

The Current Scenario of Curvilinear Architecture in Malaysia

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Abstract

The Bilbao Effect incorporates itself into numerous iconic buildings and grand designs of international architects such as Frank Gehry, Santiago Calatrava, Norman Foster, Renzo Piano, Phillip Cox and Toyo Ito who exploit curvilinear forms as their architectural language. Throughout the world, major events such as the Olympic Games have catalysed the implementation of curvilinear architecture while in Malaysia, the development of Putrajaya has provided opportunity for iconic forms, expressed in curvilinearity. The paper focuses on the current scenario of curvilinear architecture in Malaysia and its position in the international arena. It strives to answer the question of 'How far have Malaysian architects gone in implementing curvilinear architecture?' This is done by first formulating a 'Taxonomy of Rigid Curvilinear Architectural Forms' based on the works of renowned international architects. The taxonomy constitutes the instrument for gauging the position of Malaysian architects. This is achieved by having the works of local architects mapped onto the taxonomy. The research findings indicate that the international architects have advanced by leaps and bounds ahead of their Malaysian counterparts in implementing curvilinear architecture. Several recommendations are proposed in order to narrow this gap. The paper focuses on column-free, rigid and permanent buildings completed from 1990 onwards.

Keywords: Curvilinear Architecture, Iconic buildings, Malaysian scenario, Taxonomy, the Bilbao Effect

Introduction and Research Question

Curvilinear simply means curved. Curvilinear, in architecture, is that which is formed by curved or flowing lines. This paper looks at innovation in curvilinear architectural forms that is currently an architectural style being utilized the globe over. Other terms that have been used to describe similar kinds of architecture are non-linear architecture, fluid architecture, freeform buildings, zoomorphic architecture, landform architecture, free style, and hypersurface architecture. Of late, the phrase 'The Bilbao Effect' seems to describe this stance more aptly (Jencks, 2005).

The paper focuses on the implementation of this particular architectural language in Malaysia. It strives to answer the question 'How far has Malaysian architects gone in implementing curvilinear architecture?'

Literature Review

The Bilbao Effect has been a many-varied, fact-paced and global-scale architectural phenomenon. There are numerous architects worldwide who are currently exploiting various curvilinear forms as their architectural design language.

Established architects: Category 1

These are architects who are thoroughgoing and concentrated in their endeavour with curvilinear forms of architecture. They are categorised as established because their works have been featured, criticized and praised in architectural and professional journals the world over and have been awarded various prestigious accolades. The most ostentatious would be Frank O. Gehry from the USA (Mathewson). His Guggenheim Museum in Bilbao, completed in 1997, triggered off what today is known as The Bilbao Effect (Jencks, 2005). Santiago Calatrava practices in Switzerland but has architectural commissions all over the globe. His inimitable zoomorphic style is only possible because of the Architect-Engineer that he is (Tzonis, 1999). (Figure 1)

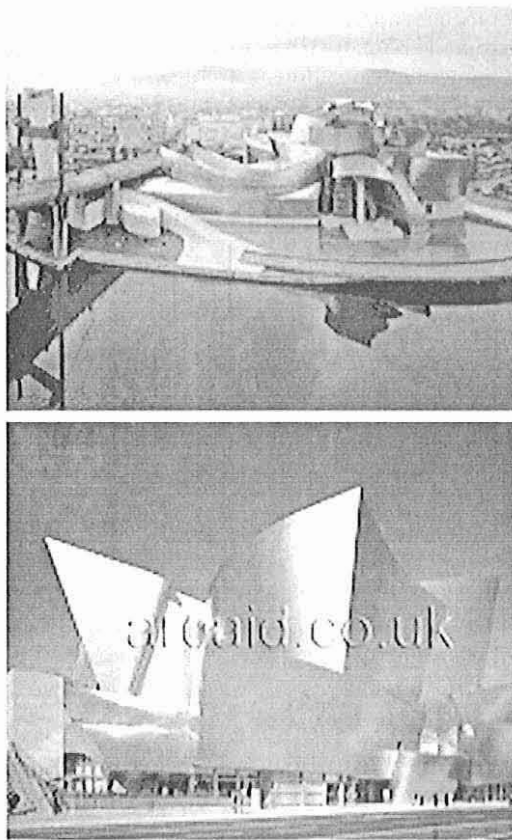
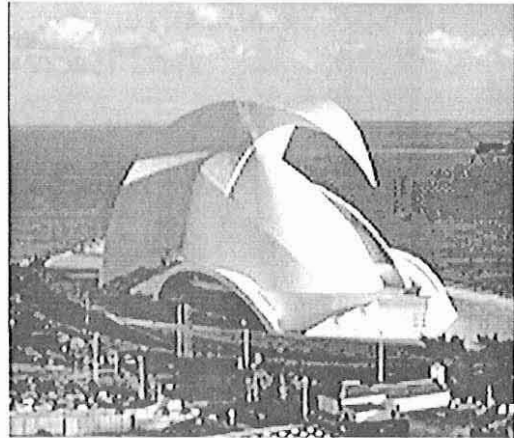


Figure 1: Guggenheim Museum in Bilbao (1997) and Disney Concert Hall in Los Angeles (2004) by Frank Gehry; Concert Hall in Santa Cruz, Tenerife by Santiago Calatrava (2005).



In the UK, Lord Norman Foster's concern with aspects of sustainability has led to many curvilinear architectural forms (Jenkins 2004). Jan Kaplicky's works have been influenced by numerous sinuous forms in art, artifacts and nature (Kaplicky, 2002). Sir Nicholas Grimshaw's curvilinear works stemmed from applying the most appropriate structure to the problem (Pearman, 2000). (Figure 2)

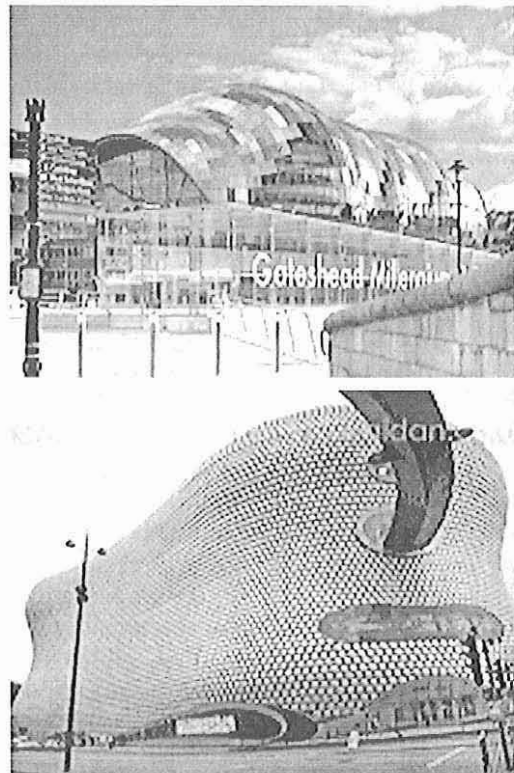




Figure 2: Sage Music Centre, Gateshead by Foster and Partners (2004); Selfridges, Birmingham by Future Systems (2005); National Space Centre, Leicester by Grimshaw Architects (2001).

In Europe there are Renzo Piano in Italy (Buchanan, 2000) and Lars Spuybroek in the Netherlands (Spuybroek, 2004). Professor Phillip Cox hails from Australia (Otmar, 2000) while Toyo Ito (Crespi, 2001) and Itsuko Hasegawa (Dobney, 1997) are from Japan.

Established architects: Category 2

These are established architects that of late are doing curvilinear architecture. In the UK are Zaha Hadid, Edward Cullinan, and Building Design Partnership, In the rest of Europe are Studio Fuksas in Italy, Herzog and de Meuron in Germany, Paul Andreu, Jean Nouvel in France. Likewise for Kisho Kurokawa, Arata Isozaki, and Shigeru Ban in Japan. (Figure 3)

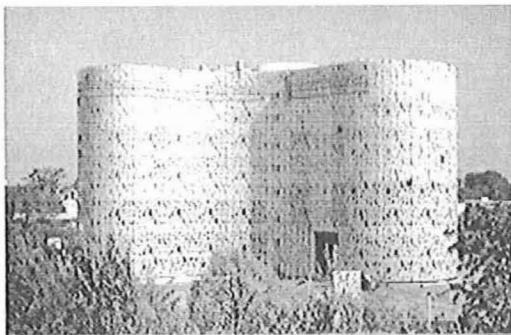


Figure 3: Milan Trade Fair by Studio Fuksas (2005); IKMZ at Brandenburg Technical University, Cottbus by Herzog & de Meuron (2004); Downland Gridshell (2003) by Edward Cullinan.

Up-and-coming architects

These are architects who are not yet widely published in reference books and professional journals internationally but their works are made known through architectural seminars and conferences, for example the Datum Annual International Conference organized by Pertubuhan Arkitek Malaysia (PAM). Ushida Findlay, Masahiro Ikeda (Datum, 2004) and Taira Nishizawa (Datum, 2006) in Japan; Jungsung Kim in Korea (Datum, 2006); PTW Architects in Australia (Datum, 2004); Foreign Office Architects based in UK and Japan (Datum, 2004); Peter Cook and Colin Fournier (Datum, 2004); and Kamiel Klaasse from the Netherlands are such practitioners. (Figure 4)

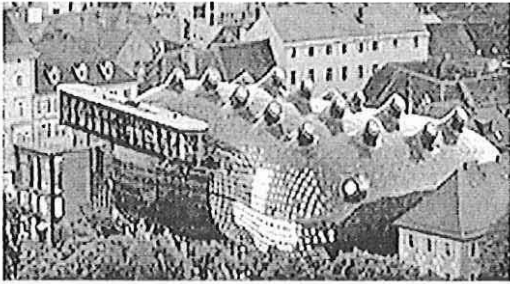
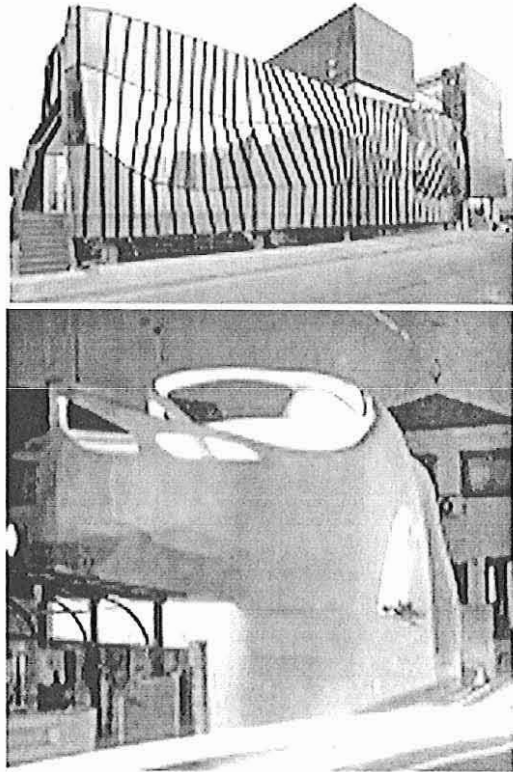


Figure 4: Art Centre, Graz by Peter Cook and Colin Fournier (2005); Borim Publishing House and Marionette Theatre, Korea by Jungsung Kim (2005); Truss Wall House, Japan by Ushida Findlay (1993).



analysis of copious renowned international architects, a taxonomy of rigid curvilinear architectural forms has earlier been formulated, and since upgraded, by the author (Faridah, 2005). (Figure 5).

The different categories and calibers, as well as the varied geographical locations of project sites and practice offices of these various practitioners, indicate what a global and transcending trend the curvilinear architectural style is.

Gauging Instrument – Taxonomy of Rigid Curvilinear Architectural Forms

A vast amount of secondary data has been obtained through reference books, professional journals, architectural symposia, trade expositions and the Internet. Based on the rigorous study and detailed

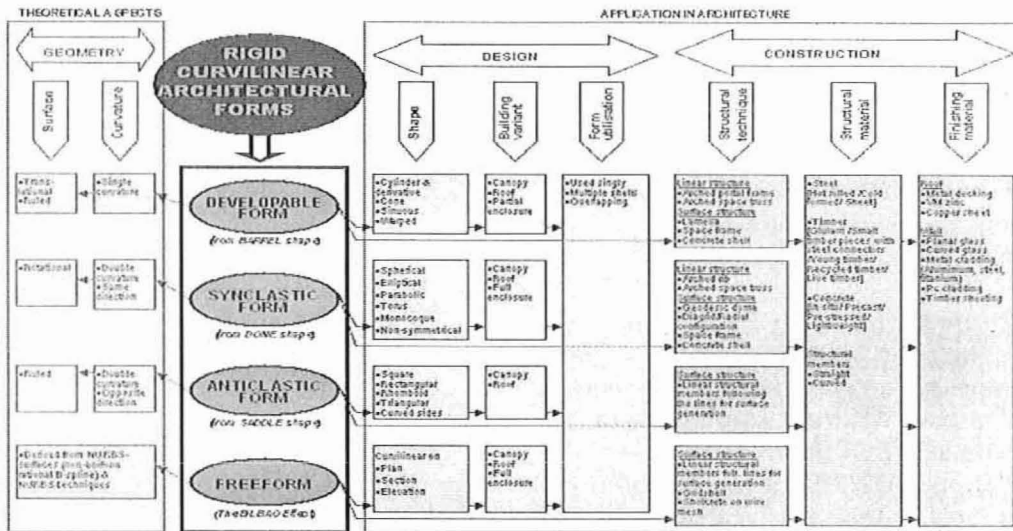


Figure 5: Taxonomy of rigid curvilinear architectural forms.

It is imperative that this exercise to formulate the taxonomy is done as according to Michael Michalko (as cited in Buzan, 2005) a taxonomy clears the mind of mental clutter, helps demonstrate connections between isolated pieces of information, and gives a clear picture of both the details and the big picture. It also allows for the grouping and re-grouping of concepts and thus facilitating connections between them. The taxonomy is formulated according to developable forms (origin and conventional name = barrel shape), synclastic forms (origin and conventional name = dome shape), anticlastic forms (origin and conventional name = saddle shape) and freeform (The Bilbao Effect). This taxonomy constitutes the instrument for gauging 'How far have Malaysian architects gone in implementing curvilinear architecture?'

Iconic Buildings

International scenario

Throughout history, major world events have spurred on major developments in the realm of what Jenks, 2005 has termed the iconic building. In the United Kingdom alone, the turn of the new millennium saw the construction of twenty-six Millennium

Landmarks as exemplified in the Millennium Dome, the Millennium Bridge and the Garden of Eden. The up-coming Beijing 2008 Olympic Games will witness the completion of four of these enigmatic signifiers namely the 'Bird's Nest' or Main Stadium, the Aquatic Centre, the China Central Television (CCTV) and the National Grand Theatre. The recent FIFA World Cup 2006 in Germany saw the Munich Allianz Arena that can glow in white, blue or red light; a glowing testimony to a sports and its lucrative commercialism.

These events brought forth new styles in architectural design by world-class architectural masters who are constantly innovating (Jencks, 2005). In turn, these iconic buildings spurred on new technologies in structure, building and construction by like-minded ground-breaking world-class engineers (Balmond, 2002). Such is the power of enigma.

The Malaysian enigma

Malaysia played host to the Commonwealth Games in 1998. The Bukit Jalil Stadium had most of its sporting facilities constructed in membrane and tensile structures, iconic in its day. These types of structures are outside the scope of this paper.

On a different front, the development of Putrajaya as the new administrative capital of Malaysia (Jebasingam, 2006) has provided the impetus for Malaysian architects to explore design in new waves and forms. The new administrative capital serves as a symbol of power for the current ruling government and the then Prime Minister (Mohamad Tajuddin, 2006).

Curvilinear forms in Putrajaya

The key building type for a new administrative capital would be the ones to house the different ministries of the government. The Ministry of Finance by GDP Architects (GDP, 2001) is curvilinear in form in response to the axis created by the Seri Wawasan Bridge. Another key building type would be a world-class convention center. The Putrajaya Convention Centre (PJCC) by Hijjas Kasturi and Associates is also curvilinear. Lesser buildings, like the Visitors' Centre at Precinct 15 by Zon Design Rekabina (Architecture Malaysia, Aug 2004) and the bus and taxi terminal at Precinct 9 by Veritas Architects (Architecture Malaysia, April 2000), are similarly curvilinear. (Figure 6)

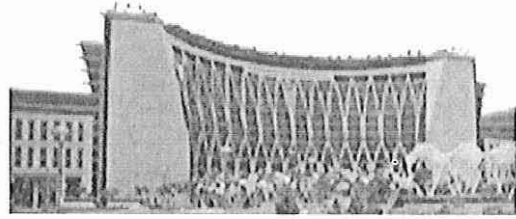


Figure 6: Curvilinear buildings in Putrajaya - Ministry of Finance, Putrajaya Convention Centre, Visitors' Centre, Bus and Taxi Terminal.

Data Compilation – Malaysian Curvilinear Architecture

Outstanding architects

These are architects with curvilinear forms as a main and recurring design language. From the secondary data obtained through professional journals, notably Architecture Malaysia and Majalah Arkitek, and various architectural symposia, four firms can be recognised as the forerunners in implementing curvilinear architectural forms in Malaysia. They are GDP Architects, Hijjas Kasturi and Associates, TR Hamzah and Yeang, and Zon Design Rekabina (ZDR). (Figure 7)



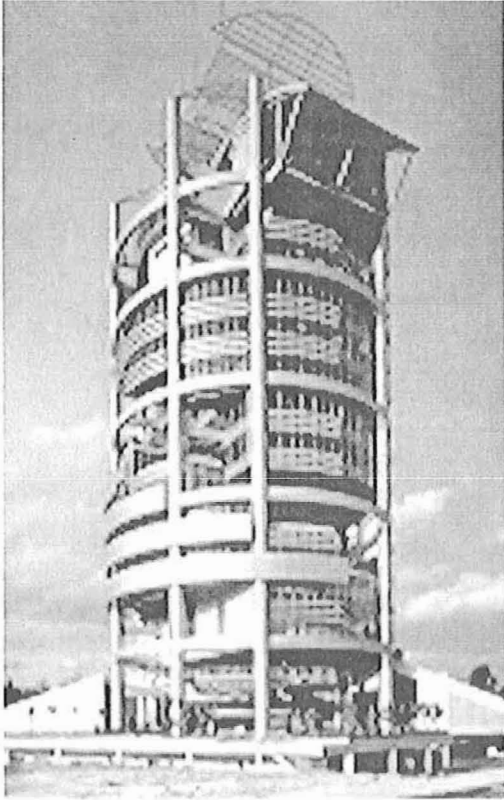


Figure 7: Universiti Teknologi Petronas in Tronoh by GDP Architects; Zouk Pub in Kuala Lumpur by ZDR; Menara Mesiniaga in Subang Jaya by TR Hamzah and Yeang; The Securities Commission Building in Kuala Lumpur by Hijjas Kasturi and Associates.

Consistent curvilinear forms

There are other practices that frequently utilize curvilinear forms but the forms are the conventional ones and less exploratory. There are Veritas Architects, Laurence Loh Architect, Arkitek Kitas, Garis Architects, Daya Bina Akitek, and Ngiom Partnership.

Occasional curvilinear forms

In addition to the above six practices there are more than twenty others that occasionally employ curves in their designs. These encompass the various private architectural practices (corporate body, partnership and sole proprietorship), as well as the government departments (for example, Jabatan Kerja Raya or Public Works Department) and semi-government departments (for example, Dewan Bandaraya Kuala Lumpur (DBKL) or the City Hall of Kuala Lumpur).

Rectilinear buildings with domes

The majority of architects in Malaysia do not utilise curves in the massing of their buildings. However, they will willingly incorporate a curvilinear dome over a rectangular massing when called for. The mosque is a prime example of a rectilinear building with dome/s. The dome, which is a synclastic curvilinear form, is here as a symbol of the Islamic faith. Jurubina Bertiga, Kumpulan Senireka, Jabatan Kerja Raya, and RDA-Harris Arkitek have all designed mosques that the nation can be proud of. Domes are also employed over rectilinear office buildings where they represent a symbol of power. The Prime Minister's Office and the Palace of Justice in Putrajaya are notable examples. (Figure 8)

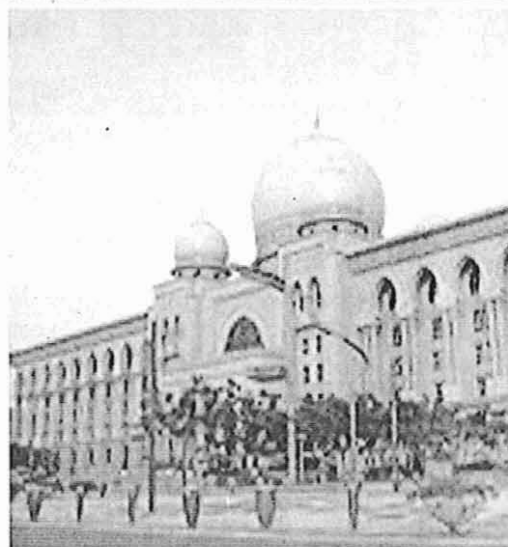
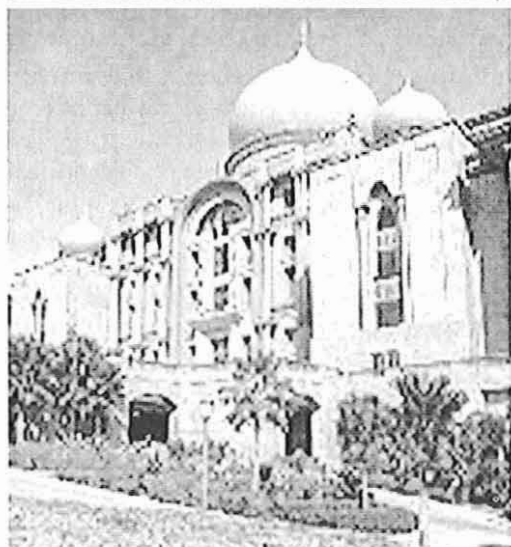
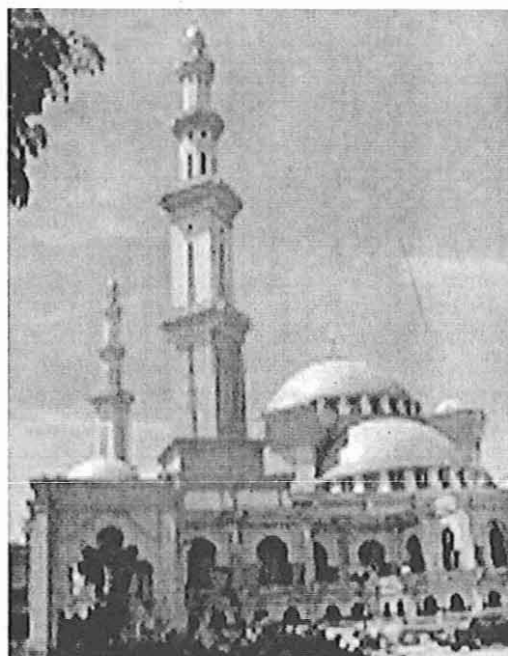
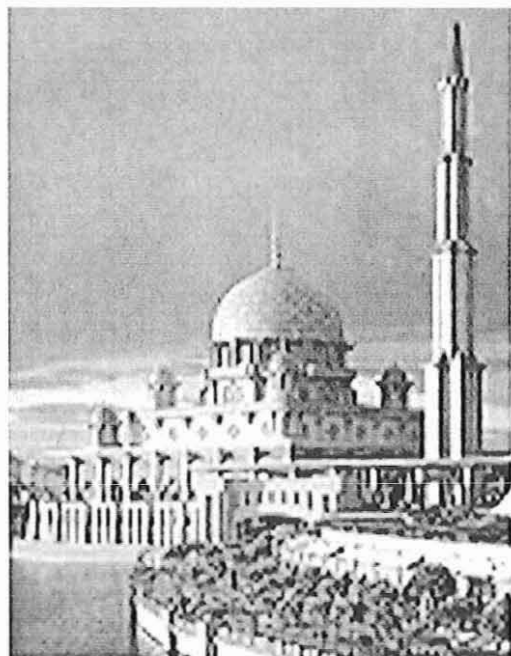


Figure 8: Putrajaya Mosque by Kumpulan Senireka; Masjid Wilayah Kuala Lumpur by Jabatan Kerja Raya; The Prime Minister's Office in Putrajaya by Aqidea Architect; The Palace of Justice in Putrajaya by Aqidea Architect .

Joint-venture projects

Several architects who do not normally utilize curvilinear forms in their designs but do get involved with curvilinear architecture when they become the submitting architect for projects done by foreign consultants and whereby the design is curvilinear. Kisho

Kurokawa Architect and Associate was the design consultant for the Passenger Terminal Complex at Kuala Lumpur International Airport (KLIA) and the Kuala Lumpur Sentral Station (KL Sentral), with Arkitek Jururancang (Malaysia) and Perunding Alam Bina as the project architect

respectively (Architecture Malaysia, Oct 1998; Architecture Malaysia, 2003). Likewise for Kevin Roche John Dinkeloo and Associates with NRY NRY Architects for the Menara Maxis at KLCC (Kuala Lumpur City Centre) (Architecture Malaysia, Jun 2000. (Figure 9)

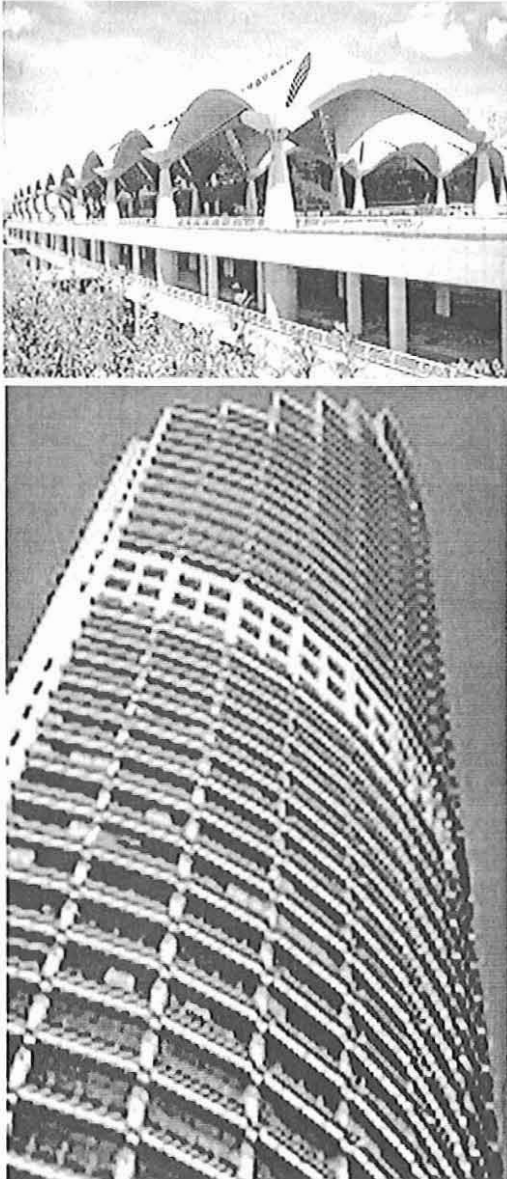


Figure 9: KLIA in Sepang by Kisho Kurokawa; KL Sentral in Brickfields by Kisho Kurokawa; Menara Maxis at KLCC by Kevin Roche John Dinkeloo and Associates.



Answering The Research Question – How Far Have Malaysian Architects Gone In Implementing Curvilinear Architecture?

A taxonomy of rigid curvilinear architectural forms has been formulated as elaborated in (3.0) above. This taxonomy constitutes the instrument for gauging ‘How far has Malaysian architects gone in implementing curvilinear architecture?’. This is executed by doing a mapping exercise of the Malaysian curvilinear works onto the international taxonomy.

Categorising Malaysian curvilinear architecture

The works of Malaysian architects are first grouped into the five categories as outlined in (5.1) to (5.5) above. (Table 1)

Table 1: The five categories of Malaysian curvilinear architectural works.

(i) Outstanding architects	Nos.
Group Design Partnership Sdn. Bhd.	17
Hijjas Kasturi & Associates Sdn	12
T.R. Hamzah & Yeang Sdn Bhd	14
Zon Design Rekabina Sdn Bhd	3

(ii) Consistent curvilinear forms	Nos.	(iv) Rectilinear buildings with domes	Nos.
Veritas Architects Sdn Bhd	4	Kumpulan Senireka Sdn Bhd	2
Arkitek LLA Sdn Bhd	4	Jurubena Bertiga (Int) Sdn Bhd	1
Arkitek Kitas Sdn	6	DBA Akitek (M) Sdn Bhd	1
Garis Architects Sdn Bhd	4	RDA-Harris Architects Sdn Bhd	1
DBA Akitek (M) Sdn Bhd	3	Jabatan Kerja Raya, KL	1
Ngiom Partnership	2	Perunding Utama	1
		Prime Minister's Office, Putrajaya	1
(iii) Occasional curvilinear forms		Palace of Justice, Putrajaya	1
CORPORATE BODY	Nos.	(v) Joint-venture projects	Nos.
Chan & Shahrman Arkitek Sdn Bhd	1	Akitek Jururancang (M) Sdn Bhd	2
Focus Architects & Urban Planners		Perunding Alam Bina Sdn Bhd	1
SB	1	NRV Architects Sdn Bhd	1
Raja Nazrin Architects Sdn Bhd	1	SA Architects Sdn Bhd	1
		Arkitek TAC Sdn Bhd	1
SOLE PROPRIETORSHIP	Nos.	Ho and Associates	1
A.K. Architect	1	Wooi Architect	1
Design Nexus Architect	1		
Hin L. Tan Architect	1		
MNA Architect	1		
SC Leow Architect	1		
TS Lee Architect	1		
James Chin Architect	1		
Angkatan Arkitek	1		
PARTNERSHIP	Nos.		
ARC Partnership	1		
Akipanel Architects	1		
Axis Architectural Partnership	1		
Building Consultants	1		
KLAF Architects	1		
Shaharun 77	1		
Y. Architects	1		
GOVERNMENT DEPARTMENT	Nos.		
Cawangan Bangunan, JKR	1		
SEMI-GOV DEPARTMENT	Nos.		
Jabatan Pelan Induk DBKL	1		
Dewan Bandaraya Kuching Utara	1		

Mapping onto taxonomy

Curvilinear traits of individual buildings by the various architects are mapped onto the taxonomy of rigid curvilinear architectural forms by international architects. Nearly one hundred mapping exercises were executed. Two examples are shown in Figure 10 from the joint-venture projects category.

Reading the mapping

The spread of the mapping over the taxonomy as well as the intensity of mapping over each type of curvilinear form depicts how Malaysian architects have advanced, or not advanced as the case may be, in implementing curvilinear architecture.

Conclusions

The research findings indicate that the international architects have advanced by leaps and bounds ahead of their Malaysian counterparts in implementing curvilinear architecture.

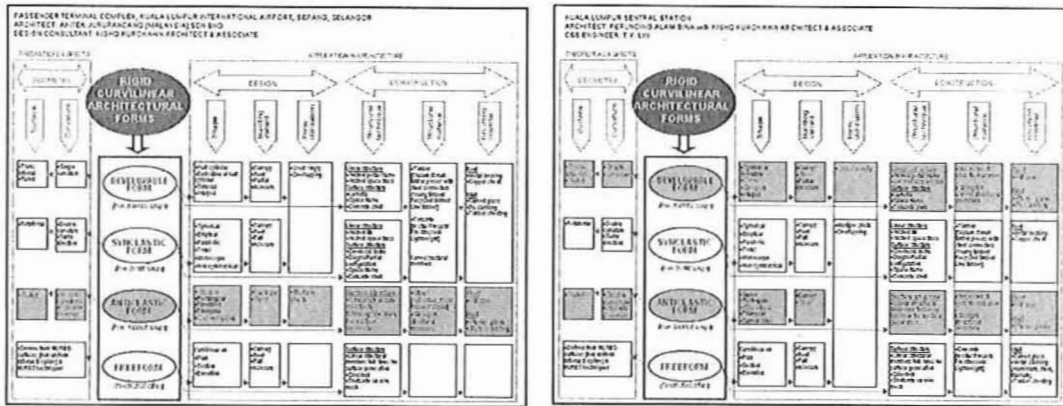


Figure 10: Mapping exercise for KLIA and KL Sentral

Developable form

Malaysian architects are conversant with this pedigree of curvilinear forms. Being single curvature they are easily structured with linear type of structure, for example the arch rib and space truss. Used as the wall, roof or canopy, but not as an enclosure.

Synclastic form

The conventional form of this shape is the dome. In Malaysia its utilization has been predominantly the symmetrical dome as part of the roof, in conjunction with a much larger rectilinear building. It is not utilized as an enclosure.

Anticlastic form

This shape is double curvature where the curvatures are in opposite direction, also termed as hyperbolic paraboloid. A very complex form whereby the utilization has been mainly in joint-venture projects between a local firm and renowned foreign practice.

Freeform

For this category of curvilinear form, which is derived from NURBS-surfaces (non-uniform rational B-spline), there has been no built example to date. Various proposals have been done, and more on the drawing board, but none yet realized.

Construction technology and materials

Malaysian architects are less adept to utilizing surface type of structure (for example lamella, diagrid and geodesic dome) as compared to linear type of structure (for example arched rib and space truss). Most work with concrete and steel with almost no usage of timber. Usage of hi-tech finishing materials, for example curved glass, has not been explored.

Recommendations

In order that Malaysian architects can draw alongside their more advanced international counterparts in implementing curvilinear architecture the following recommendations are proposed:

Continuing Professional Development (CPD)

The Datum (PAM annual international conference), PAM evening lecture series, PAM CPD lecture series, Malaysian Structural Steel Association (MSSA) international conference, and other built-environment convergences should be stepped up to include more international speakers. This is to increase exposure of architects to the development in architectural design trends, building and construction

technology, environmental awareness, and etcetera.

Awards and competition

This is to encourage Malaysian architects to be more innovative in design and technology. For example the PAM Annual Design Award should have a category for 'Most Innovative Design'.

Engineering education

The engineering education in the institutions of higher learning in Malaysia encompasses only engineering related subjects. It is almost totally devoid of aspects related with design in the architectural realm (Faridah, 2004). The syllabus should be reviewed to include programmes for appreciation of architecture and the course of its development. The philosophy of engineering design and the thoughts of renowned international engineers should also be transpired.

Joint-venture projects

There should be more joint-venture projects with internationally renowned foreign architects as a technology-transfer programme to expose and train local architects in the appropriate methodology for implementing curvilinear architecture.

Architects of domed buildings

Having acquired the technical experience in implementing the curvilinear form of the dome on a rectilinear building base, these architects should progress to implementing full curvilinear buildings.

Research on plant materials

It is imperative that more research be conducted on the utilization of young timber, small pieces of timber, leftover timber, other plant species like bamboo and palm, to turn them into structural components. The research should be in tandem with the design of connectors and the development of adhesive technology.

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