



High-Tech Architecture and Its Urban, Cultural, Historic and Economic Landscape of the Carrasco International Airport in Montevideo, Uruguay

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Received date: June 19, 2017; Accepted date: June 25, 2017; Published date: June 30, 2017

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Abstract

This is a novel and unprecedented study of the latest global-scale architectural movement. We contribute a large amount of first-hand research to the scientific community in the form of interviews with architects, observations and photographs. This paper analyzes the predominant building style for large public developments. It takes into account its history, its representative value for income, technological development, and innovation, and the reasons why it is shaping in a certain way. Hi-tech and postmodernism are extremely popular styles, yet little has been written about them. In order to analyze the architectural style, there has been direct observation of the Carrasco international airport, an interview was conducted with an architect and there was an investigation that ranged from textbooks, to articles, to influential architects' speeches. The essay inspects the history of 20th century architectural styles such as modernism and postmodernism and focuses on high-tech as the natural consequence of their predecessors. The investigation unveiled why buildings started to have more complex and unconventional form factors, as well as the causes of architectural trend shifts. It also relates technology and its impact on architectural innovation. Finally, we conclude that Hi-tech buildings scale and flamboyant aspects make them ideal candidates to revitalize neighborhoods, show wealth and engineering skills. Particularly, the airport was a positive investment, with regards to the materials and style employed.

Keywords: Architectural; Postmodernism; Architect; Airport

Introduction

High-Tech architecture has consolidated itself as the most popular style in virtually every new large scale development, performed both by states or large corporations; from airports to public libraries, to museums, convention centers, corporate offices, shopping centers, and even terminal stations, including bus and train stations. The reason for its popularity is that its stylistic principles allow and actively enable relatively cheap, efficient and modern-looking buildings. With the decrease in price and popularization of new, stronger materials in the 70s, like aluminum, steel, and glass, architects were suddenly allowed to materialize ideas and visual concepts that were previously unthinkable, giving rise to the hi-tech architectural style.

This movement is the natural successor to Frank Lloyd Wright's¹ and Le Corbusier's modernism². There was a growing disillusionment with these buildings, so High-Tech added some excitement to it, with more representative and eye-catching structures. High Tech architecture is a fairly new movement and it seems to be in the way of monopolizing the skyline of the biggest cities. There is an unspoken consensus that this is nowadays standard. However, there are not enough people criticizing it and pushing it forward.

The research question implies that, given the fact that the airport is a high tech architecture building, it should be practical. In theory, some design choices are made as to facilitate the functionality of the building. However, one of the main critiques to this movement is that architects have been prioritizing form over function, and disguising it through different techniques. This essay seeks to find out how much of the Carrasco airport's final form represents efficiency and how much is simply aesthetics [1].

The Carrasco International Airport is Uruguay's largest airport, located in its capital city, Montevideo. In late 2009 operations began on the new terminal built by Rafael Viñoly, leaving the original one for cargo purposes. It represented an investment of 165 million dollars, which may seem insignificant next to New York City's La Guardia Airport renovation, estimated at four billion dollars; but constitutes an enormous effort for a third world country like Uruguay. Nevertheless, because of its small scale, the investment for the Uruguayan building is more than enough to construct a luxurious building.

High-tech precursors and main characteristics

In order to understand whether Carrasco airport uses a hi-tech style, we must first understand the history of its precursor styles and how they have shaped the characteristics adopted by the high technology style³.

¹ Frank Lloyd Wright was an American architect. Photography of the Guggenheim museum in annex.

² Modernism is a broad architectural style that started in the early 20th century. It favors minimalism, white walls or glass; 90 degree shapes, and the incorporation of industrially produced materials.

³ Throughout this essay, hi-tech, late modernism and postmodernism will be regarded mostly as the same movement and architectural style, since their main features are shared.

Architecture is no different to other pieces of art or design, in that it is mostly fashion. Before the modernists, fashion was dictated by the content. In ancient Greece this would be the different parts of a column: the capital, the fluting, the stylobate; the details of the frieze or the complexity of the acroterium. The Romans, while having introduced domes, placed an emphasis on the mosaics and their geometric or pictorial designs.

The Germans were among the first to defy this idea, possibly because their particular interest in form, which will be explained later on in the form subtitle. Their version of expressionism has very similar characteristics to hi-tech: the adoption of new materials and seeking for inspiration in the new technical possibilities or on natural biomorphic forms [2-5].

Why Le Corbusier is a precursor to the hi-tech movement is rather clear. On a more ideological side, Le Corbusier influenced postmodernism because of his love for progress and forward-thinking. He realized how important cars would become, and gave them a special place in his houses; he (...) designed large cities as futuristic utopias (...)⁴.

Le Corbusier was an advocate towards replacing walls for columns on the ground floor. Later on these columns, pillars or stilts would be made of aluminum and look grey instead of white; they'd start to be concave or convex and would reach very large heights.

He envisioned roof gardens as a way to keep the humidity, long before it would become a mainstream practice. The horizontal window point in his manifesto points out that their purpose is to illuminate the room as much as possible, with the limitations concrete has in mind. High-tech architects can now make entire walls out of glass, leaving the support to the steel beams⁵.

Frank Lloyd Wright spent most of his career making houses. He transitioned slowly from the traditional U.S. Victorian houses to the straight horizontal lines of modernism. There is only one example of Wright's contribution to high tech architecture: the Guggenheim Museum in New York City. It was his only big scale project. The straight horizontal lines are made cylindrical, giving it a radically different feel despite its similarities⁶.

High tech architecture and postmodernism are a clear consequence of modernism. However, other 20th century styles have been a key for these to be what they are today. Brutalism had a strong influence in the earlier hi-tech examples, as they both shared the focus on efficiency and industrial aesthetic. They also have in common the exposure of building's functions, such as pipes and elevators; yet brutalism architecture only embraces it because of its low cost, whereas hi-tech incorporates it due to its bold and striking look. The latter also modified it to give it a cleaner look: pipes painted of various colors, elevators made of glass with as little metal structure as possible.

Expressionist architecture⁷, which embodies the same principles as in the pictorial arts, has definitely impacted the aesthetic large scale buildings have. While Frank Gehry's⁸ buildings represent exactly what a neo-expressionist work should look like, postmodernism and hi-tech have been increasingly borrowing some of the movement's trademarks. Carrasco's airport curved roof and concave beams, or 20 Fenchurch Street tower overall concave wedge form showcase this. The main argument being, modernists and postmodernists saw in form a chance to depart from the canon in architecture. To contribute in an aspect that used to be marginalized. On the other hand, when the façade is expected to be entirely made out of translucent glass, there is not much room to innovate in the content; colors or decorations. Skyscrapers or other mid-rises with the purpose of maximizing light and windows also have difficulty finding originality [6-8].

As the movement developed, it moved towards incorporating more green and sustainable qualities, which would become a topic in agenda in the 1980s. About the same time the greenhouse effect started to be discussed around the world, architects saw the possible implementation of greenhouse-like structures for residential and commercial buildings. In countries where the temperatures are cold throughout the year, glass roofs would allow the long wavelength sun rays to penetrate and heat the building.

Gimena Fornaro, architect who is working for St. Brendan's school, was interviewed regarding diverse aspects of hi-tech architecture. When asked about which was the main difference she saw between Le Corbusier's modernisms and high tech, she saw the answer in the advance in technology and the new creative opportunities they generate.

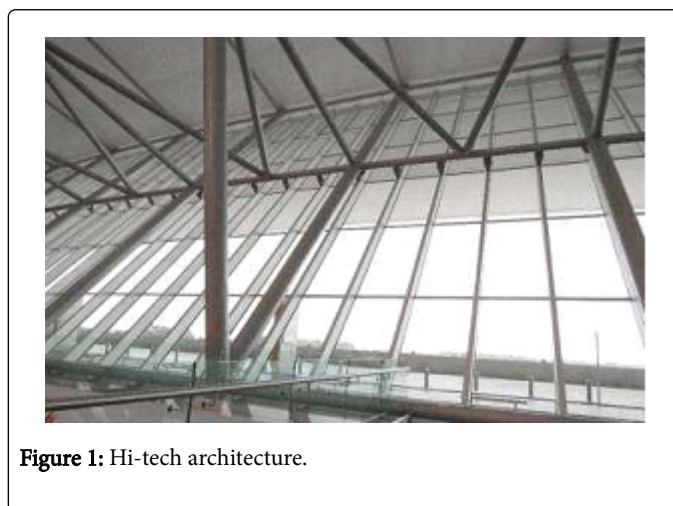


Figure 1: Hi-tech architecture.

"I believe that the main difference resides in the use high tech makes of technology in the materials, in comparison with Le Corbusier's

⁴ Moss, Von. "The Automobile in Le Corbusier's Ideal Cities." *The Automobile in Le Corbusier's Ideal Cities* (n.d.): n. pag. MIT Press, Web, 2 July 2015.

⁵ "Le Corbusier, Pierre Jeanneret." *Le Corbusier-Ouvre Complète Volume 6: 1952-1957* (1995): n. pag. Five Points Towards A New Architecture, Columbia, Web.

⁶ Drutt, Matthew. "Guggenheim." *The Frank Lloyd Wright Building*. Guggenheim Foundation, n.d. Web, 03 May 2015.

⁷ Expressionism in architecture consisted of the distortion of form for an emotional effect, the search for originality and the conception of architecture as a work of art.

⁸ Frank Gehry is an architect known for his neo-expressionist, futuristic or deconstructed style of buildings. They often look as stricken by an earthquake or tornado, while colorful and caricaturesque.

modernism. In a way, Hi-tech tried to signify many of modernism's premises, by the use of the techniques and materials"⁹ (Figure 1).

New Materials and Techniques

In high-tech architecture, when new materials and techniques became available at affordable costs, they opened up a wide range of possibilities for architects to differentiate themselves from previous styles. Gimena Fornaro's designs have also benefited from new techniques that enable her to implement new concepts, and she provides insight into how this process applies to hi-tech¹⁰.

In Fornaro's designs, she incorporates some new technologies. However, unlike world renowned architects, she has to wait for their prices to come down, which is usually a direct result of them being popular. "In my professional practice I am choosing to work with light constructive systems, like steel frames, aluminum window and door frames, drywalls and prefab horizontal systems." Steel frame consists of structures made of alloys of iron, because it is the material that supports weight the best. Then, it usually surrounded by concrete or plaster, to give it a more polished look and keep it protected from water and humidity [9-11].

In the airport, the main supports for its high ceiling are made of steel. Covered by just a layer of paint, it is exposed to the view. This is perhaps Viñoly's most hi-tech characteristic, since his buildings are mostly neat and sleek, making him a postmodernist.

Moreover, the frames for the windows are made of aluminum, because of this material's water resistant properties. Because of aluminum's expensive manufacturing process, it is normally sparingly used, only when the conditions demand it.

Drywalls are resistant to water and completely fireproof. They isolate noise and are adiabatic. Since there is nothing particularly beautiful in them, they are used in the functional parts of the buildings. In the airport, they can be seen behind the counters or in the bathroom stalls.

Prefab horizontal systems are any piece to be placed parallel to the ground that was built or manufactured previously to their application in a building, such as floating floors. The tiles that constitute the airport's dome-like ceiling belong in this categorization¹¹ (Figure 2).



Figure 2: Dome-like ceiling airport.

The use of drones (as in quadcopters) for the design and the construction of a building are becoming more and more common. A drone equipped with a camera not only allows architects to view everything from above but, unlike a map, make factors like shadows and weather conditions evident.

In addition to helping visualize the project, large drones can carry and move elements. As a consequence, the placing of objects and construction materials in high floors does not require the use of a crane anymore^{12,13}.

Green and sustainable architecture

As previously mentioned, one of the latest trends is for buildings to be energy-efficient. In densely populated areas, legislations urge architects to include plants and green space to capture CO₂. As in most cases, what is an innovation based on a necessity somewhere in the world, becomes a decoration somewhere else soon afterwards.

The Carrasco airport has got an area for recreation where passengers can sit and wait for their flight before they go through customs. In there, indoors flowerbeds with palm trees enhance the view [12-15]. When Fornaro, the architect, was asked whether it was more expensive to construct buildings with big windows and tall ceilings or not, and how this impacted on a sustainability point of view, her response was pragmatic:

"Any object that differs in some way from the standard will drive prices up. Normally, openings are 7 feet tall, if one wants to have a 10-foot tall windows (as an example) it will definitely be more costly. Big windows and high ceilings must be accompanied by a carefully planned layout, a proper orientation with respect to the sun, (and not facing the south) and a good insulating glass. It's important for the materials to be non-conducting of the heat. These are the details that make it sustainable¹⁴".

⁹ 2015, April. Gimena Fornaro, Architect in St Brendan's School (Transcript). Conducted by student.

¹⁰ Photography taken by student. Agudiez, Gastón, 6/5/2015.

¹¹ Photography taken by student. Agudiez, Gastón, 6/5/2015

¹² "Movie: Building Architecture with Drones." *Dezeen Drones Can Collaborate to Build Architectural Structures Comments*. N.p., 03 Mar. 2015, Web, 02 Aug. 2015.

¹³ "The Latest on Drones in Architecture and the Firms That Use Them." *Architect*. N.p., 21 May 2015, Web, 02 Aug. 2015.

¹⁴ 2015, April. Gimena Fornaro, Architect in St Brendan's School, (Transcript). Conducted by student.

The airport's longest sides face the east and the west, while its south side is covered by the dome all the way to the ground. Regarding sustainability, the Carrasco airport became the first airport to function fully based on clean renewable energy generated on-site. Placed near the parking lot, a four hectare site filled with solar panels provides 3 to 4 MW¹⁵.

Form over content

As mentioned before, form dominates late modernism. The Carrasco airport's single most important feature is its dome-like shape, Norman Foster's Gherkin was carefully designed to look like a cucumber¹⁶. According to Adrian Forty, Professor of Architectural history at University College of London, "(...) almost nowhere except within the world of German philosophical aesthetics was 'form' used in architecture in any other sense than to mean simply 'shape' or 'mass'¹⁷,¹⁸. The airport's form, comprised of a big dome is a clear sign that form was prioritized over function. Even though the airport has room for expansions, as Montevideo grows, a higher traffic of flights will demand for new terminals to be built. Because of this particular design, the construction of these buildings will have to be alongside, not connected; resulting in larger costs (Figure 3).



Figure 3: Airport with big dome.

and Renzo Piano are the most renowned and are regularly called to build the most iconic projects¹⁹.

High tech buildings as an urban renewal tool

The government has always influenced the way cities develop and expand. At the same time, states normally accumulate enough tax money to finance large buildings, and thus it is the state that builds airports, libraries and, in some cases, stadiums. When these factors are combined, city planners can create a specialized and organized area, such as residential or industrial zones, from the ground up or shift the axis of commercial districts, resulting in better city planning. The advantage of organizing the city with a plan in mind as opposed to allowing completely organic growth are that infrastructure can be put in place without having to buy private land, such as in the case of widening of roads, and that more efficient markets can be created by grouping industries together into clusters. The new Carrasco international airport was built at a time when Uruguay was growing. By 2010, the Uruguayan GDP had been increasing significantly for seven years. In a country where the most important value is humility, whose president used to have the lowest salary in the world, a development like the airport was quite shocking (Figure 4).



Figure 4: New Carrasco international airport.

The reason why high tech buildings are built

This type of architecture is much more expensive than regular buildings. It relies on technological advances and new inventions to be able to tweak the overall form and reach an unusual form. So an analysis of why money is spent on these is in order [14]. To begin with, big clients are the only ones that can afford to pay such sums. As a result, high tech buildings are rare and inherently, a display of wealth. Secondly, it is still a novelty. People of a certain age are nowadays still wondered by even the more modest buildings of this type. They have become today's fashion, considering that architects like Norman Foster

Particularly, the Uruguayan government has been involved in several projects along the Montevideo/Canelones department's border. Given the fact that this area is near to Montevideo, but sprawling, with proper highways and infrastructure, the state has pushed for Uruguay's biggest team, Peñarol's new stadium to be built alongside the highway. This was preceded by the new Carrasco airport and Zonamerica, a special commercial zone, for companies to place their offices and enjoy reduced taxes. City planning is never easy, it's "(...) a story of consensus building, bringing architects and archaeologists, tourism official and local officials, together to work on school siting as well as hotel siting, and on infrastructure projects that would serve residents of the old city and tourists too (...)"²⁰. When Thomas Heatherwick²¹

¹⁵ Giles, Constantine. "Uruguay: Montevideo's Carrasco Airport to Become First Sustainable Airport in the World." *Eye On Latin America*. N.p., 05 Sept. 2014, Web, 21 June 2015.

¹⁶ Building in London, formally known as 30 St Mary Axe. Completed in 2003. Photography in annex.

¹⁷ Forty, Adrian. *Words and Buildings: A Vocabulary of Modern Architecture*. New York: Thames & Hudson, 2000, Print.

¹⁸ Photography taken by student. Agudiez, Gastón, 6/5/2015.

¹⁹ Renzo Piano is an influential Italian architect. He won the Pritzker price in 1998. He has been involved in several hi-tech constructions, such as The Shard in London and The New York Times Building, in New York.

²⁰ Forester, John. *Preface. The Deliberative Practitioner: Encouraging Participatory Planning Processes*. Cambridge, MA: MIT, 1999. pp: 11-12, Print.

famous British architect, was asked about large city planning projects, he said "Whereas another special thing in an art gallery is sort of expected, expectations are so phenomenally low for projects in the public realm²². These hi-tech buildings serve as an attraction to foreign companies and business partners, and as a signal for local companies to show that an industry should be developed around that new construction. In Zonamerica, companies are provided with infrastructure and appealing architecture so that they feel comfortable relocating. It encourages a migration from the old city to the new areas where development can be planned and developed more easily to match the new strategies and modern needs of the country.

How the Style Transcends Borders

Architects who are commissioned buildings overseas often look for interesting characteristics in the architecture of the region and combine them with their personal style. They do their best to avoid making their building look like it is out of place, or alien to the culture. A building usually and traditionally needs to merge seamlessly with its surroundings. Hi-tech has seemed to break with that tradition. The movement's natural habitat is London, where it was born. But as it expanded throughout the world, more and more cities started to receive direct transplants [13]. The new mayor's office in Buenos Aires was built by Norman Foster, the world's most famous contemporary architect, who transplanted his British style and brought it to South America. Unlike his only previous work in the city, where he remodeled a classic port area barn while maintaining its brick exterior and windows details, the new government building looks like it could have been built anywhere in the world. Similarly to the image the airport wants to convey in Uruguay, this landmark building in the neighborhood of Parque Patricios, BA wants to transform the area into a thrilling technological district, where foreign businesses and investors want to belong (Figure 5).



Figure 5: New mayor's office in Buenos Aires.

The Airport and Viñoly

Rafael Viñoly has built several iconic buildings throughout his career such as the Tokyo international forum and the Kimmel center

for the performing arts. The John Jay College of Criminal Justice was his first big commission. What these buildings have in common is that they are all big scale developments, whether educative or business oriented. Their purpose is to accommodate large sums of people, while maintaining a certain specific functionality: having a good acoustic, facilitating quick path-finding, or merging with a traditional academic aesthetic.

Atriums are a key element of high tech architecture, and therefore, a leitmotiv in Viñoly's works. Their glass ceilings allow for vegetation to grow inside, as well as bringing light and ventilation to the interior. Coincidentally, under its atrium, the Carrasco airport has small gardens with palm trees. In his next project, Viñoly designed The 20 Fenchurch Street tower to have a botanical park in its top three floors, with a large variety of plants. However, the 20 Fenchurch Street building became known for the wrong reasons. Because of high tech architecture's highly experimental motives and forms, some unusual and or unprecedented consequences arise. Viñoly's London skyscraper generated a "death ray"²³, which would reflect and concentrate the sun rays into a single "hotspot" that could reach up to 72°C [15].

Conclusion

The choice of a postmodernist style for the airport suits it well. It shows international integration, not only due to the amplified traffic it allows for, but because of the evident inspiration in London and other hi-tech staples. Furthermore, its pristine look showcases wealth, reputability. It is an overall excellent first impression of the country. It regularly appears in magazines such as *Forbes* or *Travel and Leisure* as one of the most beautiful airports in the world²⁴.

The area where it was built saw a boost in the construction of luxurious mid-rises, due to its proximity to the airport, in addition to the overall quality of the infrastructure and the modernity of the architecture in the neighborhood.

Its high ceilings and open floor plan facilitate orientation and path finding, as well as making long waits less claustrophobic. This, however, may create a feeling of alienation, since it makes it hard for people to find their space and feel protected²⁵.

In practice, the airport has not had any major problems. It endured hail, long storms and strong winds without requiring maintenance. Space is abundant, even during holiday's season.

In conclusion, the airport is rather honest with the use of materials, displaying the steel beams and aluminum windows. It is sustainable, and follows the main trends in architecture. Still, it does not have the inconsistencies other buildings have for blindly following fashion, which will make it remain functional and appreciated for a long life-span.

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²¹ Heatherwick is a young, British architect and industrial designer. He became famous for his innovative solutions and creative thinking, as well as his sculptural, biomorphic buildings.

²² Kwun, Aileen. "Q&A With British Designer Thomas Heatherwick." *Dwell*. Dwell, 16 July 2015, Web, 1 Aug. 2015.

²³ Gander, Kashmiri. "Walkie Talkie Building in London to Have 'death Ray' Problem Fixed." *The Independent*. Independent Digital News and Media, 03 Mar. 2013, Web, 07 Aug. 2015.

²⁴ Jacobs, Karrie. "World's Most Beautiful Airports." *Travel+Leisure*. N.p., 12 Jan. 2010, Web, 07 Aug. 2015.

²⁵ A concept Marc Augé, a French anthropologist, describes in his book "The Non Places".

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