THE CONCEPT OF LOCAL-SMART-HOUSING: TOWARDS SOCIO-CULTURAL SUSTAINABILITY OF VERNACULAR SETTLEMENTS.

AmirHosein GhaffarianHoseini, Nur Dalilah Dahlan, Rahinah Ibrahim, Mohd Nasir Baharuddin and Ali GhaffarianHoseini

Abstract
The recent decades have witnessed the widespread manifestation of intelligent building design development around the world. Meanwhile, the concept of smart housing as one of the main issues of intelligent building design development has stimulated various architects and designers to make use of it for the sake of sustainable housing. However, this study represents a gap in smart housing design owing to the lack of a deep consideration on cultural values of users for ensuring the socio-cultural sustainability as one of the objectives of sustainable smart housing designs. Accordingly, the study puts forward the concept of local-smart-housing through utilization of appropriate vernacular architectural features and cultural values of vernacular settlements in smart housing design in order to reinforce the socio-cultural sustainability. Meanwhile, this study is limited to the Malay context in order to identify the vernacular features of Malay vernacular settlement’s functional spaces for utilization in smart housing design to make them culturally responsive. Correspondingly, this study proposes the concept of local-smart-housing based on the incorporation of intelligent building design and utilization of vernacular features for enhancing the quality of life for users.

Keywords
Smart housing; intelligent building designs; socio-cultural sustainability; vernacular settlements; functional spaces.

Introduction
Recent decades have witnessed the widespread manifestation of the development of intelligent building design around the world. The concept of smart housing as one of the main factors in intelligent building design development has stimulated various architects and designers to make use of it for the sake of sustainability (ASHRAE, 2006). Smart housing is perceived as an approach to achieve the sustainability based on the utilization of intelligent building design development and new intelligent technologies to enhance the quality of life for users. In view of this fact, a smart house is equipped with new technologies in order to ensure the environmental, economical and socio-cultural sustainability (Demiris, et al., 2009). The focus of this study is made on smart housing as an intelligent building design development that is highly interrelated with sustainable issues, highlighting the lack of a deep consideration...
of the cultural values of users for ensuring socio-cultural sustainability (GhaffarianHoseini, 2011). On the other hand, the study also draws attention to the profound vernacular features of vernacular settlements, which are substantially in harmony with the regional and cultural values of a region. The context is limited to the Malay experience, identifying the vernacular features of the functional spaces of a Malay vernacular settlement for utilization in a smart housing design within Malaysia with a view to making them culturally responsive. Thereby, the study concentrates on an identified gap within the smart housing implementations owing to the abandonment of a deep consideration on socio-cultural sustainability for developing a cultural responsive design. Eventually, this study would theorize the concept of local-smart-housing based on the incorporation of intelligent building design and utilization of vernacular architectural features.

**Smart Housing toward Sustainability in Built Environments**

According to various studies on the concept of sustainability, a successful combination of ecological, economical and socio-cultural sustainability could lead to a sustainable built environment as shown in Figure 1 (Demiris, et al., 2009; Kua, et al., 2002). Meanwhile, the experts in the field of intelligent building design declare that the significance of intelligent buildings is to enhance the ecological, economical and socio-cultural sustainability for assuring a high level of quality of life for users (Kua, et al., 2002; Kohler, 1999).

This study concentrates on the socio-cultural sustainability in terms of the preservation of social and cultural values. Thus, due to the literature review, it is argued that despite the large number of studies on the issues of sustainability within smart housing and intelligent building design, the idea of maintaining social and cultural values is not highly considered. Thereby, the substantial role of socio-cultural sustainability is not highly contemplated owing to the distinctive influence of ecological and economical sustainability. Moreover, among the influential aspects of socio-cultural sustainability, the priority is given to the other aspects such as health, safety, functionality and usability, while the concept of preserving the social and cultural values of local users is less considered (Kua, et al., 2002; Kohler, 1999).
The Concept of Local-Smart-Housing: Towards Socio-Cultural Sustainability of Vernacular Settlements.

AMIRHOSEIN GHAFFARIANHOSEINI, N. DAHLAN, R. IBRAHIM, M. N. BAHARUDDIN AND A.GHAFFARIANHOSEINI

al., 2002). However, this study designates the crucial role of cultural values of a local region for enhancing the quality of life of users. Hence, it is proposed that the utilization of socio-cultural values of a local region in smart housing design could promote the socio-cultural sustainability in order to enhance the quality of life.

Meanwhile, the studies with regards to understanding the key aspects of socio-cultural sustainability in housing, argues that smart housing designs must possess positive impacts on the daily lives of occupants. The corresponding fact expresses that the socio-cultural sustainability is achieved once the following three concepts are considered during the design process of smart housing projects (Buys, et al., 2005).

- The features which provide safety, health, well-being feeling and enhancement in quality of functionality.
- The features which concentrate on the security.
- The features which are interrelated to a unified design in order to provide comfortable and appropriate functional spaces for users.

Due to the aforementioned fact, it is demonstrated that the cultural values are not clearly considered for achieving the socio-cultural sustainability. However, this study presents the crucial impacts of cultural values of local user on promoting the quality of functional spaces in order to enhance the quality of life. This fact is overstressed while many local users prefer to stay in houses which are designed based on their own cultural values and regional context rather than a modern smart residential design (Nilhan, et al., 2007).

**Theoretical Development**

According to the theoretical development of the study, the quality of housing is considered as
a substantial parameter in enhancing the quality of life (Campbell, 1982). This study concentrates on the spatial and cultural aspects of the functional spaces within the quality of housing among many other quality indicators that could be influential in enhancing the quality of life. Correspondingly, it is proposed that the vernacular functional spatial features and the cultural meanings of the functional spaces could be considered as influential factors in enhancing the quality of life within the design of smart housing. The vernacular functional spatial features are the socio-cultural or environmental characteristics of a local region in a functional space, while cultural meaning represents a value that expresses the resident’s local way of life in a functional space.

In this research, the vernacular architectural features of vernacular settlements are studied using archival search. The study is carried out based on a theoretical framework leading to understanding the vernacular features which can be utilized for promoting the socio-cultural sustainability and enhancing the quality of life (See Figure 2). This theoretical framework, which is based upon the main issues of research, leads to the expected result of study. These main issues are the vernacular functional spatial features and the cultural meanings of vernacular

Figure 2: Theoretical Development of study (Source: Author).
The Concept of Local-Smart-Housing: Towards Socio-Cultural Sustainability of Vernacular Settlements.

AMIRHOSEIN GHAFFARIANHOSEINI, N. DAHLAN, R. IBRAHIM, M. N. BAHARUDDIN AND A. GHAFFARIANHOSEINI

functional spaces. Meanwhile, this study is limited to the Malay context in order to identify the vernacular features of Malay vernacular settlement’s functional spaces for utilization in smart housing design to make them culturally responsive. Accordingly, the vernacular spatial features and cultural meanings of the functional spaces which are inferred from the archival data are compared and categorized. Correspondingly, the vernacular features, which are corroborated by other archival sources, are considered as the result of the study in order to promote the socio-cultural sustainability for enhancing the quality of life.

Assessment of Sustainable Intelligent Buildings

According to the studies regarding the significance of intelligent buildings, there are versatile interpretations for intelligent design in accordance with smart buildings. The primary interpretations only contemplate on the crucial role of technology within intelligent building design without any consideration to the social, cultural and user interactions (Wigginton, et al., 2002). Meanwhile, other similar studies define the intelligent buildings as automated buildings with flexibility, cost-efficiency and integrated technical performances (Kroner, 1997). However, a few studies criticize the previous interpretations while arguing that intelligent buildings must be responsive to the user’s actual needs (Preiser, et al., 2002).

On the other hand, other interrelated studies represent an inherent relation between the building and well-being feeling of users (Clements-Croome, 1997). Accordingly, it is believed that the functional spaces of buildings have fundamental impacts on the well-being of users and in return, the satisfaction of users is highly in accordance with the building environment (Wong, et al., 2005). Thus, the concept of socio-cultural sustainability is not fully explored within intelligent building design development interpretations.

Despite the previous interpretations for the intelligent building design, the recent studies proclaim that an intelligent building must create a successful incorporation between intelligent design, environment and the occupants (Yang, et al., 2001). Thus, they believe that an intelligent building must be able to adjust to the environment and occupants. Nevertheless, the interpretations for intelligent building are different from region to region. For instance, it is declared that the significance of intelligent building is mostly based upon technologies in US while the UK definitions are more concentrated on user’s actual needs (Wong, et al., 2005).

Due to the retrospective facts, it is inferred that an appropriate interpretation for intelligent building design is required in order to consider the entire influential issues for creating a sustainable intelligent building. Accordingly, other studies propose a systematic double level strategy for an appropriate definition of intelligent building based on allocated quality modules (M1-M10) in order to comprise the entire allocated issues as represented in Table 1 (So, et al., 2001). Correspondingly, the first level expresses the main constituents of quality modules (M1-M10), while the second level represents three main areas for the respective modules, which are technology, functional spaces and functional requirements (Wong, et al., 2005; So, et al., 2001).
According to Figure 3, the respective quality modules are categorized in a way that ensures the economical, environmental and socio-cultural sustainability. Likewise, due to the theoretical proposition of the study regarding the crucial role of socio-cultural values, it could be seen that the “Culture” (M7) as a fundamental quality module is selected for all the intelligent building designs. Consequently, based upon the aforementioned interpretation, it is believed that the new interpretation highlights two main issues which are “technology” and “user’s actual needs” (So, et al., 2002). Hence, the studies represent that consideration of this new definition based on its corresponding modules enable the designers to create sustainable and high quality intelligent building designs (So, et al., 2002).

Respectively, this study theorizes that the cultural and local values of users could be integrated into intelligent buildings design for promoting the socio-cultural sustainability and enhancing the quality of life. On the other hand, we argue that the functionality spaces of vernacular settlements encompass profound vernacular architectural features, which could lead to a high quality of housing. These vernacular architectural features express the local and cultural values of users within each particular regional context (Rapoport, 1990).

### An Overview on Intelligent Building Design

Smart housing as an integral constituent of intelligent building design development concentrates on ICT (Information and communication technology) while integrating the technological concepts into the functional spaces in order to develop synergistic intelligent houses. Meanwhile, the backbone of intelligent buildings design, construction and operation course represents that “people” as the occupants are highly considered during the design, management and finance phases (See Figure 3). However, it is declared that there is no fundamental consideration of the actual needs of people based on their cultural values as the priority has been given to other issues during the evolution of intelligent building design (Clements-Croome, 2004). Thus, the study argues that safety, access control, control communication, security access control, user IT and communication, building control and monitoring were considered as the main target points of intelligent buildings. Due to this neglect and substantial role of people (occupants), it is
vital to focus on the people’s way of life, desired life style and socio-cultural backgrounds which create their cultural values.

Meanwhile, according to the current literature, a recent study by Alwaer, et al., (2010) is carried out to distinguish the key constituents of sustainable intelligent building design. Thus, a systematic analysis based on the responses of architects, building designers, engineers and sustainability evaluators represents four key performance indicator groups. The corresponding groups are divided into environmental, economic, socio-cultural and technological indicator groups (Alwaer, et al., 2010). As a result, the corresponding study supports our theory through representing the “culture”, “cultural heritage integration” and “compatibility with local heritage values” within socio-cultural indicator group.

Quality of Housing in Malaysia

One of the Malaysian government’s plans is to bring the appropriate quality for the housing developments. Nevertheless, inhabitants have not achieved the adequate quality of housing due to a low degree of satisfaction as a major problem in housing sectors. The low level of the quality of housing gets overstressed through not considering the cultural backgrounds, beliefs and lifestyle of inhabitants during residential designs (Abdul Mohit et al., 2009).

Due to the study by Abdul Mohit et al., (2009), various studies which focus on the residential satisfaction in Kuala Lumpur express the abandonment of the consideration of local needs, cultural backgrounds and their lifestyle. The respondents were dissatisfied with definite aspects of their house as it could not address their needs according to their cultural values.

In conclusion, reviewing various studies on the quality of life in residential designs indicates that the role of quality of housing for enhancing the quality of life is fundamentally based on culture, the household’s way of life and regional attributes. Hence, all studies ascertained the undeniable influence of cultural backgrounds which represents the actual local needs in enhancing the quality of life. The consideration of these factors is crucial during any implementation for enhancing the quality of life and housing standards in Malaysia or any particular region (CIDB, 1998).

Figure 3: Backbone of intelligent buildings, design construction and operation course (Clements-Croome, 2004).
Malay Vernacular Settlements

The Malay house as the Malay vernacular settlement represents a handmade house which is totally designed and constructed by local Malays (Yuan, 1991). The Malay house is designed and built according to the actual needs of its users by understanding their daily needs, beliefs, culture and their way of life.

Design Concept of Malay House

Originally, the Malay house is considered as a cultural metaphor which represents the Malay life (Yuan, 1991). As stated by Wan Ismail (2005), the design concept of the Malay house is based on a deep understanding of Malay life. Thus, the house is designed according to the social and cultural interactions of the Malay communities. A Malay kampong house is the place where Malay culture and tradition are represented through local daily life (Thompson, 2004). Besides, Tajuddin Mohamad Rasdi, et al. (2005) declares that these socio-cultural interactions shape the functional spaces and the interior atmosphere of the house. Subsequently, the study points out the elements which mostly affect the functional spaces of the Malay house. Correspondingly, the Islamic beliefs, social relations and desired way of life are the main constituents shaping the spaces of the house. Accordingly, the users feel a sense of belonging to the house while being in the functional spaces of the Malay house (Yuan, 1991; GhaffarianHoseini, et al., 2009). These elaborations support the theory that a deep understanding of the functional spaces of Malay houses can lead to the identification of Malay desired way of life and their socio-cultural attributes.

Vernacular Functional Spatial Features

According to the archival texts, the vernacular functional spatial features are divided into socio-cultural and environmental features which are as follows.

Socio-cultural features:

Concept: The functions of a Malay house can be categorized into three main functional constituents as living, cooking and receiving guests (GhaffarianHoseini, et al., 2009; Said, et al., 2008). The design of the Malay vernacular house is based on an open plan with three main spaces which are Serambi, Rumah ibu and Rumah Dapur. The Serambi is the reception area; the Rumah Dapur is the kitchen of the house while the Rumah ibu consists of the main area of the house (Hashim, et al., 2006).

Size: Inside the Malay house all spaces have specific sizes based on their own allocated functions. The main family interactions such as sleeping, family living, dining and praying will take place in the Rumah Ibu (Yuan, 1991). While the Rumah ibu has the largest size among all the other spaces of the house, the Rumah dapur and Serambi are categorized as the subsequent priorities in terms of size. The Rumah Ibu as a multi-functional area is a flexible space without any full height partition (Yuan, 1991).

Space relationships: Basically, the plan of Malay vernacular houses is designed based on a deep understanding of the functions which will be performed inside the functional spaces. The inter-relativity of spaces and the space adjacencies inside a Malay house are based on a clear perception of how, what and when these activities will be carried out (Yuan, 1991; Hashim, et al., 2006). Consequently, it leads to
the living spaces which are consistent with their own allocated functions. The functional spaces which are considered as private spaces are located at the back while the public spaces are located at the front of the house (Hashim, et al., 2006). As a result, the optimal use of space with the appropriate level of privacy will be achieved.

Privacy: The spaces inside the Malay house which are categorized into public, private and semi-private spaces are located based on the level of privacy. The Rumah Ibu and Serambi are in front of the house while Rumah Dapur and Rumah Tengah as allocated spaces for female interactions are at the back (Yuan, 1991).

Spatial hierarchy: The space arrangements inside a Malay vernacular house are based on the priorities of functional spaces and the space adjacencies. As it was mentioned before, the spaces inside a kampong are divided into three main areas which are Serambi, Rumah Ibu, Rumah Dapur. All spaces inside a Malay house can be classified into two parts which are the spaces in front or back (Tajuddin Mohamad Rasdi, et al., 2005). Rumah Ibu which is the main area of the house is considered as a front space while the kitchen and cooking area which contains the Rumah Tengah and Dapur are positioned at the back of the plan. The spaces which are located at the back or front are connected to each other through a joint space which is called Selang. The Anjung is considered as the guest entrance hall which is located at the front of the house and is adjacent to the Serambi Gantung which is an open verandah for the use of guests (Wan Ismail, 2005). The floor levels of a Malay house have different changes in different spaces to denote the boundaries of each functional space in addition to indicating the priority and value of these spaces. Each space inside the planning of a Malay house has its own floor level while the Rumah Ibu is in the highest level. Moreover, the variation of the height of space floors expresses the significance of the functional spaces. The floor level of the Anjung is approximately one meter lower than the Rumah Ibu while the Serambi Gantung is only one step lower than the Rumah Ibu. Various Malay decoration features which consist of wood carvings, ceravangs, grills and wall panels can be found inside the Serambi Gantung. The Rumah Ibu is the main space of the house which can be extended through a closed verandah which is called Serambi Samanaik. The Selang can be utilized as another entrance for the house while being used as a living and rest area for the women of the house who spend most of their time at the back of the house (Yuan, 1991; Tajuddin Mohamad Rasdi, et al., 2005; GhaffarianHoseini, et al., 2009).

Environmental features:
Material: The Malay vernacular houses are made of available natural resources which are timber and other lightweight materials. Utilization of these particular materials which contain a low thermal capacity inside and outside the functional spaces will cool down these spaces in a remarkable extent (Yuan, 1991).

i) Open plan layout
The open plan layout, as one of the main characteristics of Malay vernacular houses, leads to the natural cross-ventilation while optimizing the utilization of spaces (Tajuddin Mohamad Rasdi, et al., 2005). The design of Malay vernacular houses is based on a construction module which has been applied
during the design process. The plan of these houses is based on calculated modules, scales and proportions in order to be consistent with functions and environment (Yuan, 1991).

ii) Opening
Large openings are considered one of the main features of Malay houses to let the fresh air and day light come inside the house. The size of a typical window is basically the same as the full height of the door. These windows are often designed in a certain number of series which are sometimes from wall to wall. It is mostly preferred to create large openings with grills and wood carving decorations inside the house to create a sense of openness for the functional spaces (Wan Ismail, 2005; Yuan, 2001).

Cultural Meanings of Vernacular Functional Spaces
The culture of a region is an amalgamation of the lifestyle, belief system and behaviour of that region’s people – the strength of which directly influences their quality of life (Low, 1988). In this study, culture is considered as a way of life which comprises the way they act, function, conduct affairs and relationships based on their beliefs. Hence, the archival search expresses the cultural meanings of functional spaces as a value that represents the resident’s local way of life in a functional space.

According to archival texts, it is inferred that different cultures will have different use of space (Ahmad, et al., 2007). In this study, the focus is on the use of space to understand the cultural meanings of living spaces. These living spaces inside the house play an influential role for representing the local cultures.

The layout of a Malay house is divided into two main parts representing the main house and the kitchen area. The Main house is the major part of the house which consists of rumah ibu, verandah, serambi and other public spaces (Yuan, 2001). The design of a Malay houses is based on an open plan layout as the family intimacy is one of the design concepts representing the cultural values. Beside the family intimacy, the privacy which has an important role in the design of a Malay house is the main reason of dividing the house into two parts. The main house is the allocated place for the prayer as Muslims must offer prayer five times a day. The main part of the house is utilized for meetings, discussions, receiving guests and many other public interactions. According to the open plan layout of the house with flexible functional spaces, the congregations and specific feasts during a year are held in the main living room. Indeed, this flexibility which results in optimal use of space expresses the Malay’s simple way of living with no regards to ostentatious lifestyle (Gibbs, 1987). The verandah which is close to the living room is considered as an open space for entertaining the guests or family members while the child (boy) sleeping can take place there (Ahmad, et al., 2007). Moreover, a Malay house is based on lack of regard for pretentious lifestyle which leads to spaces which are even without modern furniture. Thus, a living area without modern bulky furniture can be utilized for sitting, entertaining friends, prayer and more functions while in night it is the allocated space for sleeping (Gibbs, 1987). According to Yuan (1991), in a Malay family, as the children grow older, the boys have more freedom to go out, visit friends or work for earning money. On the other hand, the girls are much more confined in the house to help their mothers while they spent most of a day in the rumah dapur area.
As stated by Ahmad, et al., (2007), the Malays like to keep the floor of the functional spaces clean so that they can sit on the floor or pray in any allocated space. Thus, the Malays must take off their shoes prior to entering the house. The main part of the house which contains the main living room is mainly allocated for men while the prayer can also be carried out there. However, the kitchen area is an allocated space for women. The activities such as preparing food, cooking, washing and family dining is carried out inside the kitchen area (rumah dapur) while the guest are served in the main living room. The rumah dapur is an allocated space for females and even the house owner can not enter the kitchen area while the female guests are inside. When a couple (husband and wife) come for a visit, the husband will enter the house from the main entrance at the landing and will be entertained at the verandah by the husband or the eldest son of the house owner. However, the wife will enter the house through the kitchen and will be entertained by the wife of the house owner or the eldest daughter in the family (Ahmad, et al., 2007).

The two main part of the house which are the main living room area and kitchen area are connected through a joint functional space which is a passage way. This space is allocated for the ladies interactions, chit-chatting, kids playing area and even casual discussions between the house owner and his wife (Yuan, 2001). The Malay houses in different regions of Malaysia have minor differences in design. However, the functions and functional spaces of every section remain the same (Tajuddin Mohamad Rasdi, et al., 2005). When a guest intends to enter a Malay house, the status and relation of the person to that particular family should be considered. If the person is a stranger, he can only stay at the landing area while if the person is a friend of the family members, he can enter the house up to the verandah. However, if the person is a relative of the family, he can enter the main living room to be entertained there. The kitchen area is always a restricted functional space which is allocated for the females and a male guest can not enter that area unless he is a family member or son in-law (Ahmad, et al., 2007).

In conclusion, it is demonstrated that people with different cultures and regions have different way of life specifically while living in their houses. The same goes to Malays while the design of Malay kampong houses represents specific way of living which is allocated for them according to their own culture and needs. Since most of their communication interactions occur in their living place, the Malays have their own way of setting up rules and norms patented by vernacular architectural features of the functional spaces in their houses. Understanding these vernacular features leads us to appreciating the Malay’s life style and local way of life (Ahmad, et al., 2007). As a result, this investigation and contemplation identify the cultural meanings of Malay vernacular functional spaces and their spatial features.

**Conclusion**

In conclusion, the main aspects of smart housing were identified and highlighted according to the intelligent building design. The study presented a gap within smart housing implementations as a result of the abandonment of a deep consideration of socio-cultural sustainability for developing a culturally responsive design. On
the other hand, the study focused on the Malay kampong houses to expound the importance of an understanding of the cultural meanings inherent in functional spaces. Thus, it has been demonstrated that the congruency between residential spaces and traditional values is an important consideration for designers of residential buildings in order to enhance the quality of life. Thus, an understanding of vernacular architectural features is recommended in order to address local needs within living spaces. These architectural features embrace the vernacular functional spatial features and the cultural meanings of functional spaces. The vernacular functional spatial features are the socio-cultural or environmental characteristics of a local region in a functional space while the cultural meaning of functional spaces is the value that represents the resident's local way of life in a functional space.

This study proposed the concept of local-smart-housing based on the incorporation of intelligent building design and utilization of aforementioned vernacular architectural features. Correspondingly, the identification and adaptation of vernacular architectural features is operative to address local needs inside the smart housing functional spaces. Thus, it is suggested to the architects, designers and house developers to consider the respective vernacular features during the design process of smart housings. Eventually, this consideration could lead to addressing the actual needs of the local residents inside the functional spaces of local-smart-housings. These contemplations highlight new directions towards enhancement of quality of life based on ensuring the socio-cultural sustainability within smart environments. Therefore, the concept of local-smart-housing through the incorporation of intelligent building design and utilization of vernacular features for creating culturally responsive smart living environments could lead to enhancing the quality of life.

Acknowledgements
This paper is an extended study from a part of paper presented in 4th World Engineering Congress 2010 (WEC2010), Conference on Buildings and Infrastructural Engineering organized by Malaysian Society for Engineering & Technology, Federation of Engineering Institutions in Islamic Countries and MIMOS.

References


The Concept of Local-Smart-Housing: Towards Socio-Cultural Sustainability of Vernacular Settlements.

AMIRHOSEIN GHAFFARIANHOSEINI, N. DAHLAN, R. IBRAHIM, M. N. BAHARUDDIN AND A. GHAFFARIANHOSEINI

Society, 3(1), 43-57.


The Concept of Local-Smart-Housing: Towards Socio-Cultural Sustainability of Vernacular Settlements.


AmirHosein GhaffarianHoseini
AmirHosein GhaffarianHoseini is a PhD academician and a professional architect at the department of architecture (University Putra Malaysia - Faculty of Design and Architecture) while holding Msc and Bsc degrees in Architectural Studies and Architecture. He has contributed as professional architect, scholar, professional researcher and academic lecturer for several years.

Nur Dalilah Dahlan
Nur Dalilah Dahlan is a senior lecturer at the department of architecture (University Putra Malaysia - Faculty of Design and Architecture) while holding Ph.D in Architecture from Welsh School of Architecture, Cardiff University.

Rahinah Ibrahim
Rahinah Ibrahim is Professor in Architecture at the Department of Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia (UPM). She received her Masters of Architecture from SCI-ARC, U.S.A., and completed her Ph.D. degree in Construction Engineering and Management at Stanford University, U.S.A. Dr. Rahinah has extensive project management and architectural practice experience in hospitality developments and large-scaled residential projects before joining UPM. She had led the establishment of UPM’s architecture program that emphasizes socio-culture and sustainable architecture when she was its Architecture Program Coordinator. She was the Deputy Dean of Research, Innovations and Graduate Studies from 2006-2011. Dr. Rahinah is inventor to several patented innovations and had won awards at local and international exhibitions. Her research interests include developing theories and emerging computer-integrated applications for enhancing the movement of knowledge in complex design and construction processes using industrialised building systems (IBS). She can be reached by email at rahinah@putra.upm.edu.my.

Mohd Nasir Baharuddin
Mohd Nasir Baharuddin is a Masters of Fine Art graduate from Savannah College of Art and Design, Georgia, U.S.A. Mohd Nasir has been involved in many national and international exhibitions, and has won numerous awards in many local and international art competitions. He has taught art and design at various colleges and universities, and was an art director for the Gallery Shah Alam, Selangor before joining Universiti Putra Malaysia (UPM). He is currently a senior lecturer at the Architecture Department, Faculty of Design and Architecture. His teaching concentrates on socio-cultural environment and visual culture.
study that focus on design knowledge and culture. He is active in collaborative art projects, international conferences, forums and art activities. His current research interests include developing design theories which emphasize the process of design meaning and socio aesthetic.

-------------------------------------------

Ali GhaffarianHoseini
Ali GhaffarianHoseini is a PhD academician and a professional architect at the department of architecture (University Putra Malaysia - Faculty of Design and Architecture) while holding Msc and Bsc degrees in Architectural Studies and Architecture. He is a professional architect undertaking practical design assignments as well as corresponding academic research projects. He has achieved well-recognized international innovation gold and silver awards. He is the inventor of an innovative architectural implementation method holding a worldwide patent in regards with automation in architecture in addition to publication of various international level journal articles, conference papers and book chapters.