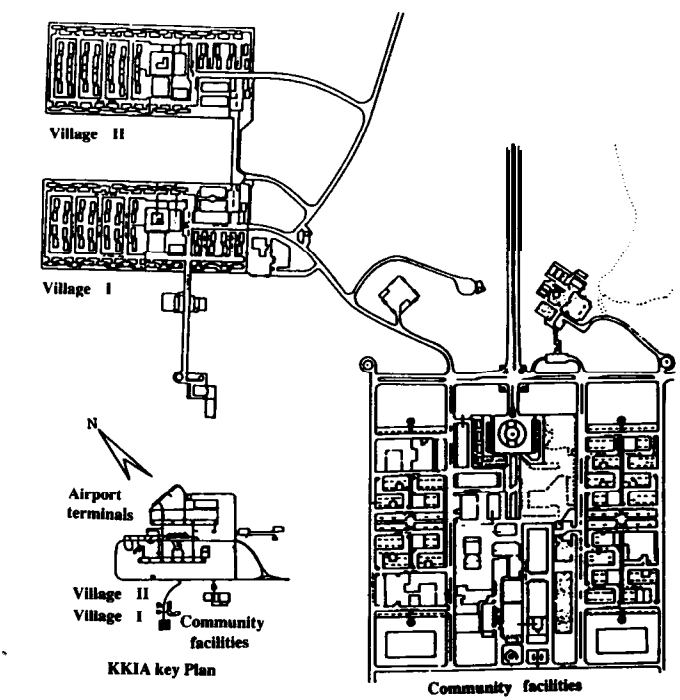


Fig. 2. Key plan of KKIA and the layout plans of KKIA community facilities and villages I & II.

The single family courtyard type of houses in the community were designed to suit Saudi climate and culture. To ensure privacy and security, the villas are divided into private and semi-public areas separated by courts and covered arcades, with each unit having a private yard or deck. Apart from internally shaded and protected courts and trellised areas, housing has been densely placed to reduce distances of the shaded walks. Besides providing for five, four bedroom dwelling units for the top executives, the community provides for four variations in single family houses ranging from two to three bedrooms with or without a servant room. The village I is composed of 124 western style villas and provides for a restaurant, pre -nursery school, a club with a swimming pool, tennis courts and a library. Village I only provides for one type of villa with a small outside lawn.

A probe into the trend of occupancy of the courtyard type of single family houses by Saudi families (Fig. 3) and the alterations made therein is quite revealing. In the beginning, most of the Saudi families **prefered** to live in village I villas rather than the courtyard type of dwelling units in the community, even though the level of facilities in village I was lower than those in the community. With the result that

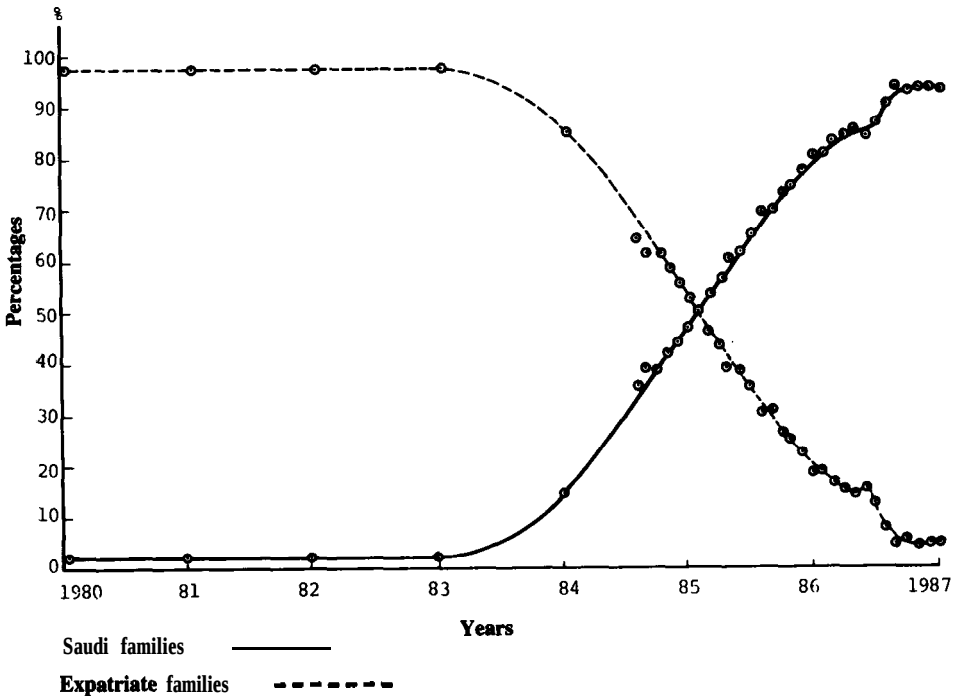


Fig. 3. Percentages of Saudi families and expatriate **families occupying** single family houses in **King Khalid** International Airport community **housing during** tbe **1980-87 period.**

Source: Manager, Housing KKIA, Riyadh, Saudi Arabia.

about 97% of the community single family housing was allocated and occupied by the expatriates. An idea of the popularity of the western type of villas in village I may be formed by the fact that the Airport Authorities had to construct village II, instead of developing the phase two of the single family courtyard houses of the community as was originally planned. village II, which is completely occupied by the Saudis, is an exact prototype of village I in its layout, with the exception that in village II, the garage has been converted into men's sitting room.

In 1980 few Saudi families, living in camp apartments which were constructed to accommodate the employees during the transitional period, opted to shift to the single family houses in the community because of the non-availability of villas in village I. These families found the living in the adapted version of the courtyard house quite comfortable, both climatically as well as culturally. This provided a demonstration effect and in 1983, the Saudi families started moving into the courtyard type houses in the community in preference to the western type villas in village I. To accomodate this trend, in 1984-1985(4) eighteen expatriate families had to be shifted from the community to the western style villas of village I. At this stage, it appears appropriate to point out that both the Saudis as well as non-Saudi residents of the Airport housing have been very mobile. After the Commissioning of the Airport, many expatriates have also been moving out after the completion of their assignments and Saudis moving in to replace them. The sharp decline of expatriates from community courtyard type houses between the years 1984 and 1985 as shown in Fig. 3, represents both the out-movements to the village I villas as well as to their respective countries. Likewise, the sharp increase of Saudis in the community during the same period represents the movement from the western style villas of village I as well as from outside.

In the process of further adapting the courtyard type of dwelling units to their way of life, the Saudi residents have been incorporating a number of alterations in the KKIA housing. Three of such changes are worth mentioning. One, there is a strong trend to convert the garage into a men's sitting room. Two many of the combined living and dining rooms have been converted into two separate dinning and living rooms. The only exception are those few Saudis having foreign wives. Three, the internal corridors are being subdivided into two portions thereby completely segregating the house into two separate male and female sections with independent entrances.

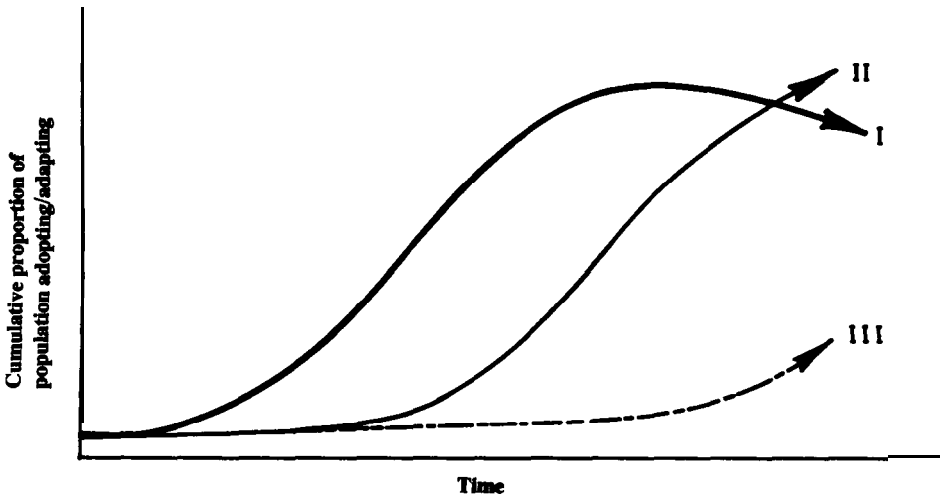
The attitudinal aspect of innovation diiusion in housing in Saudi Arabia: a dual phenomenon

The study of KKIA housing substantiates the view that the diffusion of innovation in housing in Saudi Arabia is a dual phenomenon, directly related to the attitudes of Saudi people regarding the adoption and adaptation of innovations in

(4) The break-up of the two categories of residents for the year 1983 is not readily available.

housing and that there are strong tendencies towards the revival of the courtyard house and innovations based on the cultural imperatives.

A diagrammatic version of this dual phenomenon of innovation diffusion in housing in urban areas of Saudi Arabia is shown in Fig. 4. Curve I represents the trend of adoption of "villa" as an innovation in housing in Saudi Arabian cities. The study conducted by Al-Hathloul [10,p. 188] regarding the institutionalization of "villa" as a single family dwelling unit in Saudi Arabia provides sufficient empirical evidence about the adoption of innovations denoted by curve I and that these have almost attained a level of saturation in Saudi Arabian cities. Curve II indicates the adoption lag of "villa" as an innovation in the towns and the hinterlands of cities of Saudi Arabia. A close examination of the two curves also indicates that in cities, the process of innovation in housing having undergone the "origin", "diffusion" and "saturation" stages (Fig. 1), tend to discard the innovations originated in a different cultural and climatic setting, whereas the smaller urban areas are still in the stage of adoption of villa as an innovation in housing. Curve III indicates that coupled with the trend of disclaimation of imported innovations in cities, there is a shift towards the adaptation of innovations to the indigenous cultural and climatic conditions, prevailing in Saudi Arabia.



Adoptioo of "Villa" as an innovation in housing in Saudi Arabian cities.

Adoption of "Villa" as an innovation in housing in towns and hinterlands of cities in Saudi Arabia.

Adaptation of "Villa" to the Saudi/Islamic culture and the revival of innovations in courtyard houses in Saudi Arabian cities and new towns during 1970s and 1980s.

Fig. 4. Aconceptualization showing the processes of adoption, adaptation and revival of innovations in housing in various urban centers in Saudi Arabia.

It may be mentioned here that there are inherent variations in the nature of innovations and their rates of diffusion in housing in various countries due to the prevalence of different sets of socioeconomic, environmental and technological factors. The process of innovation, however, gets further differentiated in developing countries, as compared to that in the developed countries, due to the temporal variance in the technological inputs and the consequential innovatory lag. The innovation diffusion processes in housing in developing countries, unlike the developed countries,. appear to be a dual phenomenon comprising of a differential mix of adoption and adaptation processes. The adoption process comes into play during the early stages of development in a developing society which implicitly gets adapted to the cultural values of the innovating society; whereas, the adaptation process gets initialized differentially during the later stages of development as a result of explicit realization of comparative advantages of the traditional value system and indigenous resources.

The innovation diffusion in housing appears to standout uniquely in Saudi Arabia as compared to other developing countries. There appear to be two distinct phases of innovation diffusion in housing during the short but very dynamic developmental history of the country. The first phase, indicating the adoption of foreign innovations in housing, highlighted by curves I & II, appear to have started with the construction of Aramco towns in the eastern region in the 1950's. The innovation diffusion of this phase appears to be approaching its saturation stage in the metropolitan cities and continues to propagate itself in towns and smaller settlements of Saudi Arabia. The phase two, denoting the revival and diffusion of innovations in housing in the Saudi cultural and climatic context appears to be emerging during the recent past and is still in an incipient stage. The incidence of the dual phenomenon of innovation diffusion appears to be a consequence of unprecedented technology transfer and the ingrained strength of Saudi culturalvalues. The reversal tendencies of the progressive infusion of innovations dipicting the Saudi cultural values are expected to increase with time. However, the precise nature and magnitude of the two types of innovation diffusions can only be ascertained by conducting a time series analysis of housing developments starting from the Aramco towns to more recent residential developments such as the Ministry of Foreign Affairs' Housing, the Diplomatic Quarters in Riyadh, the new towns of Jubail and Yanbu and a number of planned unit residential developments in other Saudi cities.

Having probed into the nature of diffusion of innovation in housing in Saudi Arabia in the foregoing paragraphs, the forthcoming section will explore the ways and means for optimizing the various innovation diffusion processes in housing in the context of Saudi Arabian social and climatic imperatives, both in the public and private sectors.

The operational aspect of innovation diffusion in housing in Saudi Arabia

As stated earlier, the processes of innovation diffusion in housing thrive best with the collaborative partnership of public and private sectors. In this alliance, the

public sector provides both the 'catalytic' as well as the 'demonstration' effects, and the private sector, depending upon the level(s) of social acceptability, act both as a 'receptacle' as well as 'an agent' for the propagation of innovative concept(s).

Innovation diffusion in the context of cultural imperatives can, perhaps, best be optimized by alleviating the root causes for the non-adoption of an innovation, rather than resorting to symptomatic treatment; or in other words by adopting a preventive rather than a curative approach. In order to be able to effectively deal with the causes, one has to understand the nature and the mechanics of the interacting variables responsible for: (i) the non-adoption of innovations conceived within the framework of cultural and climatic environment of a society and (ii) the adoption of innovations developed in different cultural contexts. It may also be re-emphasized here that the presence of cultural conflicts in urban patterns in a society in fact indicate differentiated degrees of adoption of innovation(s) developed in alien cultures. Al-Hathloul [2,pp. 71-77] provided an excellent conceptualization which explains the mechanics of cultural conflicts in urban patterns. The conceptualization not only provides an explanation for the existence of cultural conflicts in urban patterns, but is also capable of being operationalized to alleviate the cultural conflicts in urban patterns [3,pp. 251-253]. Al-Hathloul has explained the prevalence of cultural conflicts in urban patterns in terms of three intersecting sets of: (i) Conventions of Social Use, (ii) Conventions of Physical Environment and (iii) Empirical Use, shown in Fig. 5-a.

The adoption of revived innovations in housing conceived within the framework of cultural and religious values of a society can be optimized by maximizing the intersection of the three intersecting sets identified by Al-Hathloul. Out of the three sets, the set representing the conventions of use (CU) having been derived from religious and cultural ideals, serve as a parameter and therefore, can be reckoned as a bench mark in case of Saudi Arabia. The other two sets, however, can be treated as 'variables'. Fig. 5-g represents the total intersection of the three sets, representing an ideal condition with no cultural conflicts in urban patterns or 100% adoption of: (i) spatial innovations in the cultural context or (ii) traditional forms. This condition is hardly achieved in the real world situation except in very special and limited cases of (turn key) projects such as planned unit developments conceived and implemented under strict regulatory measures. Complete adoption of innovation diffusion in various land-uses (of which housing constitues a predominent part) in the cultural context requires concerted efforts of public and private sectors and is a time consuming process. One can, at best, aim to optimize the adoption of innovation diffusion in housing by achieving a situation represented by Fig. 5-e or 5-d. This can be done by two parallel approaches, namely: (i) by increasing the intersection between the conventions of Physical environment (CE) and conventions of social use (CU) as shown in Fig. 5-b; and (ii) by increasing the intersection of the sets representing Empirical use (EU) and conventions of social use (CU) as indicated in Fig. 5-c.

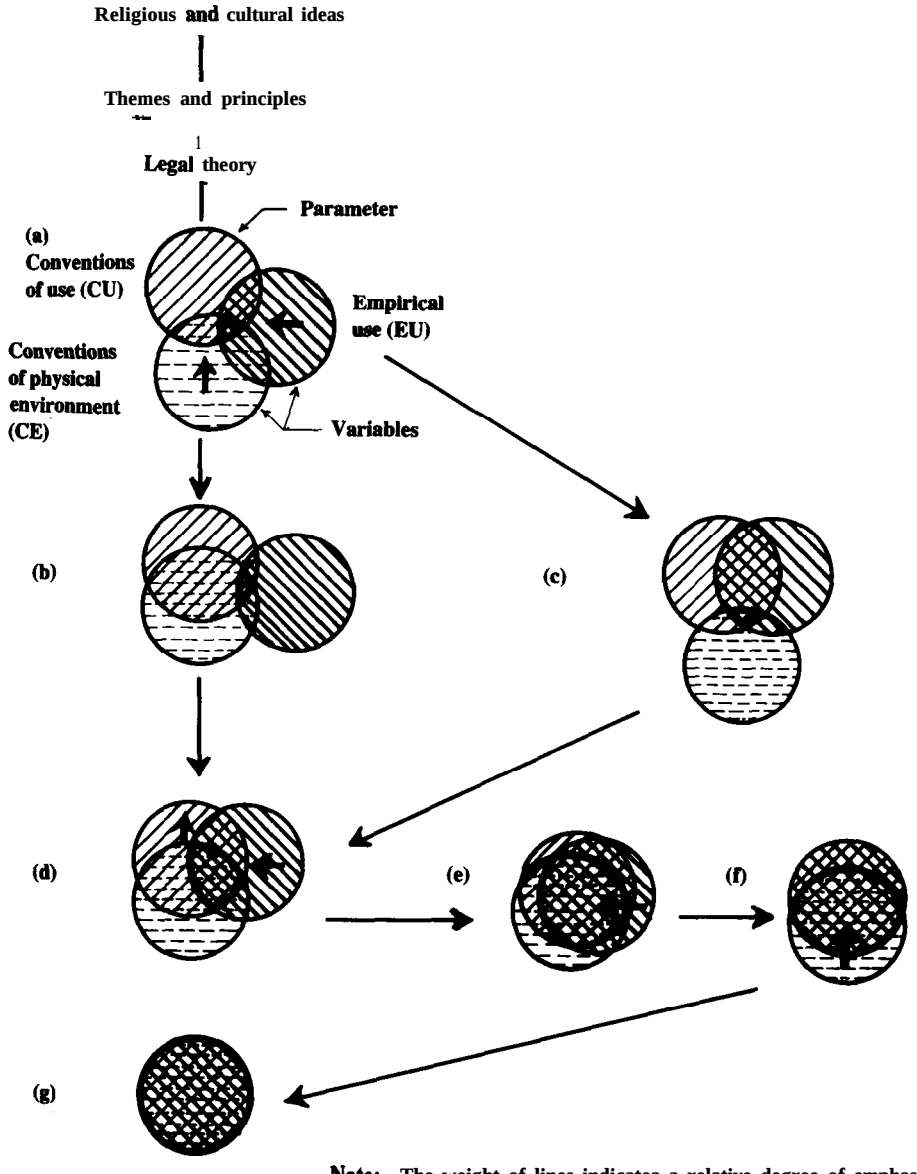


Fig. 5. Elfectaation of Hathloul's conceptual schema for the adoption of innovation diffusion in housing within the context of cultural imperatives.

These interacting approaches require a number of actions both in the public and private sectors. For instance, the first approach will require a number of statutory actions by the government; and the second will require promotional measures which will increase awareness among the people and provide incentives to the private sectors. In Saudi Arabia, the government is encouraging various municipal and regional authorities to promulgate zoning and sub-division regulations which are more in keeping with its cultural and climatic conditions. City of Hail has already adopted new set of regulations and other cities such as Buraida and Onaiza are in the process of formulating more forward looking sets of zoning and sub-division regulations. The newly adopted zoning regulations in Hail region provide for the construction of Arab style houses with family oriented courtyards by doing away with the rigid requirements of side and rear set-backs subject to the condition that the owner complies with certain design criteria that would preserve the privacy of his neighbors [11].

Conclusion and Recommendations

The study of the pertinent literature about the innovation diffusion and probe into the case study of King Khalid International Airport housing in Riyadh reveal similarities as well as differentiations between the innovation diffusion processes in housing in Saudi Arabia and the developed nations at large. As advocated by Griliches [8], Hagerstrand [7,pp. 17-25] & Brown [1,pp. 21-22] there is sufficient empirical evidence to substantiate the contention that in all the countries the innovation diffusion gets initiated in larger urban centers and proceeds to smaller centers. The adoption of innovation diffusion follows a S-curve through time as shown in (Fig. 1) and also appears to follow the laws of friction in physics, viz ., the coefficient of friction increases in the initial stages of movement of an object. However, once the object starts moving, not only the coefficient of friction stops increasing but the object also picks-up momentum with time. Similarly, there appears to be an obsession on the part of people to adopt an innovation in its early stages. However, once the initial obsession is overcome, the rate of diffusion and adoption of an innovation starts increasing. This inference is borne out by the very shape of an S-curve as well as by the pattern of acceptance of courtyard type of houses exhibited by the Saudis in case of KKIA Community housing study (Fig. 3).

There are however, a few aspects of innovation adoption in housing in Saudi Arabia, which appear to be distinctly different from those prevalent in the developed countries. Among others, for instance, the rate of adoption of technological innovations in housing has been much more faster in Saudi Arabia than in the now developed nations. This can be explained by the fact that the developed countries were following "made to measure" approach as far as the use of technology is concerned, whereas Saudi Arabia is adopting a "ready to wear" approach. In other words, Saudis, unlike the western nations, are "selecting and using" the technology rather than "developing and using" it. An idea about the unprecendented rate of

growth may be formed by the fact that major portions of most of the Saudi cities and towns are comprised of developments which happened just after the 1973 oil boom. It will not be out of place to mention that the western countries took centuries to accomplish a comparable level of urban development.

Another distinguishable feature of Saudi society is the existence of a dual phenomenon in housing. The first phenomenon is based on the adoption of villa and its allied innovations orginating from the western countries. The second phenomenon, which is still in an incipient stage, is emerging out of the Saudi cultural imperatives. It is resulting in the revival of the Arab style house and/or the adaptation of villa into a courtyard type dwelling unit. It may be pointed out that Islamic culture is so deep rooted in Saudi society that even though the western style villa became the accepted form of housing in Saudi Arabia during the 1950's and 1960's [11], it continued to undergo a number of alterations to satisfy the cultural values of Saudi people. Despite the development of apartment buildings, single family house incorporating the privacy features and greater number of rooms, providing for the segregation of sexes and the guests, still appears to be the preferred type of dwelling unit in Saudi Arabia. Also, the prevalence of a single value system and the monolithic nature of Saudi society further augments the adoption of innovations conceived within the cultural framework. However, it may be pointed out that this study was only limited to a conceptual probe of a few aspects of innovation diffusion in housing in Saudi Arabia in a limited geographic context. A comprehensive empirical investigation of the housing developments, starting from the Aramco towns to recent residential developments and new towns will be necessary to ascertain the exact nature and magnitude of innovation diffusion in Saudi Arabian housing.

Lastly, it may be re-emphasized that the desired level of innovation diffusion in housing in Saudi Arabia can not be achieved without an effective public and private sectors' partnership. It is, therefore, imperative that ways and means to optimize the innovation diffusion in housing in the Saudi cultural and climatic context, are explored and institutionalized to get the desirable results. Some of the facilitating ways and means may be enumerated as under:

1- Enacting an enabling legislation at the national level, providing for the preparation and approval of national, regional and local physical development policies/ plans with a special emphasis on their implementation.

2- Promulgating public land-use controls (zoning and sub-division regulation) based on Islamic traditions and climatic conditions.

3- Increasing the awareness of people about the relative advantages of various house-types, conceived in the cultural and climatic context through mass media, seminars and symposium.

4- Developing "type designs" which can be readily adopted or adapted, and require minimal efforts in getting the municipal approval.

5- Developing demonstration projects and model houses with a view to illustrate the functional workability and climatic comfort of various type-designs.

6- Providing financial, fiscal and other incentives such as the availability of free designs or subsidized design services and incentive zoning.

7- Awarding prizes to the planners, architects and developers for producing innovative building designs, suitable for the Arab-Islamic culture.

8- Subsidizing the private sector to undertake the development of befitting planned unit developments.

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انتشار التجديد في الإسكان في المملكة العربية السعودية

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ملخص البحث. الغرض من هذه الورقة هدفين، أولاً التدقيق والتحقيق في طبيعة انتشار التجديد وجوانبه المميزة في الإسكان بالمملكة العربية السعودية في إطارها الحضاري والمناخي، وثانيًا استكشاف طرق ووسائل لتحسين ورفع مستوى انتشار التجديد في الإسكان تتلاءم مع المقومات الحضارية والمناخية بالمملكة العربية السعودية.

أما من حيث تناول البحث فإنه يتكون من ستة أجزاء. الجزء الأول يحتوي على مقدمة ونبذة عن الجوانب التاريخية لانتشار التجديد في الإسكان. والجزء الثاني يحتوي على وصف للجوانب الحضارية والمناخية بالمملكة. والجزء الثالث يبرز تأثير الحضارة والمناخ على الإسكان. والجزء الرابع تقويم لتأثير المستوجبات الحضارية على انتشار التجديد في الإسكان بالمملكة. والجزء الخامس يتناول بالبحث والتمحيص الجوانب المكانية والتطبيقية وطرق انتشار التجديد في الإسكان بالمملكة. والجزء السادس والأخير يتناول الاستخلاصات والتوصيات التي تخرج بها الدراسة.