

Public (transport) space

Public transport hubs as an integral part of an open city

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Abstract

The role of public transport in our mobility patterns is becoming increasingly important. In our transition to curb global warming and halt biodiversity decline, public transport stations and hubs in particular will play a larger role in our daily mobility. This will also elevate public transport hubs as significant public spaces. Currently, these hubs primarily focus on efficient people flows, which limits their capacity to function effectively as public spaces. Moreover, transport hubs are often surrounded by spatial boundaries that physically and socially divide the city around them. For these areas to become genuinely public and accessible to everyone, they require transformation. This paper uses the open city concept as a guide to establish design principles that facilitate stations acting as connectors rather than dividers. The five elements from the open city are connected to other theories that have similar objectives, including the elements of the city and theories about people-oriented public spaces, and applied to the specific conditions of public transport hubs. Subsequently, the theories are operationalised and tested by identifying them in three case studies: Rotterdam Centraal, Piazza Garibaldi, and Stadelhofen Bahnhof. This process identifies how the open forms can be integrated into public transport hubs on both urban and architectural scales under specific site conditions. This demonstrates that current stations exhibit various examples of open forms; however, as a whole, the application of these open forms remains limited. It also underscores the importance of embedding public transport hubs within their context by responding to specific site conditions.

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1. Introduction

As we realise that our current mobility patterns and life in cities exacerbate the climate crisis and biodiversity decline, public transport is receiving increased attention as a means to reduce our environmental impact. The public transport hub is being valued once again as a central part of our mobility, connecting people within cities and across national borders. It is becoming one of the most central places in our cities. Therefore, it has great significance as a public space where people can meet and interact.

How to deal with this increased importance? The current public transport hub is public, yet mostly not designed as a public space. It is not widely recognised as an important public space and is mainly focused on the efficient transfer of people. This monofunctional use prevents these hubs from becoming an integral part of the city and limits the use of this public space. Moreover, public transport hubs have usually been assembled over time, with more modes of transport added without attention to the boundaries created with this new mobility infrastructure. While the connections on a larger scale, within the city, region, country, or abroad, have improved, the connections on a local scale have deteriorated. This creates physical barriers, but also symbolic and social barriers between parts of the city (Eldijk & Anciaes, 2024). One approach to both improve the public character of stations and mitigate these boundaries is the open city concept. The open city stems from the ideas of Jane Jacobs and has been further developed by Richard Sennett (2006, 2018). It opposes the closed city, which is governed by integration and equilibrium, and instead embraces complexity, diversity, and disorder. This allows cities to grow organically and enables people to participate in gradual changes. As the public transport hub takes on this more important part of our public space, it should also become open. Therefore, the following question will be addressed:

How can the open city concept be operationalised to inform the design of an open public transport hub?

First, the five open forms that Sennett (2018) proposes to create an open city are examined. The open forms are then linked to other theories about the public space that have similar objectives, which could therefore also contribute to creating an open city. This results in a more comprehensive set of design principles for an open city. Furthermore, the application of these design principles to public transport hubs is discussed. This theoretical research is then complemented by three case studies of public transport hubs: Rotterdam Centraal in the Netherlands, Piazza Garibaldi in Naples, Italy and Stadelhofen Bahnhof in Zurich, Switzerland. These case studies are used to test the theories and investigate the degree to which public transport hubs can already be considered open. The paper concludes with an outline of its findings and provides recommendations for further research.

2. Five open forms for public transport hubs

In his book *Building and dwelling: ethics for the city* Sennett (2018, p. 205) attempts to create a design guide for an open city, proposing five open forms: Synchronous, Punctuated, Porous, Incomplete form and Multiple. These open forms provide a framework for an open city; however, they do not yet offer concrete design principles or inform the design of an open public transport hub. To better understand how these open forms can be applied to cities and public transport hubs, they are compared to other theories with similar objectives. This methodology is illustrated in the theoretical framework of Figure 1. This literature review results in a more elaborate set of design principles that can be used to make public transport hubs more open.

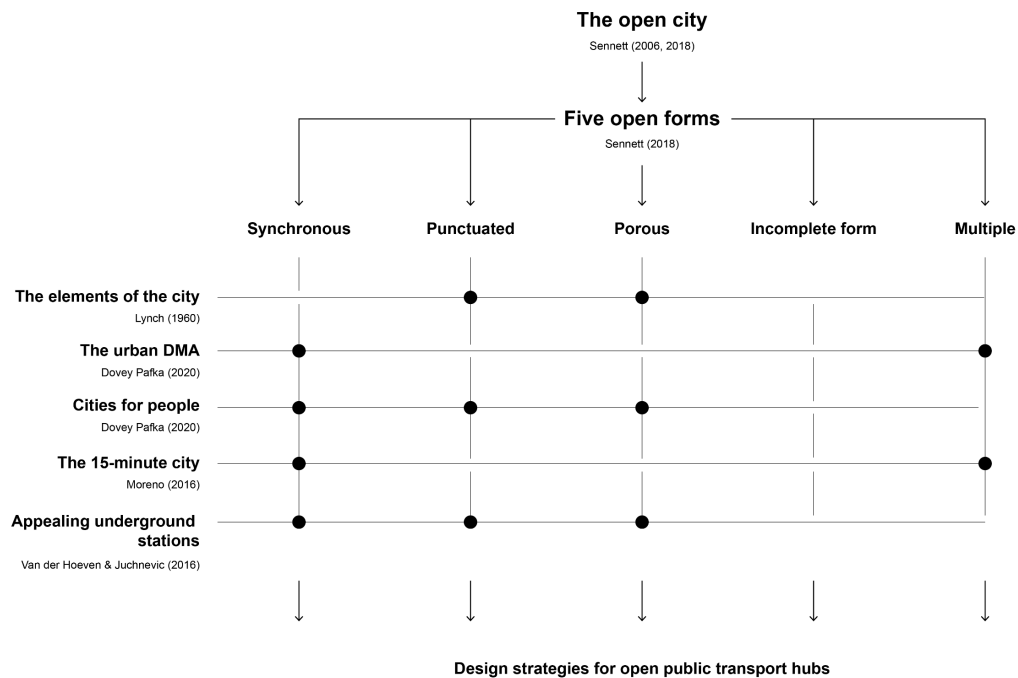


Figure 1: Theoretical framework

2.1 Synchronous

Sennett (2018, p. 206) pleads for a synchronous centre, where different activities can occur simultaneously, as opposed to sequential spaces, where activities are more organised and take place one after another. A synchronic space should invite people to use the space in different ways. The space should, however, also give some directions on how to use it to ensure different activities can happen side by side without interfering with each other.

Walkability can be considered one of the prerequisites for a synchronous space. For people to employ different activities simultaneously, they have to be in the same space. Walkability, however, is a broad and imprecise concept influenced by many factors. Dovey & Pafka (2020) focus on the morphological conditions that enable a walkable urban environment, because the urban form is very persistent and therefore needs careful consideration. They summarise these morphological conditions into the Urban DMA, which stands for: density, mix and access. Density creates concentrations of buildings and people; a mix of functions and activities brings the places we want to be closer together; and access allows us to reach these places. These three factors closely relate to creating synchronous spaces.

A synchronous centre also has much in common with the theories set out by Gehl (2010) in his book *Cities for People*, where he describes the importance of designing the built environment for the human dimension to achieve lively, safe, sustainable and healthy cities. He argues that this can be achieved by designing public spaces that encourage walking, cycling and staying. By walking, we not only go from point to point, but we can engage with other people, exercise, play, recreate and shop (ibid., p. 6, 19). Gehl (ibid., p. 232) proposes five strategies to attract people in public space: assemble, integrate, invite, open up and increase. He calls for assembling functions to shorten distances. Through the integration of functions, he aims to create more variation in the city. Furthermore, people should feel invited to use public space, which can be achieved through safe conditions for pedestrians and cyclists. By opening up building edges between buildings and the city, more interaction can take place. Lastly, he calls for public spaces that increase the time people spend in them by providing opportunities to stay and linger.

The idea of the 15-minute city is another example of a strategy that helps to achieve synchronicity. The 15-minute city aims to provide daily needs and services in the city within 15-minute travel time by foot, bike or public

transport (Moreno, 2016). This can be linked to the urban DMA, since the 15-minute city will require a mix of functions and good accessibility.

The public transport hub can be regarded as an integral part of achieving synchronous space. Access will be improved through the connections that hubs establish. For example, Wolański (2023) emphasises the importance of public transport in achieving a 15-minute city. He shows that while a mixed-use neighbourhood can provide basic day-to-day services, people will often still travel longer distances for school or work. Therefore, he argues for a transit-oriented development 15-minute city in which the transport station is the centre of a multifunctional walkable neighbourhood.

Summarising the above theories, a public transport hub can become a synchronous space by making it a central part of a neighbourhood. Through the Urban DMA, neighbourhoods will have the morphological prerequisites to become synchronous, while Gehl's strategies help to attract and keep people in and around the public transport hub. Moreover, the 15-minute city strengthens the position of public transport hubs as a central mobility point, making it a natural point of confluence.

2.2 Punctuation

"The holy grail of urban design is to create places which have a particular character." (Sennett, 2018, p. 211). This particular character is determined by a collective image people hold of places. Lynch (1960, p. 46) describes in *The image of the city* a set of elements that define the city's physical form and create distinct areas. He categorises these forms into: paths, landmarks, edges, nodes and districts. While Lynch's elements focus more on how we give structure to and store a mental image of the whole city, with punctuation, Sennett highlights more how the city is read and perceived through experiencing the city. For example, Lynch's (1960, p. 48) element landmark can be related to the exclamation point Sennett (2018, p. 212) describes. Both stand out and create a marker, providing a sense of orientation. Sennett describes it as a visual marker and way of orientation, while Lynch focuses more on how it contributes to our mental image of the city. Both theories are thus strongly related and supplement each other by giving a more comprehensive idea of how we perceive the city. This is supported by Van der Hoeven & Juchnevic's (2016) research into how the design of urban underground stations can be made more appealing. One of the design concepts they have identified is the canopy. The canopy is a powerful way to highlight the entrance of an underground station to users, creating an exclamation point.

In conclusion, by applying punctuation in the city, public transport hubs can become more emphasised and open towards their surroundings. This can be further strengthened by adding punctuation in the design of public transport buildings, shaping the station into a landmark.

2.3 Porous

With porous Sennett (2018, p. 218) describes the permeability of urban edges, both spatial and psychological. He distinguishes two types of edges: borders and boundaries. While borders are porous membranes that allow for interaction between their two sides, boundaries create impenetrable barriers that restrict access. He argues for the creation of borders that stitch together different parts of the city to create a more complex and open whole that has greater interaction between its parts. This porosity can be achieved by designing these edges so they attract people from both sides. For example, by placing a market on the edge that attracts people from both sides, interaction between people from either side increases.

Public transport is both part of the problem and the solution. Eldijk & Anciaes (2024) describe how public transport infrastructures often act as boundaries, fragmenting the city. Public transport hubs are therefore often situated at the edges of parts of the city. Public transport hubs can mitigate this boundary effect by becoming places of confluence, attracting people from both sides.

Edges can also be identified in buildings, for example, between indoor and outdoor. These edges can similarly act as boundaries or borders, attracting people and creating interaction or keeping people out. Gehl (2010, p. 75) argues for these edges to be porous, or soft, as he calls it. A soft edge sets the stage for interaction between building and public space. He therefore calls for these edges to have open, interactive, interesting and varied appearances. This can also be applied to public transport hubs. Through the increase in openings and placement of activities and functions on the edge between indoor and outdoor spaces of the station, the edge will become more porous and lively. This is supported by Van der Hoeven & Juchnevic's (2016) research into the appreciation of underground stations. They uncovered that by creating more seamless transitions between the station and the city, the appreciation of the station will increase. This can be done through the use of canopies at the entrance of stations and the incorporation of city functions inside the station.

In conclusion, on the city scale, the negative effects of boundaries created by mobility infrastructure can be counteracted through the use of stations as a porous membrane. This works through the design of the edges of the public transport complex. Its connection between indoor and outdoor should be designed as a porous membrane to soften the barrier and increase interaction through open, interactive, interesting and varied appearances.

2.4 Incomplete form

With an incomplete form Sennett (2018, p. 228) describes the need for an open built form that can be altered by people. He argues for adaptability and the ability to gradually construct a building guided by changing needs through the use of the shell and the type form.

The shell provides a form that allows it to be built upon and for a variety of alterations to be made without affecting the shell structure. The building is not presented as something finished, but as an invitation to adapt the building to changing needs. When translating this to a public transport hub, this can take the shape of a station complex that embraces alterations. For example, over-dimensioning spaces or structural elements, so they can be filled in or built upon at a later point.

To balance the endless variations and overbuilding of the shell Sennett (2018, p. 231) describes the type-form, which has inherent prerequisites and qualities while allowing for different alterations within a set domain, depending on the context and circumstances. This can be translated to, for example, the entrance hall of a station. While the entrance hall has several fixed necessities such as ticket machines, waiting areas and the display of timetables, it can take different shapes to allow for commercial activity, the assembly of people or its use as a community centre.

2.5 Multiple

There is no one way to design the open city. An open city is inherently interwoven with its urban and social context. With the fifth open form, 'multiple and seed-planning', Sennett (2018, p. 235) describes the need to embrace differences between different parts of the city and create a multiplicity of open cities. He argues for seed-planning, related closely to the type-form, which encompasses the planning of generic forms and allows the context and circumstances to shape the incomplete form into a unique design that reflects its context. This idea of multiple is also embedded in the Urban DMA (Dovey & Pafka, 2020). Instead of one calculated ideal ratio of mixing, it aims for a mix of mixes. A public transport hub should therefore not look the same everywhere, but respond to the needs of the neighbourhood around it. While some stations might become interwoven with a shopping centre, others may perform a role as a community centre. Urbanism and architecture firm De Zwarte Hond also emphasises the need for a variety of station types that take on a different role in their urban context, making a distinction between urban transport hubs and countryside train stations (Zandbelt & Van Dongen, 2024, p. 65).

3. Operationalising the five open forms

The five open forms have now been translated into a public transport hub. This chapter identifies the open forms in existing hubs and assesses their performance as open public transport hubs based on the design principles that come out of the five open forms and related theories.

3.1 Centraal Station, Rotterdam

Rotterdam Centraal is the city's main public transport hub, located in the centre of Rotterdam, the Netherlands. The station is a major hub for regional, intercity and international trains. It also serves a large role as a hub on the city and metropolitan scale through the several tramlines and two metro lines that run past the station. Furthermore, the station includes several city bus and international bus stops. The station has a strong north-south orientation and is flanked by two very different parts of the city. The north side of the station has buildings of three to four storeys with predominantly residential functions. The south side, on the contrary, has a very urban character with a large mix of functions and several high-rise buildings of up to 40 storeys.

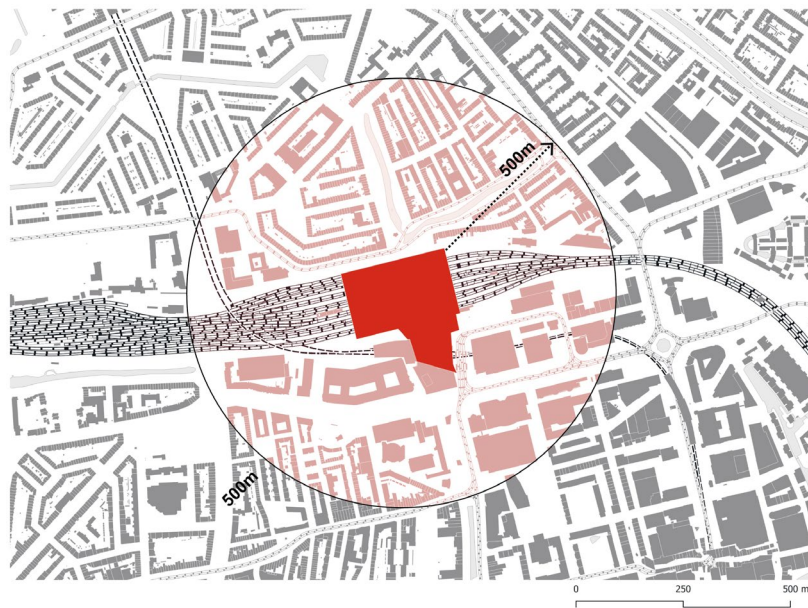


Figure 2: Rotterdam Centraal with surrounding city and a 500m radius highlight.

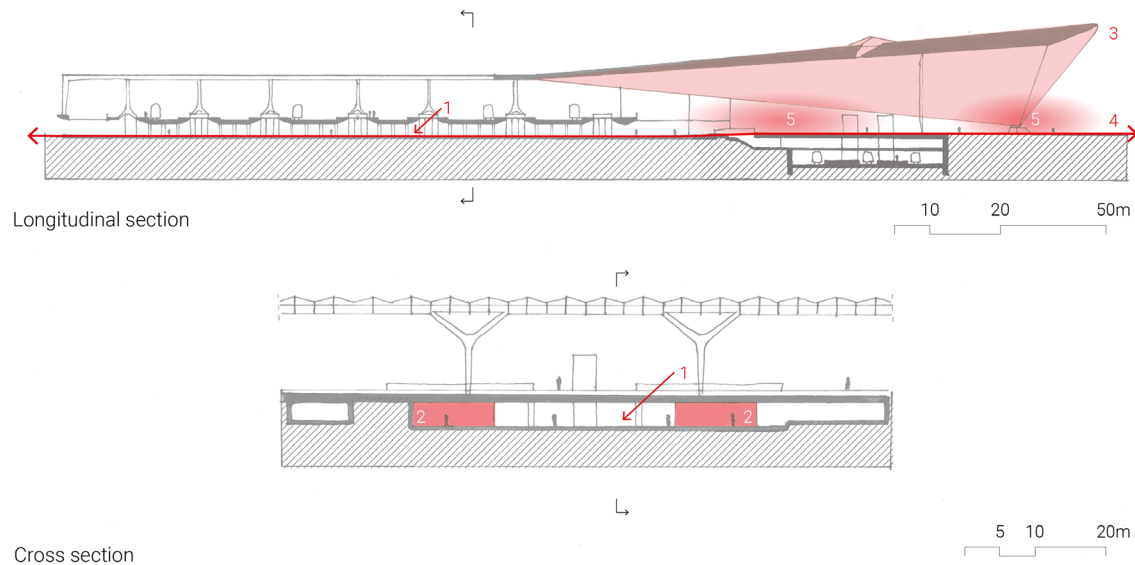


Figure 3: Sections Rotterdam Centraal.

1. Intervisibility and light create punctuation improving navigability
2. Commercial functions in and around the station improve the porosity between the city and the station
3. A canopy creates punctuation
4. The station forms a path connecting the two sides
5. The large canopy defines both an indoor and outdoor square.

Synchronous

When examining the synchronicity of the area around Rotterdam Centraal, we can review the density, mix and access of the area. The station has a high density directly around the south entrance because of the several high-rise buildings that flank it. The buildings directly around the station mainly contain office spaces. When reviewing the larger circle around the station, the mix of functions becomes greater with residential and office towers situated above commercial plinths. The area around the station is very much oriented to pedestrians and cyclists, with wide zebra crossings and lots of pedestrian space. However, the urban grid is composed of very wide city blocks, limiting the penetrability of the city, as can be seen in Figure 2. Moreover, the station itself creates a large barrier between its two sides, with only two nearby passages crossing the tracks. The north side of Rotterdam Centraal has a significantly lower density. There is also a lower degree of functional mix, with predominantly residential functions and some commercial functions in the plinths of buildings. The area outside the station is pedestrian- and cyclist-friendly; however, access throughout the area is limited because of the long city blocks (Figure 2).

The synchronicity of the station itself can be examined by the degree to which it allows different activities to happen simultaneously. One way in which it allows for other activities is the incorporation of commercial functions inside the station (Figure 3). The entrance hall of the station (Figure 3) is another way in which this happens. The hall can be viewed as an extension of the public square outside the building and can be used as such. This is illustrated by its frequent use for protests.

Punctuated

Rotterdam Centraal has a large canopy on the south entrance of the station, which can be seen in the longitudinal section of Figure 3. The canopy extends across the square in front, making a grand gesture towards the city. This can be described as an exclamation point, as it creates a striking point of reference. Moreover, the canopy creates a strong visual direction pointing south. This is reinforced by the square in front, which also flows in a southern direction. This can be described as a colon, powerfully announcing to people: this is what you should focus on. In contrast, the other side of the station has a more introverted entrance that responds to the more calm and residential character of its surroundings. This side can be regarded as a semicolon, because people enter underneath a covered structure, creating a small threshold.

Another example of punctuation can be found at the transition between the access passage and the platform. Through the use of what can be described as intervisibility and architectural light (van der Hoeven & Juchnevic, 2016) the access to the platforms is highlighted, see highlight 1 in Figure 3. This can be considered a question mark, emphasising the choice of direction that people have to make to either continue or take the stairs to the platform.

Porous

The area around Rotterdam Centraal has a very strong edge condition that is created by the station. The wide tracks form a significant boundary between the north and south sides of the station. The porosity between these two sides is limited. For one, because only two crossings within 500m of the station connect the two sides. Secondly, one of these crossings is inside the station and is restricted through the use of ticket gates (Figure 3). The commercial functions inside the station can attract a variety of customers, these functions mostly cater to public transport users.

The station complex itself also has an edge condition between the station complex and the public space outside it. The longitudinal section shows that the south side entrance hall acts as an extension of the public square outside of the station. It is only separated by a light glass facade, creating a small threshold. This main square also has several commercial functions, attracting people other than public transport users. This creates a soft transition between the city and the public transport hub.

Incomplete form and multiple

When assessing Rotterdam as an incomplete form, its large canopy structure can be described as a shell because it allows for an infill with other functions. However, the building has already been filled in with a fixed program. Moreover, the highly controlled nature of the station limits a more disorganised and informal use of the space.

As type-form of a station complex, Rotterdam Centraal is a good example of the multiple forms a public transport hub can take. Its form is directly related to the station's unique context, with the large canopy on the south side responding to the highly urban city centre and the north side blending in with the low-rise residential neighbourhood.

3.2 Piazza Garibaldi, Naples

The Piazza Garibaldi metro station and sunken commercial passage are located in the centre of Naples, Italy, on a square of the same name. The passage runs from east to west, with the main entrances located at either end and two additional entrances positioned midway along the passage. It also connects to the city's central train station, which is served by commuter, regional and high-speed trains. The square is flanked by the train station to the east and other buildings rising five to ten storeys high and offering a diverse mix of functions in all other directions.

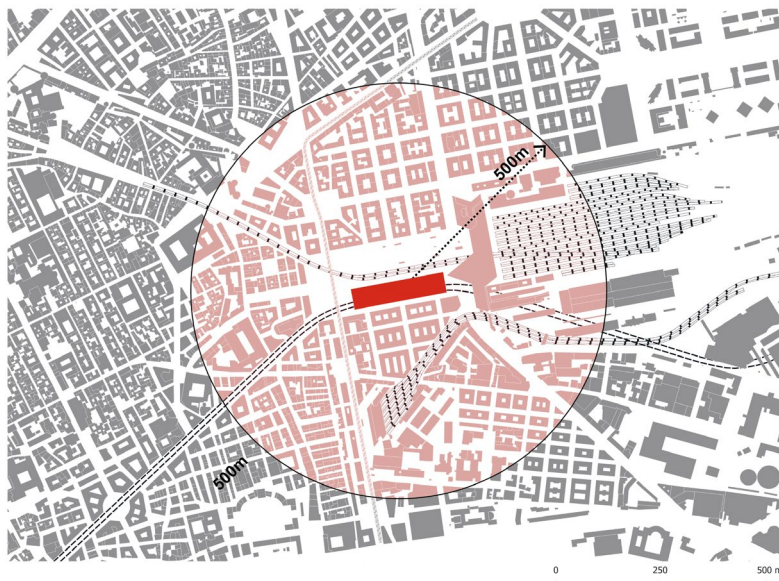


Figure 4: Piazza Garibaldi with the surrounding city and a 500m radius highlight.

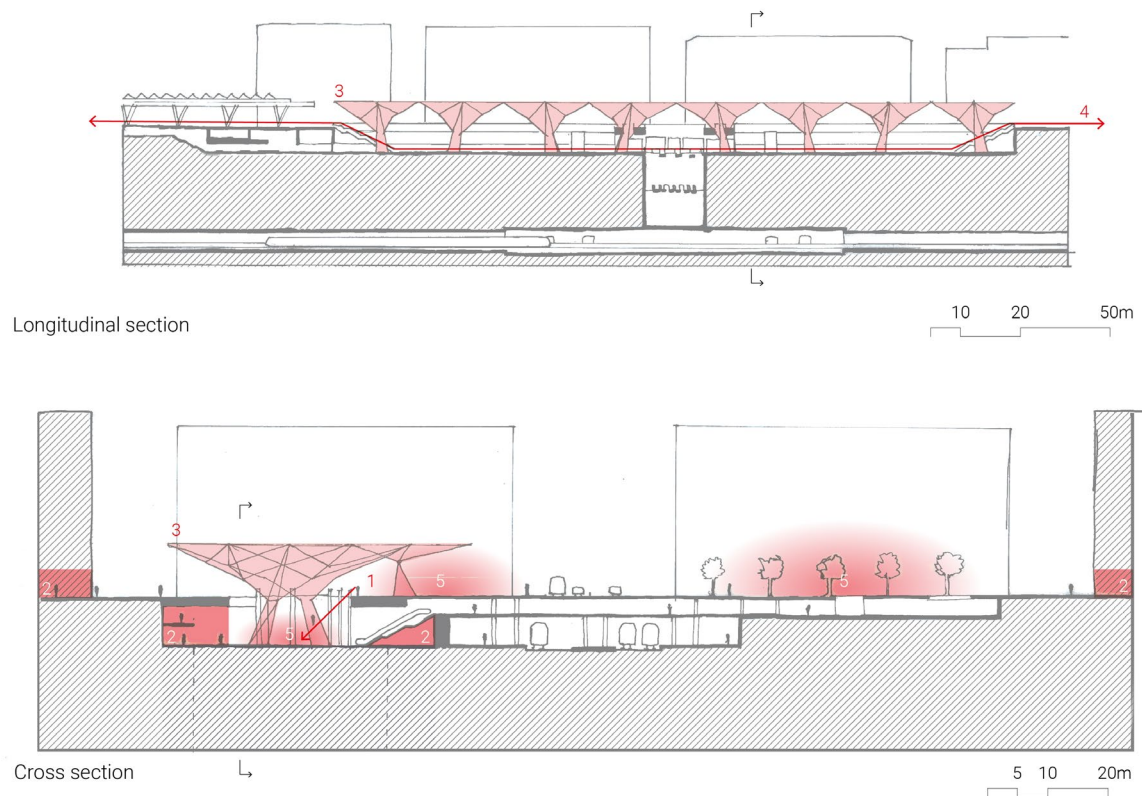


Figure 5: Sections Piazza Garibaldi

1. Intervisibility and architectural light create punctuation improving navigability
2. Commercial functions in and around the station
3. A canopy defines the station
4. The station's main access points are on either side of the passage
5. The station defines both an indoor and outdoor public square.

Synchronous

When assessing the synchronicity around Piazza Garibaldi, we consider the density, mix and access of the area. The station is located in a densely built part of the city with a tight urban grid and buildings rising on average five to eight storeys. The station is surrounded by a high diversity of functions. The passage is surrounded by a large square that has a lot of pedestrian space, and the relatively small urban grid creates a variety of routes, improving access. However, the square is surrounded by roads that limit accessibility for pedestrians.

The incorporation of commercial functions inside the station, which can be seen in the cross-section of Figure 5, contributes to the synchronicity of the station complex. However, access to the sunken passage is limited to only four vertical access points. Moreover, the station is not part of a larger route connecting the city, limiting the users of the sunken passage to public transport users and people who specifically visit one of the commercial spaces.

Punctuated

The longitudinal section in Figure 5 shows the large canopy that is placed over the sunken passage. This can be considered a clear way of punctuation because the characteristic roof structure attracts attention. It therefore acts as an exclamation point, placing focus on the entrance to the metro station.

Another example of punctuation can be found in the materiality of the sunken passage. The facades of the sunken passage are all clad in black panels, creating a stark contrast with the above-ground facades. This can be described as quotation marks emphasising the passage.

Porous

The area around the passage has a strong edge condition due to the Piazza Garibaldi square, where several of Naples' main streets converge. The public transport hub contributes to this edge, functioning as a porous membrane because it attracts public transport users from all over the city. However, while the square is bordered by

several commercial functions, the square itself lacks a pull factor to attract other users. The square's role as a porous membrane is further complicated by car-centric roads that create boundaries around it. The station's role in bridging these boundaries is limited because it only provides an underground crossing for one of them. Moreover, the sunken passage acts as a boundary due to the limited number of crossings over it.

When reviewing the station's porosity, the underground passage can be seen as an edge between the metro station and the square above. By incorporating commercial functions along the passage, the city is brought into the station, attracting shoppers. The passage entrance also acts as a boundary for people trying to cross the square. Furthermore, the passage is located in an area of the city with a variety of uses, including many commercial functions at ground level. This reduces the pull factor of the commercial functions within the passage. It can therefore be concluded that the passage's performance as a porous membrane is limited.

Incomplete and multiple form

The canopy structure of Piazza Garibaldi can be considered a shell structure, as it allows for a variety of uses beneath it. However, the space underneath the canopy has already been filled with built structures, so it is difficult to add anything to it.

Piazza Garibaldi is not a strong example of an open public transport hub. While the station is specific in the way it connects with the mobility infrastructure, its relationship with the urban context is weaker. The design of the passage as a commercial street is less convincing, given that the square is already surrounded by commercial activity. Furthermore, the passage solely provides access to the public transport hub and is not integrated with an urban route, which would make it more embedded in the context.

3.3 Stadelhofen Bahnhof, Zurich

Stadelhofen is a medium-sized public transport hub in the centre of Zurich, Switzerland. It is served by many suburban trains as well as trams. The station can be accessed on the southwest and northeast sides, however, it is situated on the edge of a steep elevation change and therefore is mainly oriented towards the southwest. On this side, the station is bordered by a square that extends to Lake Zurich. The square is bordered by buildings rising around five storeys high, with a diverse mix of functions. On the northeast side, the station borders a neighbourhood with a more residential character and more detached buildings rising around three storeys.

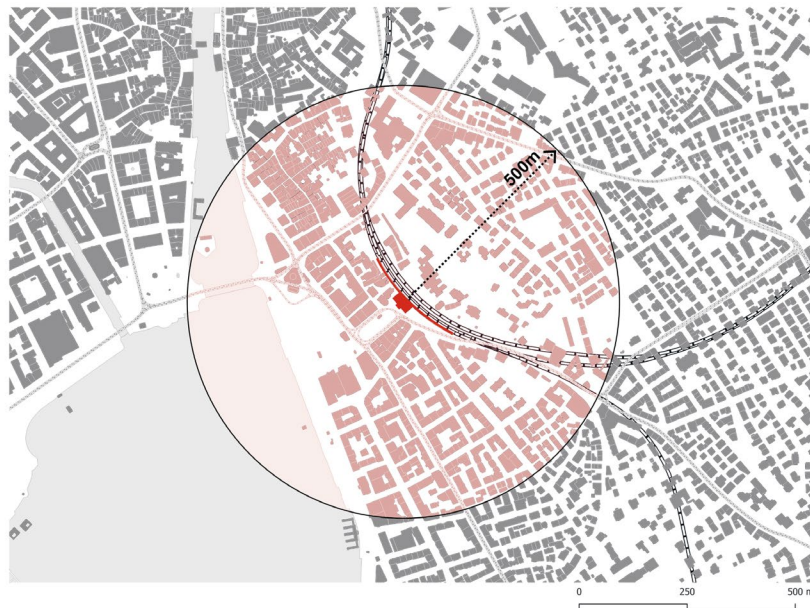


Figure 6: Stadelhofen bahnhof with the surrounding city and a 500m radius highlight.

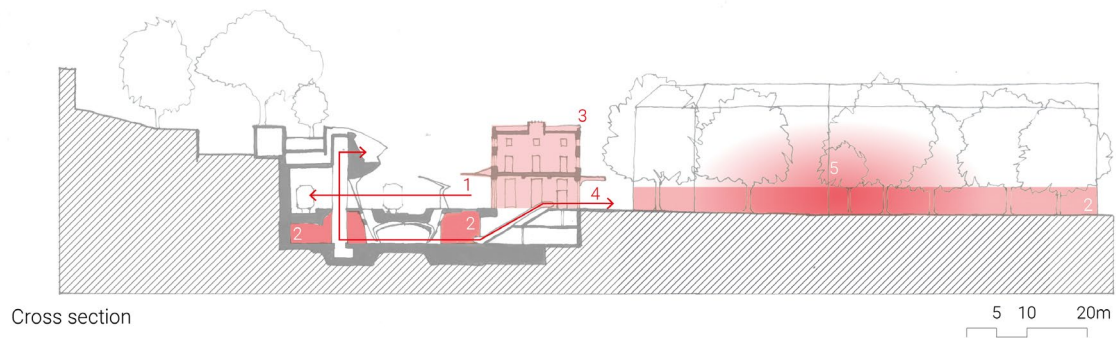


Figure 7: Section Stadelhofen bahnhof

1. Intervisibility and light penetration provide orientation, helping with navigability
2. Commercial functions in and around the station contribute to a synchronous space
3. The archetype station building defines the station and creates recognition.
4. The station forms a path connecting its two sides
5. The station flows into a public square

Synchronous

When we look at the degree of synchronicity in the area around Stadelhofen, we will again consider the degree of density, mix and access. The southwest side has a high building density with a tight urban grid and closed building blocks that rise around five storeys high. There is a high degree of functional mixing with commercial functions in the plinth and residential and office functions situated on higher floors (see Figure 7). The area is pedestrian- and cyclist-friendly and has a small urban grid, which creates a high degree of access. The northeast side, on the contrary, is characterised by detached buildings that are around three storeys high. The level of functional mix is lower, with mainly residential buildings and a school. Moreover, the degree of access is significantly lower because of large plots and several dead-end streets. The conditions for synchronicity are thus much better on the southwest side of the station than on the northeast side.

The conditions for synchronicity inside the station are less favourable. This is partly caused by the limited amount of space inside the station. While it does incorporate commercial functions, bringing people inside the station, this commercial space is only part of the access to the platforms and is not part of an urban connection. This reduces the number of people who pass by these shops. Secondly, the shops mostly cater to the public transport user, reducing appeal for other customers.

Punctuated

Punctuation in the area around the station can be identified in the square in front of it. The square creates a pause in the rhythm of movement, because people have to decide which direction to go in. This can be considered a comma because it makes people more aware of their surroundings and forces them to make a choice. The main station building, highlighted in the section of Figure 7, can also be considered an example of punctuation. It is an archetype of a train station building, which creates instant recognition. This can be described as quotation marks that place emphasis on the square.

Porous

The area around Stadelhofen has a strong edge condition because of the sudden shift in elevation that occurs around the station. This edge is further strengthened by the tracks that create a boundary. Therefore, the station itself can potentially work as a porous membrane between the two sides of the station. The station integrates several under- and overpasses that bridge the tracks and the difference in terrain, providing physical connections. However, for an edge to work as a porous membrane, it has to attract people from both sides. While it does attract public transport users from both sides, it does not attract a lot of people inside the station, because the commercial functions inside the station are mostly aimed at passers-by and do not have a strong pull factor. If we consider the square in front of the southwest entrance of the station part of this edge, it can be argued that it will act more as a porous membrane. The variety of functions and services will probably attract people from the other side of the station. However, this interaction would be mostly one-way, as the interaction does not take place the other way around.

Incomplete form and multiple

Stadelhofen is designed as a gesamtkunstwerk featuring custom-designed canopies and catenary. Furthermore, the building is fully embedded in the landscape. This allows for only minor alterations. It can, therefore, not be regarded as a shell structure.

Stadelhofen can be considered a prime example of the multiple forms a public transport hub can take in the way it responds to the two sides of the station. It opens up towards the southwest side and fits in with the very lively part of the city that has a high level of accessibility and a mix of functions. On the northeast side, it blends in with the topography and connects to the more park-like area by allowing greenery to creep over the station. However, its underground spaces with commercial functions lack a strong relation with the context. They do not complement the area, because there is already a lot of commercial activity. Furthermore, there is a lack of integration with the existing urban fabric.

4. Conclusion

This paper has addressed the question: how can the open city be operationalised to inform the design of an open public transport hub? An examination of the five open forms and related literature has shown that there are already many design principles that correspond with the five open forms and can help achieve an open city. While the Urban DMA helps establish synchronicity, the design principles of Gehl also help to create more porous edges in the city. Specific applications of the open city to public transport hubs are more limited, however, the principles for the design of public spaces and buildings can be used in public transport hubs. Investigation of the case studies has shown that while public transport hubs employ some open forms, it is mostly limited to the punctuation of the station complex as an exclamation point and the incorporation of some commercial functions, which may attract different users to the station. The research also shows that there is no one way to design a public transport station. The station must be embedded in the context, responding to specific urban conditions.

This paper is limited in its ability to uncover how public transport hubs can be made more open. Sennett explains the basis of the five open forms in his book, but the ways in which these forms take shape are myriad. Moreover, there will be many other theories that relate to urban design and planning that also follow the logic of the open forms. Further linking these theories would create a more extensive set of design principles. The size of this paper has also limited the ability to uncover all the ways in which the case studies employ principles of the five open forms. Both a more qualitative and a quantitative analysis of case studies would be needed to create a more comprehensive set of principles for open public transport hubs.

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