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## UNDERGROUND HUBS. INTERIORS: DESIGN QUALITY EFFECT ON USER EXPERIENCE

PAPER

*USER, INTERIOR, QUALITY*

### DDR STATEMENT

In a Design Driven Research approach, the primary importance of analyzing an object from multiple points of view emerges, keeping the choices made in the field of design as a common thread. This research investigating the world of underground hubs follows an inductive methodological approach, within the field of action and related sub-themes, followed by a careful and targeted study of the bibliography and case studies. From the analysis of the case studies (selected by specific geographical, functional and design criteria) and their taxonomic comparison, it is possible to extrapolate data that can be evaluated as design components that are effective or not in guaranteeing a satisfactory user experience. The data will be discussed and related to reflections on the quality of the interior space and the ability of the hub to manage in-transit flows between surface and underground. The data observation will be supported by a careful overview and redesign of the project sections of the case studies, from which important information about the spatial relationships between the different areas of the hub can be extrapolated. This will be combined with the consultation and contribution of experts in the field, who will be able to provide key information regarding some of the choices applied. The conclusion of the research sees the elaboration of project guidelines that will allow, at an international level, to approach the hub system by fully exploiting the potential of transport infrastructures, taking the user experience into account from the design phase onwards.

### ABSTRACT

The research investigates those spaces of the city located underground and daily functional to the transit of vehicles, users, and services. The whole research follows two directions, one investigating the architectural role of the interconnecting spaces between the ground and the subsoil, and a second one focusing on the design of the hub's interior. In this paper we will focus on this second issue. Particular attention is paid to the relationship between the user and the space and to the factors that influence positively or negatively the user experience. The research starts by questioning how and how much the quality of the interior space affects user satisfaction and seeks to extrapolate from an immersive field survey universal tools to achieve high standards of user experience in similar contexts by making changes and improvements to the hub design approach.



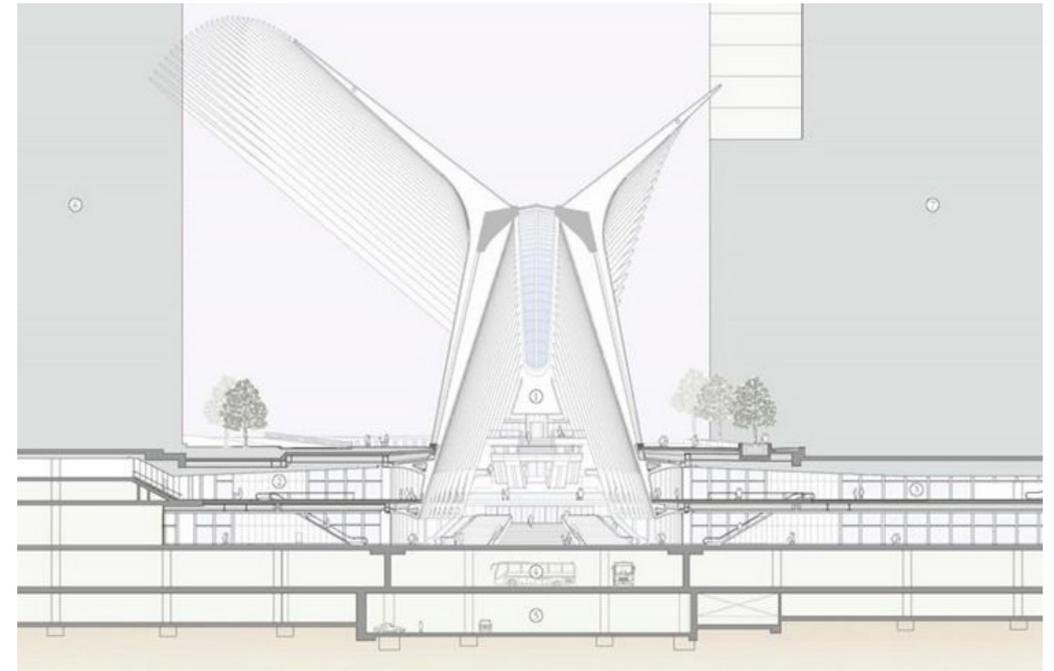
The term **Hub** gathers a multitude of concepts and information united by the aim to express an idea of network and interconnection between the parties. We usually hear about it in computer language, when we talk about big data storage related to each other, or even in the field of urban planning when we identify a city as a centralizer of services. The research concentrates on a hub typology that is widespread in many international metropolises and that has generated a substantial change in the habits of mobility within them. I am referring to the major metropolitan transport hubs that, through the complexity of the engineering work, connect the city on the surface to an artificial underground network of transport and communication routes. A physical place made up of engineering, architectural and IT components that are linked together to ensure the movement of large masses of users and information from one place to another in the city in a rapid, efficient, safe, and controlled way.

Referring to the time/space contest the research makes an excursus from the beginning of the twentieth century, with the appearance of the first underground transport systems, to a more specific investigation of the design choices of the twenty-first century. Geographically, the field of action focuses on international metropolises and then on large Italian cities comparable in terms of users' number and complexity of the transport network.

The research follows two directions, one investigating the architectural role of the interconnecting spaces between the ground and the subsoil, and a second one focusing on the design of the hub's interior. In this paper we will focus specifically on the relationship between the internal space of the hub, the user and the environment.

Depending on the design process that leads to the definition of a project we identify some key steps that precede the reflections on the interiors. The space in many cases is nothing more than the result of a complex system of morphological and landscape characteristics of a place, engineering choices, and logistical needs to be satisfied. The role of the designer is to convey these aspects into a project that responds effectively to these requirements. The complexity of this action lies in having to guarantee high standards of quality, performance, and aesthetics at the same time. When looking at an interior space, it is necessary to consider some basic factors that define its quality: light, form, and matter above all.

**Light** acts on the space, shaping it and enhancing its architectural character. It provides comfort and, depending on how it is used, ensures a high standard of performance. Its ability is to become a fully-fledged architectural component that shapes surfaces and space in a dynamic process requiring a careful design. These observations are evident when we look at an example such as Santiago Calatrava's Oculus at the World Trade Center in New York (*fig. 1*), where the infrastructural engineering component is proposed as a tool for conveying light, which filters rhythmically through the large steel wings that rise towards the sky, infusing the hub with an ethereal and dynamic atmosphere.



*fig.1*  
**Oculus - World Trade Center Transportation Hub**  
New York, USA | 2016 | Project section | © Santiago Calatrava Architects & Engineers

**The shape** is the element that, more than any other, can twist an environment and determine how it is used. In a hub is very interesting to understand the influence of the shape on the internal flows. Is the shape necessary to direct flows or are there other elements that can play this role within the hub? Let us take the example of the large King's Cross St. Pancras transport hub in London (*fig. 2*), where the form welcomes the user and cradles him inside; only later it would be directed through a complex but systematic scheme of corridors, drops and focal points. The most evident characteristic of the large international hubs is that they include mixed functions belonging to the commercial, infrastructural, and service sectors, which coexist in harmony with each other and, through height differences and large free-standing plants, guarantee harmonious circulation between the different areas.

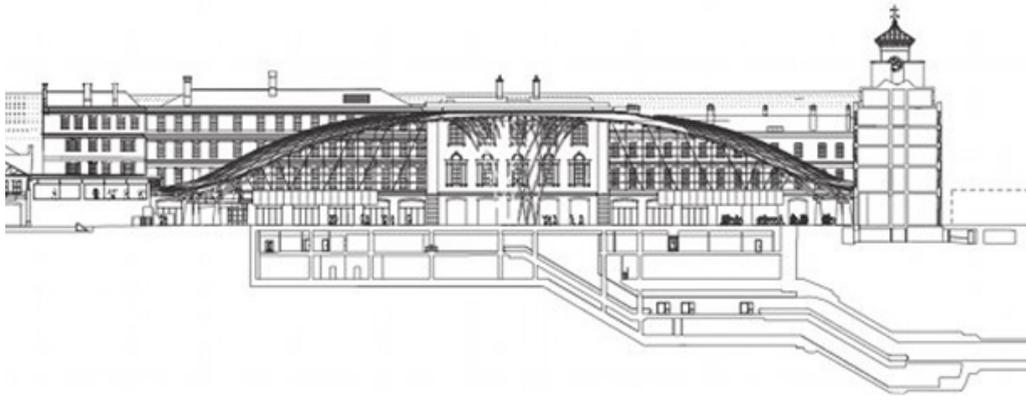


fig.2  
**King's Cross station**  
 London, -UK | 2012 | Project section | © John McAslan + Partners

**The matter** constitutes a complex aspect of the hub affecting the spheres of design, construction, and perception. The choice of materials influences first the engineering choices and immediately afterwards the Interior design solutions. It would not be possible to define the character of a space without materials, and so in the hub, structure and trims are firmly linked, underlining the unique character of each structure, and demonstrating the high efficiency and performance of the materials. Without going into too much detail about the numerous international debates on the construction of the Canopée des Halles in Paris (fig. 3), I would like to emphasize that in designing this work, because of its complexity and the constant search for approval, the designers evaluated numerous material solutions, finally selecting products that respect the structure, guarantee high performance and ensure a balanced aesthetic ratio with the context.

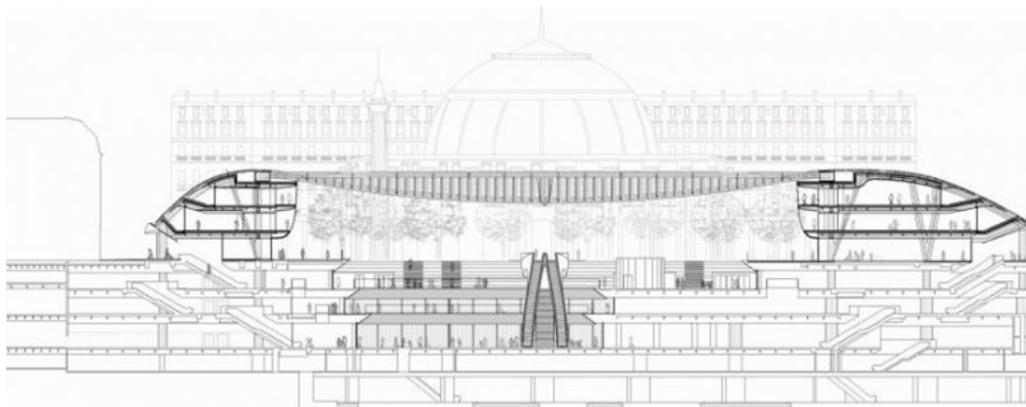


fig.3  
**Forum des Halles**  
 Paris, France | 2016 | Project section | © Berger Anziutti Architectes

The three engineering works mentioned in the previous paragraphs (King's Cross St. Pancras in London, Oculus in New York, and Chatelet Les Halles in Paris) have been selected as international examples of large transport hubs which, in their sectional development, demonstrate the complexity of the interconnections and show how the internal space is not only the result of structural choices but the real core of the hub. These international case studies will therefore be compared with three Italian case studies: Tiburtina Station in Rome (fig. 4), Garibaldi Hub in Naples (fig. 5), Stazione Centrale Milano in Milan (fig. 6), in which a very different design and logistics approach is found.



fig.4  
**Stazione Roma Tiburtina**  
 Rome , Italy | 2011 | Project section | © ABDR Architetti Associati

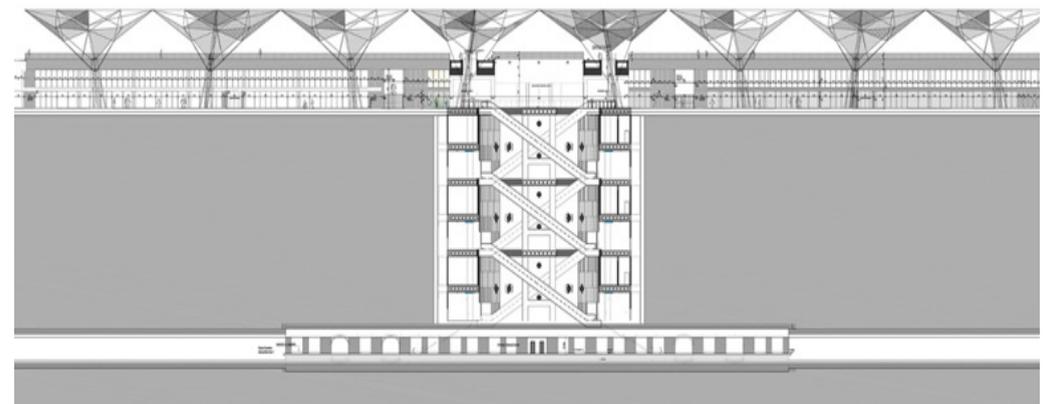


fig.5  
**Piazza Garibaldi Hub**  
 Naples, Italy | 2016 | Project section | © Dominique Perrault Architecture

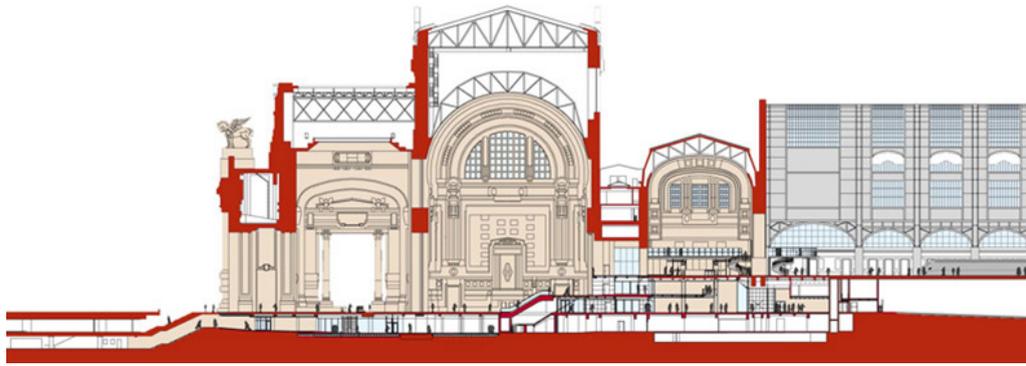


fig.6

Stazione Centrale Milano

Milan, Italy | 2010 | Project section | © Ingenium Real Estate - Marco Tamino e Fabrizio Graziani

“When the point of contact between the product and the people becomes a point of friction, then the industrial designer has failed. On the other hand, if people are made safer, more comfortable, more eager to purchase, more efficient — or just plain happier — by contact with the product, then the designer has succeeded.” In his 1955 book *Designing for People*, Henry Dreyfus makes us aware of how the success of a product (in this case a hub) lies in the satisfaction and comfort perceived by the user by placing greater emphasis on the importance of the design product experience. One of the objectives of the research is to investigate the characteristics of the internal space of the hub and how it is firstly designed and subsequently experienced. The questions arising from this investigation want to focus on the interaction between the hub and the user, and in particular on the design of the interior space and its use. How far, then, does the quality of the hub’s interior design affect the user experience? Could a correct and preventive analysis of the user experience guarantee a more efficient design of these complex structures? Which design solutions can universally guarantee a satisfactory user experience in the hub?

The research applies a user-centred design methodology called ‘contextual inquiry’, in which the user is observed and involved in the researcher’s processing of the data. The user and the analysis of the context are the starting points of the investigation. Direct observation of the case studies, on-site visits, and a careful study of the bibliography, as well as the involvement of figures who have played a key role in the design of these structures, constitute a fundamental contribution to answering the questions. In order to better understand the interaction between the user and the space, we turned our attention to an ethnographic research method, based on the researcher’s analysis of the symbolic and relational dynamics observed in specific contexts of use and consumption, in this case in hubs. This method of

observation analyses the use of space and the ways in which it is used by groups and communities, whether large or small, more or less structured, and subsequently provides the researcher with qualitative data of extreme importance for improving or modifying the design approach in these socio-spatial contexts. For each of the case studies, test groups will be defined in which the participants will be divided into expert users (those who frequent the hub spaces on a daily basis) and non-expert users (those who do not frequent the hub on a daily basis). The group of experts will be asked a series of questions in order to understand the interaction between space and user, while the non-experts will be given a short guided experience in the hub and then asked questions. This type of observation, which is very close to the anthropological field, requires the researcher to be immersed in the context of analysis, to become familiar with it and to become part of it, so that the information will be collected and processed in a more natural, spontaneous and therefore more faithful to reality way. The results of the survey will form a basis of fundamental importance for the definition of general guidelines in the design of future hubs and the adaptation of existing ones.

Underground hubs, intended as places of interconnection between flows of people, information and transports, constitute a sort of unique “ecosystem”, regulated by well-defined balances, whose alteration could lead to the malfunctioning of the entire network. Precisely for this reason, these spaces are designed with attention to every minimum detail, without neglecting the needs of anyone and trying to guarantee users maximum comfort in terms of well-being. But often in these complex spaces engineering or design choices have prevailed, without taking into account possible implications on the environment, or vice versa on the effects of the environment on this “urban ecosystem”. Hubs can be both an advantage in spreading positive messages of sustainability and a disadvantage in terms of consumption and waste produced by the hub itself. The future action to be taken will be to enhance the hub as a meeting place for the masses and concentration of transport services, improving its performance from an environmental point of view by making increasingly sustainable design choices. This last thought might appear off-topic, but I believe that in order to understand the effects of hubs on user experience, it is essential to consider both endogenous (with the user) and exogenous (with the environment) interactions, defining a hub model as a generator of positive experiences.

The conclusion of the research sees the elaboration of design guidelines that consider not only the space but also the relationship between it and the user inside the hubs, with reference to the components light, form and matter, and their variation from the surface to the underground. In support of this decalogue, design components will be extrapolated from the case studies that would allow to exemplify metaprojectually each of the guidelines.