



Artsience Museum an Embedded Stand-Alone Art

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Article Info

Article history:

Received 06 January 2020

Received in revised form 13
January 2020

Accepted 21 January 2020

Keywords:

Artsience

Museum architecture

Abstract

This paper reviews and analyses the process and built-up of the ArtScience Museum. It touches on the history, building features and Moshe Safdie's design approach in forming the museum's architecture. Furthermore, it explores the motivations in having a cultural institution within the Marina Bay precinct and the correlation of what it was intended to be with the identity it has formed today. The Art Science Museum can be seen as a form of an add-on to Marina Bay Sands as the tender competition project included a design for a cultural institution. However, despite it being a form of enhancement, the ArtScience Museum arose and served its purpose being an intriguing form of architecture and a place for learning for people alike.

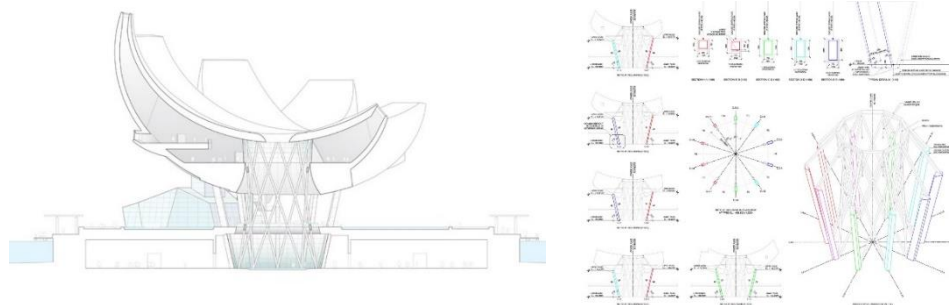
Introduction

As seen in Singapore's famous skyline, ArtScience Museum sits nicely at an awkward yet individually fitting spot along the Singapore waters. A reaching hand, a lotus or a bunch of bananas are the few associations people have come up with when they witness the museum. Many have labelled it to be a reaching hand and have formed it to be the "welcoming hand" of Singapore and though this is rather flattering, the museum is nature-inspired; resembling a flower (Safdie Architects, 2011). Before the construction of the museum, Singapore authorities set guidelines, objectives and a fixed price of 800 million for its land, seeking for the best quality project over the highest possible bidder to develop an integrated resort in Marina Bay precinct. Las Vegas Sands Corporation won the bid and the plans of the integrated resort and museum soon rolled out. Moshe Safdie, an Israeli-Canadian renowned architect designed both Marina Bay Sands and ArtScience Museum to fulfill the Marina Bay precinct project. The ArtScience Museum is the largest private museum in Singapore and is the first museum of its time to combine arts and culture with science and technology. The museum opened its doors to the public on 19 February 2011 and accommodates to approximately 3500 visitors. It has 3 storeys and houses 21 galleries, making a total of 6,000 sq m (Zakaria, 2017).

Nature Inspired & Biomimicry in Action

The building features an 11m diagrid structure that allows the ArtScience Museum to look like it is floating on water. To achieve this, Safdie and his team looked into nature and observed that mangroves and tree roots realising it can hold up a heavyweight as long as it branches outwardly. From this, they decided to have the 'roots' of the museum expand and extend underground below the reflecting pool surrounding the structure, supporting the entirety of the building's weight (Fig. 1). The supporting structure connects the inside and the

outside of the building by having its dish-shaped roof collect rainwater and unloads it through the oculus creating a 35-meter drop waterfall through the open-air atrium on the ground floor of the whole museum (Fig. 2). On top of this, the choice of material of the massive petals is stainless-steel composite which is durable and gives off the seamless shell look. More importantly, its high corrosion resistance is reduced at a self-weight which eases the supporting diagrid structure of the museum (Princess Cruises, 2018).



Safdie Architects (Media). (2011) Figure 1. Section of ArtScience Museum and detail of supporting structure.



Figure 2. Safdie Architects (Media). (2011) Diagrid Structure and reflecting pond.

Taking advantage of Singapore’s tropical climate and high rainfall rate, the ArtScience Museum integrated a rainwater harvesting green sustainable technology. The petal shape allows efficient collection of rainwater which channels through the shape of the building; washing itself and collecting rainwater through the oculus (Fig. 3 and 4). Collected rainwater is then recycled for washrooms, water feature maintenance and landscape spaces of the museum. To add, the rainwater is then recycled once more into the overall framework of Singapore’s Green Mark program (HomeKlondike, 2017).



Figure 3. Oculus.



Safdie Architects (Media). (2011) Figure 4. Oculus and open-air atrium.

Petals of the museum were shaped and designed to capture as much light as possible allowing the museum to be self-sufficient. Ends of petals are made out of fibreglass polymers allowing sunlight to illuminate galleries, showcasing exhibits within the museum (Fig. 5).



Safdie Architects (Media). (2011) Figure 5. Interior space where natural light enters.

Due to its excellent sustainable performance, the ArtScience Museum was awarded Singapore's Green Mark for its environmentally-friendly design, Building and Construction Authority's Design and Engineering Safety Excellence Award and Leadership in Energy and Environmental Design (LEED) Gold certification by the United States Green Building Council, first museum to be awarded in Asia Pacific region due to its water, energy and waste management efforts (Khoo, 2019).

ArtScience Museum blurs the distinction of art and culture with science and technology, bringing the two distinctive ends together, forming an intriguing institution. The biomimicry approach came after the design of the building and with respects to the intent of the museum. Safdie first formed ideas for the museum and only after did he look into nature for answers. Similarly to Janine Benyus, biologist and natural science writer that believes that architects should look at nature, the most sustainable thing on Earth for answers. Though Safdie pushed further and developed a form of hybrid of the arts and biomimicry functions. To me, this is impressive and surely required experts of different fields to get the museum to not only look like a piece of art but also function like one of its nature.

The building's form looks rather simple yet behind its construction, fills with complex and complicated science injected with sustainable features. Though the biomimicry approach is only on an organism level of mangroves, flowers and nature and not on an ecosystem level, which some may consider it as an after-thought and not an initial part of the design, the museum still served its purpose and is an added value to Singapore's environment. With mimicking nature and the careful choice of materials, Safdie approach to biomimicry is commendable and impressive as to its reflection of the awards that ArtScience Museum have won.

Architect's and Construction Team's Reflection

ArtScience Museum was built as a union of art and culture with science and technology going against the epistemology of both distinct concepts coming and working together. In an interview with Safdie, he mentioned that Singapore wanted a cultural institution to complement with the other buildings of the precinct, specifically Marina Bay Sands (MBS). As Singapore is deep-pocketed with buildings of different functions; Esplanade, Malls and a resort, Marina Bay Sands which then Safdie has already designed, Safdie was considering on something unique that hasn't seen the light of day in Singapore or in other parts of the world. In short, Safdie wanted to create something creative that highlights and accentuates Singapore's skyline, forming a somewhat gateway to the city. He derived to combining the arts and sciences that it should look like some kind of flower and that it was floating in the air; light and something you can see through underneath it. The main form was a sphere on the water which he took out slices off the sphere to see how it looks. Designs of the museum

were first formed through drawings, which was then passed over to engineers to model it on a software before it was built (Fig. 6). The name of the building suggests and focuses on the interconnectedness of the arts and sciences, alike to its exterior, the high-tech exhibitions too resembles the integration of the two distinct disciplines (Glennie, 2015).

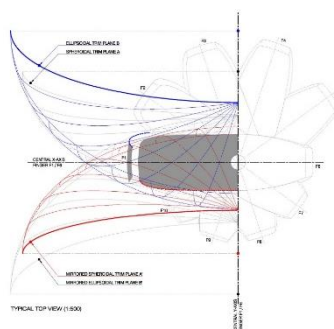


Safdie Architects (Media). (2011) Figure 6. Moshe Safdie sketches.

There were a couple of design challenges, initially, the bowl of the museum was supposed to house a 3,000 seats amphitheatre, however, due to the public's uproar of saying it looks like "a bunch of bananas", Safdie decided to reach out to a team of engineers to use a 3-dimensional modelling to form the building we see today (Fig. 7). Achieving the flower-like geometry required complex mathematical geometry as it is made up of 10 irregular petals with one side of the building is larger and heavier than the other (Fig. 8) (Ghosh, 2016). Peter Bowtell, Buildings Leader for Arup, the museum's Civil and Structural Engineer mentioned that with wanting the building to look like it is floating, it involves balancing the museum in the air through complex calculations. 3D modelling was vital in dealing with the building challenges with the tight timeframe they had. It helped eased the documentation and tender stages of the project, cutting a work that could take 3 years manually to just 3 days. Comprehending the 3D model and determining the right shape and forces on each petal was what led to the success of the project (BCA, 2013).



Safdie Architects (Media). (2011) Figure 7. 3D Model from engineers in Arup.



Safdie Architects (Media). (2011) Figure 8. Detail of irregular petals

Moving on, the construction of the museum was complicated as the steel members each had a different geometry. The museum required 5,000 prefabricated pieces which were thoroughly put together like a high-stakes giant jigsaw puzzle. The overlapping irregular petal shapes are supported by a diagrid truss structure that rises from the central core of the museum (ARUP, 2011).

Safdie's philosophy is rather humane, in a way that architecture should revolve around people. He strongly believes that design should contribute to the society where it shapes the public realm and has a purpose unique to its place and culture. He mentions that it too should address human needs and is buildable through the processes of construction. Moreover, sustainability should also be a guiding principle where a design should be built responsibly where resources are used efficiently to proceed with a client's goals and that it should strive to be a natural extension to the environment. The more unique approach is that he feels that buildings are mega-scales that dehumanizes spaces so it is important to have a design that not only humanizes the mega-scale itself but taking responsibility in enhancing the quality of life and enduringly to the society (MGS, 2019).

To him achieving a successful ground between a design aesthetic and it being purposeful meant that architects and client must communicate through the design processes before reaching to the final form. This too expands to exploring about the more complex problems about the building's potential identity, personality and symbolism all of which to find for the most appropriate and 'right' solution. It is important to Safdie that his designs are impactful, has meaning and is inclusive. It is not about a spectacular over the top building, in fact, it should be in respects to the existing culture, the concept of intrinsic buildability and expression to the intended life of a building. All of this made possible with rapport with the client through open discussions and dialogues and a common understanding that architecture can impact the lives of individuals and on a larger scale forming a city-style and identity (Craven, 2018).

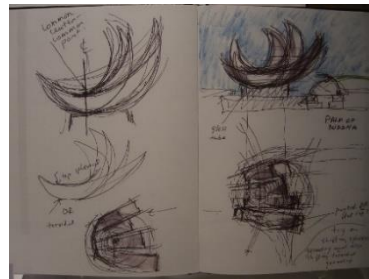
To The Public Eye

It was without a doubt that casino proposals in Singapore were arising in the early 2000s in hopes to boost the tourism scene. However, due to moral grounds and anti-casino policies that formed a national narrative especially for the ruling party post-independence, proposals have been turned down. When the Integrated Project (IR) came into play, Singapore decided to say 'yes' to the idea of IRs which does not exactly mean saying 'yes' to casinos but in a political standpoint, it was accepted yet again despite Sentosa's plans of opening a casino. This threatened Singapore's moral pillar of nationalist modernity (Kah-Wee, 2015). The IR project scope was the Marina Bay precinct and it should include financial centres and a cultural institution. After 4 developers submitted their bid, Las Vegas Sands Corporation ironically won the competition. The ArtScience Museum came slightly a year after the completion of Marina Bay Sands (MBS) that houses financial centres and the controversial casino (Goldhagen, 2015).

As with the current stock of research and data, the ArtScience Museum stands in the shadows of Marina Bay Sands which begs to question, was the Art Science Museum built-in compensation for Singapore going against its moral pillars? Was the requirement of having a cultural institution within the tender project purposeful to soften the controversial blow of the political and controversial casino decision? Safdie too speaks very little about the museum in comparison to his other works, MBS and Jewel. Perhaps the cultural institution element of the entire project is just icing on the cake onto Singapore's values and identity as a nation and that the Art Science Museum was more of an embedded project to MBS than it is a project of its own. Furthermore, with MBS's conspicuous consumption, ArtScience Museum may be a platform where it offsets MBS. With that, the ArtScience Museum may represent a more

promising and morally accepting direction in comparison to MBS which gave motivations in developing it.

It may seem that Safdie found this to be an opportunistic platform as initially before Las Vegas Sands won the project, the design for the museum were “finger-like” and had little to do with the element of science (Fig. 9). When they did win the project and the designs of the museum are evolving to its final forms, Safdie found it to be an opportunity to integrate science, reaching out to engineers from Arup to use mathematics to configure the final design we see today. Though the ArtScience Museum may come off to be an after-thought of the MBS, this embedded structure do highlights and stands like a charm of an art piece integrated with technology and science on the city skyline of Singapore.



Safdie Architects (Media). (2011) Figure 9. Moshe Safdie finger-like design sketches.

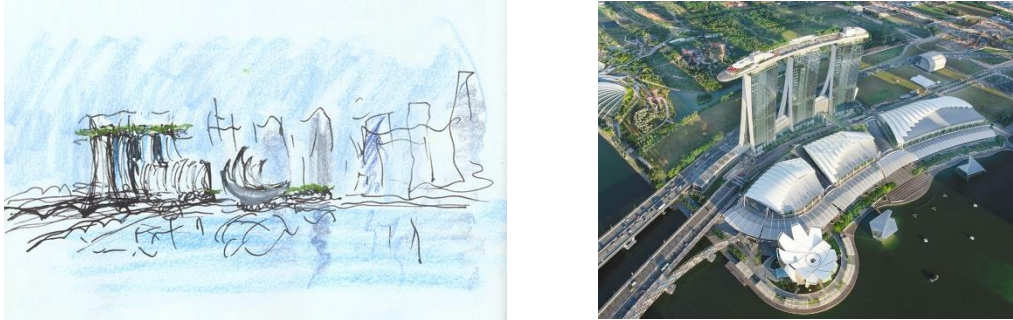
People saw the building differently most of which for its function. As the exterior speaks for itself; arts and science. The interior exhibitions too follow through with the museum’s name making the museum well-visited with tourists and locals (Fig. 10). The interconnectedness and fluid integration of artistic expression, technological ingenuity and scientific enquiry are the base concepts of the museum (Jin Kim, 2018) (Arderly, 2011).



Safdie Architects (Media). (2011) Figure 10. ArtScience Museum exhibition.

Before its current final form, there was an uproar from the public that the ArtScience Museum looks like “a bunch of bananas” which led Safdie re-looked and reached out to engineers for help to make it look more elegant (Online, 2010). It is rather instructive to ask whether the words of the public could simply affect Safdie. Perhaps, being a modernist himself that strives to create something cultural, philosophical and ethical towards a city has led him to be some sort of a populist. His attempts in creating the ArtScience Museum culturally meaningful to the locals in contrast to MBS may have placed him in a spot to approach the design of the building in a populist manner by listening to the public and redefining his form based of the public’s opinion. Indeed, some may feel that this may not sit well with architecture as it portrays that the populist approach meant architecture should be pulled back by society. However, to me and alike to Safdie, he believes that socialism is a key factor in architecture where the wow-factor of a design should be secondary to that of the effects of social gathering and equality a building could bring for its people. Architects alike need to sit and understand the viewpoints of the client or the people that will run the building

and not just have the system of the people be fit into an architecture. With that, the museum has edged its way not only to the city's skyline due to its strategic spot but also into the values that Singapore wants to represent (Fig. 11 and 12).



Safdie Architects (Media). (2011) Figure 11. Moshe Safdie Singapore skyline sketch and Singapore city skyline render.



Safdie Architects (Media). (2011) Figure 12. Singapore's city skyline.

Museum sticks out like a sore thumb with its alienated flower-like design in comparison to the buildings around it. Along the walkway filled with tourists and locals alike that without a doubt would snap a picture or two of the building. In my opinion, the ArtScience Museum comes from a place of opportunity where arises a special building that somehow became iconic. Despite the ArtScience Museum is a form of enhancement to the MBS, it did form its own identity as it stands along Marina Bay Sands and with its different and unique tectonic in comparison to almost any other building in Singapore. Unlike the MBS where it represents the national building identity of Singapore today, the museum stands for its Singapore's modern cultural aspect, drilling the moral pillar of the nation today. As to Kenneth Framptom's approach where he mentions a design shouldn't be too kitsch or cliché in forming a sort of identity, Safdie has met the middle ground of embracing Singapore's values and identity with modernism as an approach through the populist approach and the openness in understanding what the public feel about the design. To add, it was commendable that Safdie reached to engineers hoping they can help form a design of elegance. It is critical to not only design aa efficient building but to also be efficient with the resources a project has which Safdie had achieved. Along with the abstract concept of modern regionalism, Safdie have somehow used the play of green initiatives and Singapore's outlook into the future in designing this building, all within respects to the post-independent Singapore and the Singapore we come to be today. With Safdie looking at the ArtScience Museum in an opportunistic way, progressive and populist approach has made an impact to locals and tourists where they come together to not only appreciate the exterior of the building but to go through the interiors, coming out of it only hoping to visit again in the future.

Conclusion

the ArtScience Museum surely completes Singapore's value asset and gives an equilibrium to the city. It stimulates and evolved the public imagination having people referring it as a lotus, a reaching hand and sometimes "the symbol of Singapore". The understanding and coexistence of the arts and the science give off an exhilarating touch to its knit-like spot in the city skyline. More importantly, the ArtScience Museum enhances and accentuates the future-forward cultural depth of this nation, serves as an integrated space for the appreciation of the arts and science and pushes its boundary making the 'embedded art' into beautiful stand-alone architecture.

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