

**Megastructure as a New Urban Paradigm
“Hauptbahnhof” station of future cities**

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Abstract

In this research I would like to compare Berlin's Hauptbahnhof to other megastructures in order to understand their relationship to modern urbanism. Megastructuralism can be explained in three different steps showing its self-evolution from the utopian housing concepts of the 1930's to the megastations of the 21st century.

First step: megastructure as a residential project. The beginning of the Megastructure era was related to the residential housing project located along a highway from the modernist movement's "Fort l'Empereur project" (Le Corbusier, 1931) or Archigram's proposal link to the new urban forms in a technological period known as "Lower Manhattan Expressway" (Paul Rudolph, 1970).

Second step: megastructure as institutional project. The use of large structures found its place in cultural spaces such as "Centre Pompidou" (Piano, Rogers and Franchini, 1970) and in workplaces of the post-industrial city described by Koolhaas in "Delirious New York".

Third step: megastructure as mobility, ecology and technology project. The modern society of the 21st century has a never before seen demand for mobility. Today's cities become more and more machines of transportation. The combination of computer technology and the challenges of the 21th century, produce a new kind of megastructuralism. Berlin's public transportation system is one of the Europa's biggest train stations: "Hauptbahnhof".

In this research it will show that Hauptbahnhof station must be seen as a new kind of megastructure. In the future, cities will become more and more crowded; hence space will have to be used more efficiently. Hauptbahnhof shows how space can be used most efficiently if buildings grow into megastructures that accommodate every possible function. The station is therefore a vast source for models of densification that could lead to a sustainable urbanism in the future.

Keywords: Megastructure, Sustainability, Urbanism, Regeneration, Mobility

1. Introduction

To understand the megastructures such as the main train station of Berlin, Germany, it is important to take a look at the terms; built structure and megastructure. Built structure includes any large, man-made object.

Consider Hauptbahnhof as a megastructure. The station stands very prominently, probably for many people as a building that is no longer a building, as a machine that contains the entire infrastructure that is needed but nothing more than that. The built structure created under and above ground is designed to keep these knots running and to provide the adequate facilities for shopping and other dependent commercial activities to happen. Although not among the largest buildings in the world these megastructures are hubs for intersections of people, goods and services magnitudes higher than their smaller counterparts. Therefore, the station serves as a model for sustainable urban development in the 21st Century.



Figure 1: Haptbahnhof, Berlin, 2014

2. Objectives

As for complexity and flexibility it is probably undoubted that the mega-buildings of the 21st century do not have to be ranked behind their companions from the centuries before. The mix of use and the cycle in which a building has to adapt to the market is faster and more complex, which has never been seen before in history. Changes have to be made within weeks and the globalization and its consequential new demands lead to a more and more diverse combination of functions in every huge building. Sometimes this mix is not as easy to grasp as it were in projects of the megastructure era. Megastructure can contribute to environmental solutions for the future of sustainable urbanism.

The present study aims to identify the problems of the current contemporary urbanism using the case study Hauptbahnhof:

- Land consumption and natural land
- Automobile dependency: traffic congestion
- High cost of infrastructure and public services- Decline of downtown and inner city

To recommend the solutions and opportunities for future cities:

- Strategies of regeneration of urban centres
- Clean transportation systems

3. The future of the Post-Carbon city

Megastructure is a combination of the word mega (Greek for large) and the word structure. It is a relatively new term and was first used in print by Fumihiko Maki in 1964. Other terms that are closely related to megastructures are ‘expandable framework with subordinate units’, ‘modular’, ‘extensible’, ‘clip-on’, ‘plug-in’, ‘dominance of form’, ‘formalistic obsessions’, ‘technological excitements’.

Megastructure can be used as a means of controlling the chaos of activities in a city. The city itself may be a megastructure; the building blocks and houses grew according to the visions of architects through “siedlungen”. The same is true for the real megastructures in Berlin such as the train station Hauptbahnhof. Even though it has an obvious outer architectonic system, it follows very precisely the system of supply and demand.

With this concentration of activities and opportunities it gives the city a lot of advantages, through an aesthetic level, at least the one an architect’s eye would like to see.

If the megastructural framework is too rigid it is very probable that it becomes a problem for the building and is inhibiting any further change that is demanded by new activities. Public investors for transportation hubs such as Hauptbahnhof would not take that risk but still embrace the advantages of a highly flexible massive building that concentrates a vast mix of different activities.

Even though there are some doubts regarding Hauptbahnhof’s qualification as a megastructure, it includes a great number of features very typical for these kinds of buildings. The only two elements that is disputable as megastructure features are the predominantly vertical emphasis of its exterior and its very open look. Both prohibit extensibility in the plane that is generally considered to be horizontal for megastructures. The glassing box-like facade might make it look like a usual large building, but looking closer at its interiors, the plans and sections reveal a complexity that speaks for itself and advocates for it to be called a megastructure.

If we compare Hauptbahnhof to other train stations in the world we find another reason why it can be regarded as a megastructure. Unlike train stations such as Grand Central Station in New York or the main station in Lyon, Hauptbahnhof does not have a large number of tracks pointing in the same direction, even though it is one of the most frequented train stations in the world. Hauptbahnhof is much more like a cluster of platforms that is adapting to the needs of its use. The complexity is actually far beyond that of earlier megastructures such as Place Bonaventure or the like. And yet there are many similarities.

The reason train stations such as Hauptbahnhof have been considered as megastructures probably lies in the fact that their complexity is easy to grasp with the eye and that these buildings have a unifying and visible framework that is a common criterion to recognize megastructures. Another reason might be that although train stations often are very large structures, they lack the complexity and spatial clutter that many definitions of megastructures require. In fact many train stations are indeed very large but not everyone would consider them as megastructures. If we look for example at the main station in Zurich we see many features that

are the exact opposite of a megastructure. The stations main hall although big is a very simple box unlike the intersecting forms of Berlin's Hauptbahnhof; the layout of the tracks in its linear order inhibits any expansion and flexibility as opposed to Hauptbahnhof which has lines in multiple directions; the whole structure is oriented along a central main axis in the direction of the tracks, which doesn't allow the structure to exceed a certain limit of complexity.

Of course the main station of Zurich is also becoming more complex, especially with new underground tracks that were added in the 1990's and 2010's, but these tracks are just a repetition of the tracks above ground, they lay in the same axis as the rest of the structure. The same is true for Grand Central station in New York or Gar de Lyon in France.

Hauptbahnhof train station is of a completely different nature due to many reasons. The most obvious is its main hall. Hauptbahnhof is an impressive station complex with many different lines of trains connecting the city within itself as well as to other cities in Europe. There is an overall concept because public companies operate the lines. This has led to an amazing complexity that is combined with many other features such as size and flexibility, making it a megastructure of the 21st Century.

Megastructures were utopian projects, but with structuralism one tried to combine these ideas with beautiful geometry to form the structuralism movement. The built megastructures of the late 20th Century, lack these geometrical, clearly visible principles of growth though. Nevertheless they grew impressively over time as can be seen at Hauptbahnhof, it's just that their logic is much more complex than a simple grid structure. Today we know from science that the simple structures that we find in nature are in fact much more complex and unpredictable. They imply an incredible beauty and perfection as well, although far more difficult to capture for the human eye.

'Freakish financing' was indeed often the main reason megastructures could be built the way they were built. The sheer size and the expression of the geometry led to expensive and often not very useful let alone economical spaces. There were not freakish financing for Hauptbahnhof, there was a precisely calculating public railway company "Deutsche Bahn" that had to build a station with some adjacent facilities that could regenerate the urban environment. Even though the building was based on ideas from Le Corbusier it became a very pragmatic train station and shopping machine: 'an urban object'.

In comparison, the development of Shibuya train station (Tokyo, Japan) was exactly the opposite. There is a main shape in the beginning; it is just the need for a train station. Over time more uses and buildings are added to the building and so it kept growing. The criticism by Reyner Banham who accuses the megastructuralists of being too academic, too much in love with the geometric shape of the building is therefore not true for Shibuya. It is nevertheless a megastructure in all its other features.

Hauptbahnhof is an urban object that articulates the city. Looking at all its features we find many indicators that make it a megastructure by definition or simply by the way we perceive the building complex. The most important of these features being:

- Size
- Complexity and program mix
- Public space
- Difference of scale
- Hierarchy
- Cluster complex
- Structure and infrastructure

3.1 Size

The projects from the era of Megastructures, such as Archigram's Walking City, were very ambitious in terms of their size, they were of a much larger scale than the projects that were realized in the decades after the movement. The language of the architecture might have changed but in terms of their scale they are less 'mega' than their historical counterparts.

This is readily apparent than in Hauptbahnhof. The length of the whole station complex exceeds half a kilometre. This out of scale thinking to the earliest Megastructure buildings of the 20th century. The building establishes a completely new scale that is no longer linked to the human scale or the street level but to urban scales and sometimes even those of nature.

This massiveness also gets visible in the construction of the building: Huge window facades, enormous columns, and incredible volumes that contain whole train stations, shopping malls, and office complexes.

3.2 Complexity and Program Mix

First and foremost Hauptbahnhof station is a train station that was completed in 2008. Not only in terms of tracks and traffic, but it also serves as a shopping mall. Hauptbahnhof as a transportation hub became more important and over time the shops inside the building, as well as other stores built facilities in the growing cluster complex. Not only as a shopping mall Hauptbahnhof is very lucrative: two office towers, supermarkets, and public spaces are part of this megastructure.



Project Maglev in Berlin by GRAFT

The combination of many facilities in one building was one of the most important reasons for Megastructures to emerge in the 50's and 60's. Architects were fascinated by the new building technologies. They made it possible to combine the needs of a whole city in one building, a building that would therefore be as long as a village wide. With this new size of building and their mix of program there came along also a new complexity and architectural language. The new possibilities had to be expressed in architecture, and so buildings started to dissolve themselves into elements, units and clusters that allowed more flexibility and were prepared for future changes. These new buildings were designed to accommodate virtually every program in the future. Hauptbahnhof though not designed from the beginning as a megastructure shows many of these early megastructure features.

3.3 Public Space

The train station complex of Hauptbahnhof gives you the feeling of being in a huge building. The main reason for this impression is the fact that all the functions in Hauptbahnhof seems to be extremely organized into the building, there are many free and unused spaces, for most uses there is actually a lot of space. Standing on one of the 5 floors with hundreds of passengers streaming by, through one of the escalators you always have the impression of being in a building complex that is more than 500 metres long.

3.4 Difference of Scale

One feature that defines Hauptbahnhof station as a megastructure or mega- cluster is its scale and how that scale stays in sharp contrast to the surrounding urban fabric. Berlin is a city with very medium parcels of land and therefore medium buildings and patios. For centuries Berlin was a low city with building not higher than a few stories. In the last few decades this image has changed and a large number of skyscrapers have been built. But Hauptbahnhof is not just a

station with two towers; it is a building complex that stretches over 500 meters. This difference of scale is very obvious when walking around Hauptbahnhof and goes back to the very beginning of the Megastructure era.

Megastructuralist's deployed not only new techniques of model building, they also had very bold ideas for the cities and their buildings. It was possible to think of a building as if it were a city, like a huge infrastructure that was not bound to the principles of scale in an ordinary city. This was both fascinating and scary since nobody knew what these dimensions would mean for the human scale.

3.5 Hierarchy

Hauptbahnhof is composed with a spatial hierarchy, it has two main entrances North and South and into its multiples corridors, halls, and sections. These entrances indicate the beginning and end of this megacluster. There is also a unique hall, a central monospace that is all open which makes up this enormous train and subway station. Where you enter, and where you exit its borders are clearly defined. This possibility of prediction, the clear boundaries, the feeling of a huge building with clearly defined entrances.

3.6 Cluster Complex

The concept of cluster in architecture goes back to the Megastructure era. As the megastructure projects got bigger and bigger it became necessary to think of buildings in a different way. Buildings were more like mountains or accumulations of cells in nature. They no longer had a predefined shape but rather changed their appearance and adapted over time to meet the need for more space.

Hauptbahnhof station can therefore be seen as a cluster complex like the ones from the Megastructure era, like Archigram's 'Plug-In City' from 1963 or Alice and Peter Smithson's Economist building from 1964 in London. Hauptbahnhof became a cluster due to controlled growth because it was intended as one. There is an overall framework in which the cluster can expand as there is a final appearance defined by the design; the buildings look remains unique.

3.7 Structure and Infrastructure

Megastructures allow pure infrastructure projects such as train stations, bridges and the like to express their greatness with new means. The movement was always fascinated by the size and technical challenge large infrastructure projects were, allowing architects a completely new way of expressing all the things nobody was interested in and therefore had to be hidden away. Megastructures allowed the emphasis of parts that have previously been seen as pure necessities such as staircases, elevator shafts, pipes, or structural members.

5. Conclusion

Hauptbahnhof must clearly be seen as a new urban paradigm. With that comes not only the glory of the old Megastructure era, but also the shame in which it ended. Hauptbahnhof stands very prominently, probably for many people as a building that is no longer a building, as a machine that contains the entire infrastructure that is needed but nothing more than that. As much as

Hauptbahnhof is a megastructure it incorporates so many of the disadvantages and defects that the early megastructures were blamed for and that finally ended their glorious years in the 1970's.

But Hauptbahnhof shows many features that could be read as answers to the everincreasing complexity and density of cities. Therefore it serves as a vast source for ideas and visions for a future urbanism. To examine and adapt its features and strategies to future cities could show promising results. Hauptbahnhof also shows that megastructures are not utopias from the past, but rather visionary ideas for the future.

Hauptbahnhof station can be an example for the future. Its generous spaces, efficient use of land and different uses, can give us the next steps of sustainable urban regeneration for the city in 2050.

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