ID 1473 | USING BOUNDARY OBJECTS TO MAKE STUDENTS BROKERS ACROSS DISCIPLINES - A DIALOGUE BETWEEN STUDENTS AND THEIR LECTURERS ON BERTOLINI'S NODE-PLACE-MODEL AND INTERDISCIPLINARITY

Lukas Gilliard1, Fabian Wenner[1], Gal Biran Belahuski[2], Elisabeth Nagl[3], Anna Rodewald[4], Fabian Schmid[4], Maximilian Stechele[4], Michael Zettl[3], Michael Bentlage[1], Alain Thierstein[1]
1 Technical University of Munich, TUM Department of Architecture, Chair of Urban Development
2 Tel Aviv University, The David Azrieli School of Architecture, Student of the BA Architecture Studies programme
3 Technical University of Munich, TUM Department of Architecture – Landscape and City programme
4 Technical University of Munich, TUM Department of Architecture, Student of the MA Architecture programme
l.gilliard@tum.de

ABSTRACT: Competencies required for steering urban development sustainably are scattered among various disciplines. Most prominently, this has been acknowledged by the growing community of planners in the field of transportation and urban development promoting an integrative approach known as transit-oriented development (TOD). Disciplinary traditions including different ways of thinking and doing as well as a strong vertical organisation of public administration form major obstacles for TOD and other interdisciplinary approaches to urban development. The implementation of TOD principles in plans and planning policy is usually dependent on strong actors brokering across disciplinary and departmental boundaries (Thomas and Bertolini, 2017: 145). "Boundary objects" (Wenger 2000) can help sustaining the effort of individuals promoting integrative planning approaches against institutional and disciplinary rigidness. These objects allow practitioners of different disciplines to discuss common challenges without constant guidance of experts in multiple disciplinary fields. The development of boundary objects is therefore crucial in order to support current "brokers" (ibid.) and provide continuity when brokers are unavailable. We believe that the node-place-model (NPM) by Bertolini (1999) can be such a boundary object. We test our hypothesis as part of two design studio courses confronting urban design students with the task of developing their own design brief based on a node-place-analysis – a systematic quantification of both accessibility and activity at transit stations. We conducted the course twice while testing our approach on two scales: a city-wide node-place-analysis of the City of Munich with the goal of designing a small city quarter and a node-place-analysis of the entire metropolitan region of Munich with the goal of developing a spatial strategy for the City of Ingolstadt, a key economic node within the metropolitan region. The paper is of dialogic, discursive nature. The lecturers and the students discuss whether or not the node-place-model enables us to understand better the relationship between transit and urban development and to develop spatial strategies based upon an integrative approach. Our discussion reveals that the node-place-model, despite of or perhaps due to its compelling simplicity, cannot necessarily bridge disciplinary boundaries successfully. The model does not comprise mechanisms about how both domains are qualitatively linked. It simplifies node and place into quantitative variables without providing sufficient guidance on operationalisation. Operationalising the model is often subject to misinterpretation. The schematic quantitative nature of the model incites users to blindly apply calculated results. We therefore reject our hypothesis and conclude that the node-place-model may not be suitable as a boundary object in planning practice. Due to above mentioned shortcoming, it cannot serve as a common tool across disciplinary boundaries. However, both lecturers and students see value in the model as a didactic instrument. It initiates food for thought during a discursive process that may lead students to become brokers across domains. The model forces students to connect and integrate knowledge of multiple domains. It raises awareness for the pitfalls of interdisciplinary issues, but at the same time also enforces a critical stance on simplified quantitative implementations.of multiple domains. It raises awareness for the pitfalls of interdisciplinary issues, but at the same time also enforces a critical stance on simplified quantitative implementations.

1 INTRODUCTION

Competencies required for steering urban development sustainably are scattered among various disciplines. Cities, with their multitude and complexity of actors, structures, and processes cannot be conceived as being the domain of one particular discipline in traditional categories. Rather, they are shaped and (re-)produced by the overlapping, converging, or sometimes conflicting outcomes of a range of disciplines – in fact, there are few scientific fields without at least indirect impacts on urban environments. There are however a number of them which are explicitly connected to understanding, and in some cases ultimately influencing them. Among these are architecture, civil and transport engineering, (human) geography, urban economics, or urban sociology, to name just a few. Public administration follows the same disciplinary logic subdividing its institutions in sectoral departments and agencies. Urban planning, that already lays claim to interdisciplinarity with respect to urban space, has to conform to the same idea of vertical separation between disciplinary domains. This vertical separation comes with the distribution of responsibility and power among various stakeholders. While politicians and citizens expect planners to effectively steer urban development, planning departments have to broker between various public and private actors.

Despite the interdisciplinary nature of urban planning, teaching approaches across disciplinary boundaries are still relatively rare (Rooij and Frank, 2016: 483). Establishing planning degrees with homogeneous groups of students has led to the formation of its own unique ways of thinking and doing. However, scholars and practitioners alike are confronted with the challenge of understanding and incorporating different disciplinary backgrounds in group work. Programme administrators and lecturers are hence looking for new ways to bridge potential incomprehensibilities between students, for example in graduate programmes of urbanism which admit students with a range of different undergraduate degrees (Bertolini et al., 2012).

Interdisciplinarity has been discussed as both encouraging and underdeveloped avenue for future research and teaching for a range of subjects during the last decades. One case where this becomes clear is integrated transport and land-use planning. Sectoral technical planning and comprehensive land use planning both exert a strong influence on our built environment, which is not always aligned. Planning practice and academia has now long acknowledged the deficits that can arise for our urban environment if a single of the disciplines involved in its formation becomes prevalent over others (Jacobs, 1961; Mitscherlich, 1965; UN Habitat, 2009). The dominance of the private car in western cities can partly be attributed to the supremacy of traffic engineering in post-war urban development of the 1950s and 1960s, which is strongly connected to the modernist ideal of the functionally segregated city, in many cases to the detriment of the quality of public space. It was only in the 1970s and 1980s that other disciplines, such as heritage protection or urban design, reasserted their claim to be equally considered in urban development. This example shows that it is necessary to find methods and tasks that enable disciplinary experts to introduce their knowledge into the urban development process and put it into perspective.

Integrated transport and land-use planning today still is an area that yields potentials for interdisciplinary student group work. Often, students with a civil or transport engineering background view urban development challenges more in terms of quasi-mathematical optimisation problems while students with a background in the social sciences emphasize specific place-based qualities in need of protection or strengthening. The planning vision of transport-oriented development (TOD), which suggests a joint analysis and alignment of settlement densities and (public) transport quality, creates space for a common discourse between these disciplinary approaches (Kinigadner et al., 2016). The emergence of interdisciplinary discourses in urban planning and developments is summerised under the title of Urbanism (Wolfrum and Schöbel-Rutschmann, 2011; Olsson and Haas, 2014; Gilliard and Thierstein, 2016).

2 METHODOLOGY

The paper presents two studio courses of the last two years that employed the node-place-model (NPM) developed in the 1990s by Luca Bertolini (Bertolini and Spit, 1998) to acquaint students with the challenge of integrating land use and public transport planning. The students had to familiarise themselves with the NPM and were asked to use it as an evidence base for identifying areas for development. The students had to understand the model, to apply it as a calculation model and to interpret the results. Consequently, they developed design proposals on the scale of individual stations and their surroundings as well as for general strategies of an entire city. The learning goal was to familiarise students with an object that can span the boundaries of two disciplines: urban planning and civil (transport) engineering.

However, the studio fulfilled a second goal for us as teachers. Munich's MSc Urbanism programme is designed for graduates of various disciplines. Developing interdisciplinary methodologies that help students with different previous knowledge to communicate about urban space is crucial for the success of such a degree. Our hypothesis for the studio course as well as the paper is that the NPM is a boundary object that allows experts from two fields of transportation and urban planning to jointly develop plans for the future. Wenger (2000: 236) conceptualises boundary objects as processes, discourses or artefacts shared by multiple disciplines. They are designed "to enable multiple practices to negotiate their relationship and connect their perspectives" (ibid.).

Students of both the MSc Urbanism and the MA Architecture programme joined our studio course. Their backgrounds include bachelor's degrees in architecture, civil engineering and geography. We tested our hypothesis on two scales: once for the city of Munich and then for the metropolitan region of Munich. The hypothesis is assessed by a discursive methodology. First, both student groups talk about their application of the NPM to an integrative land-use and transportation design project. Both groups will individually reflect on their experiences before developing a structured conclusion together. The last part summarises what we as educators have learned from both projects and what we think are important implications for planning education.

3 NODE-PLACE-MODELLING AS A DIDACTIC INSTRUMENT

3.1 BERTOLINI'S NODE-PLACE-MODEL

While the general long-run impact of accessibility improvements on settlement patterns in the past is well documented (Wenner, 2017), the effect of land-uses on transport infrastructure depends more on policy decisions (Rietveld and Bruinsma, 2015: 239). The 'node-place' model (Fig. 1) is an analytical tool that enables formulating such planning guidelines. One of Bertolini's major advanaces for urban planning is the combination of two basic concepts of space. On the one hand, space is formed by its geographical strcture and refers to the dimension of place. On the other hand, space also inheres a topological component that is adressed by the term node. Regarding didactics, the NPM enables to understand locations in a wider regional context and consider these from the position in transport networks and there physical qualities. In effect, it suggests to match densities of activities, which generally also translate into building density, with public transport service level in order to achieve a more sustainable urban development. It essentially describes a normative relationship: areas of high density of activities ('place') should be served by more frequent and more diverse public transport, and accessible locations ('node') should be surrounded by dense and diverse urban development, while for sparsely used areas a lower accessibility level is acceptable, and vice versa (Bertolini, 1999: 201). Locations where node- and place-quality are balanced are called 'accessible'. This serves two functions: On the one hand, high accessibility levels of public transport in low-density areas mean an inefficient use of public resources that should be avoided (this would be an 'unsustainable node'), while high densities with low public transport accessibility gives rise to car-dependency, which is associated with negative social and environmental consequences ('unsustainable place').

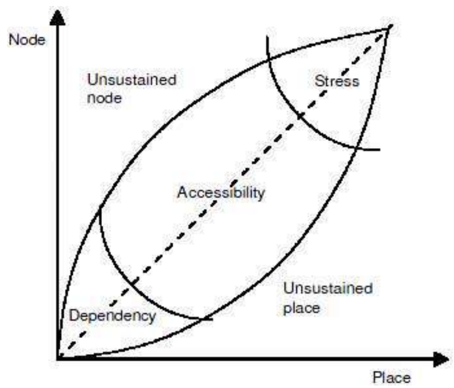

Figure 1 The node-place model.
Source: Bertolini (1999: 202)

There are, however, cases where node- and place-quality match which nevertheless can cause difficulties for urban development. First, there are situations of ‘stress’: “Great concentrations of flows and activities mean that there is an equally great chance of conflicts between multiple, extensive claims on a limited space. The property development ideal of maximal intensity of land use and the transport development ideal of maximal flexibility for infrastructure adaptation and expansion have to find here a difficult synthesis” (Bertolini, 1999: 201-202). Second, there are dependent locations: Here, other factors than accessibility are decisive to maintain supply of both public transport and urban activities.

3.2 EXPERIENCE OF THE FIRST STUDIO

The studio included an analysis of the city of Munich, using Bertolini’s NPM as a guideline, an identification of places that stood out from the results as having potential for development and implementations of urban design projects in those places. For the analysis, a node was defined as a rail-operated public transport station (suburban rail, underground or tram) and a place was defined by the characteristics of an area within a 700 meter radius around a node. Then, calculable “sub-values” that comprised the final node and place values were defined.

The node value (Fig. 2) was calculated from two sub-values: centrality and frequency. The centrality value represents the amount of people that would travel through a certain station when going from point A to point B using the shortest path (betweenness centrality, as defined in Sevtsuk et al., 2016: 12). The values were calculated using the “Urban Network Analyst” tool developed at the MIT as plugin for ArcGIS. The frequency value represents the sum of the frequencies of all public transport lines that pass through a specific station. The frequency was calculated as the average of weekday and weekend frequencies at different times of day (7AM, 12PM, 9PM) and was given in trains per hour. The place value (Fig. 3) was also calculated from two sub-values: density and diversity. The density value comprised of population density (municipal data from the city of Munich was available by neighbourhoods and was recalculated for the 700 meter radius of each place), built density, the percentage of built area within the radius at ground floor levels (not considering the height of the buildings), density of activities, the number of businesses within the radius categorized by NACE as retail (G), gastronomy (I) or culture (R) and density of workers, taken from GIS firm data and modified to take into account small businesses as well as corporations. The diversity value was defined as the level of balance between the population density values, number of workers and number of firms. The basic assumption was that the ideal diversity exists when all three values are equal, the bigger the difference between the three values is the lower the diversity value is.

The final step of the analysis was to enter the node-place value for each station area into Bertolini’s node-place-diagram, to receive a classification for each station (unsustained node, unsustained place, stressed, dependent or accessible) (Fig. 4). To calculate the node and place values, we used GIS data provided by the city of Munich, while frequency data was compiled using the online timetable of the municipal transit agency.

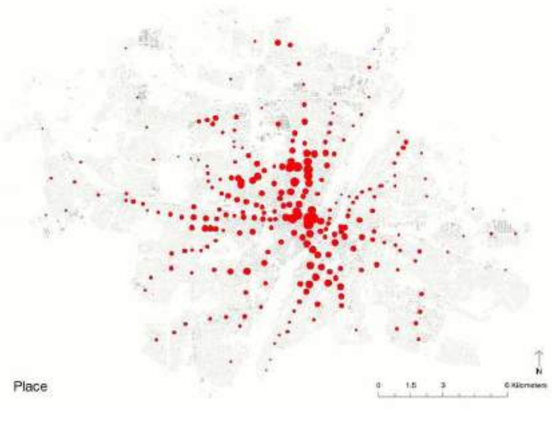

Figure 2: Node values overlaid on a map of Munich. Larger circles indicate higher values.
Source: own account

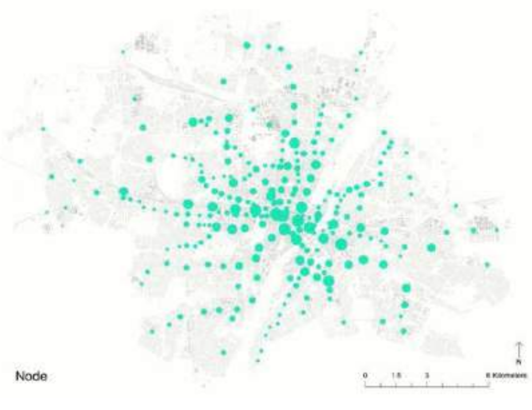

Figure 3: Place values overlaid on a map of Munich. Larger circles indicate higher values.
Source: own account

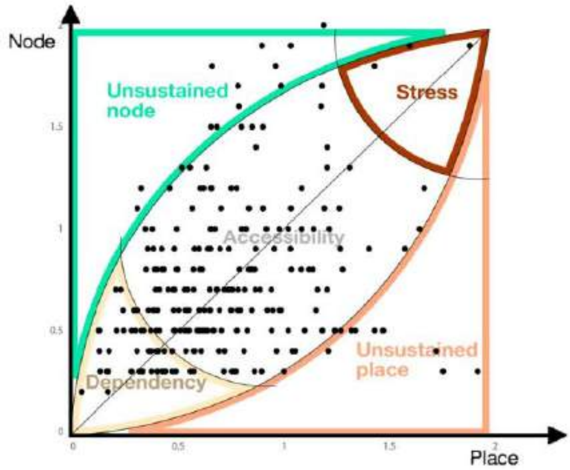

Figure 4: Node-Place diagram showing all analysed stations in Munich. The abundance of accessible areas is clearly visible. Source: own account using Bertolini (1999: 202)

The results of the analysis showed that Munich is mostly a balanced city with a majority of accessible station areas (Fig. 5). The stressed stations were, as expected, in the city centre, in proximity to the main station and historic centre. Most of the unsustained places were found to be located in neighbourhoods close to the city centre where the population, business and activity densities are the highest. The majority of unsustained nodes were found to be located along the main suburban rail line passing through the city from east to west. The stations categorized as dependent were mostly located in the periphery of the city. Within the analysis results that were mostly unsurprising, a few of the station classifications stood out and required further attention. In Schwabing, a popular neighbourhood north to the city centre, three adjacent station areas with less than 500 meters between each station received different classifications. Clemensstraße station was classified as an unsustained place, Karl-Theodor-Straße as accessible and Scheidplatz as an unsustained node. Scheidplatz station also stood out as one of only three unsustained nodes not located on the main suburban line. A similar situation was found in Giesing, another central neighbourhood, with the adjacent Tegernseer Landstraße station and Giesing station. Finally, it was very surprising to discover a cluster of mostly dependent stations right next to the city centre in Altstadt-Lehel neighbourhood (Tivolistraße, Bundesfinanzhof and Paradiesstraße).

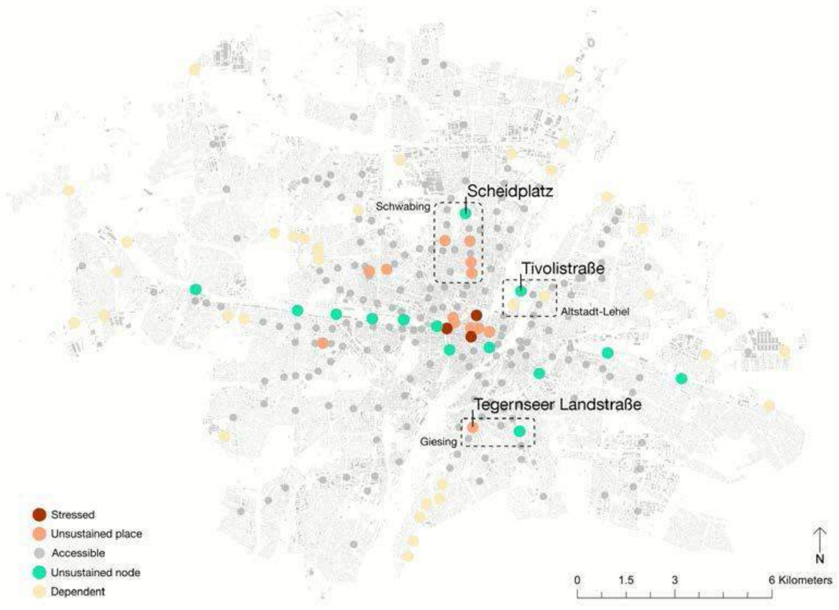

Figure 5: The five categories of the node-place model: accessible stations (grey), stressed areas (red), unsustained nodes (green), unsustained places (orange) and dependent areas (light brown).
Source: own account

Limiting our analysis to rail-operated public transport stations meant that areas not covered by these networks were excluded. However, extensive coverage of the Munich suburban rail, underground and tram networks made this a negligible problem as virtually all relevant areas of the city were found to be within reach of such stations.

As a way of checking our results, we calculated the model with a modified radius of 400 meters instead of the previously used 700 m. This was meant to take into account that 400 m is a more realistic distance that people would actually be willing to walk. Across the majority of stations the relative place-value decreased, which produced a higher number of unsustained nodes. Although we could not with absolute certainty attribute a cause to this effect, we assume that it might be related to the often significant proportion of empty space in the vicinity of a station (street junctions, railway lands, etc.). A decrease in radius would render these areas proportionately more important. Another factor was that a decrease in radius would very often lead to a decrease in the diversity value, on account of functions not being evenly spread out across the analysed area. This was an important find, in that it clearly illustrated the inaccuracies involved. As the NPM is relative, the results can easily change, depending on the dataset that is used. Thus, a station that is categorised as an unsustained node or place could in another dataset possibly be in accessible range.

We also encountered several other shortcomings in the results of our node-place analysis. The analysis did not take the positive aspects of public open space (namely parks or the banks of the river Isar) into account. By virtue of being non-built-up areas, these areas therefore had a negative impact on the place values of nearby stations. They do however, especially during the summer months, generate significant footfall and contribute to a high quality of place.

We also found that the model could not realistically display situations where stations of different lines or modes were spaced closely together. This is especially true of many of the tram stops within the city centre which would consistently get low node values. However, many tram stops are in fact within easy walking distance of a railway or underground station and interchange is therefore possible, but is not accounted for in the model.

There have been many instances where the model could have been calculated in a much more detailed manner (e.g. by using actual walking distance instead of a predefined radius to define our areas of analysis.) Since the strengths of the model were seen in its simplistic approach, we felt that the model would not necessarily be more powerful with such an increased level of complexity.

As the design phase of the studio did not seek to develop a coherent spatial strategy for the city of Munich, it was decided to pinpoint several localized improvements across the city which were taken forward by individual students. When choosing these locations, we selected a two-phased approach. First, a shortlist was compiled from the stations that featured in the outer extremes of the node place diagram. Second, the stations from the shortlist were visited to enable an empirical analysis of the sites. During this stage it was decided to progress only with the unsustained stations as we thought they would be more interesting to develop than stressed or dependent areas and because some of them were, as has already been mentioned above, among the more surprising results of our analysis. The stations that were selected were Scheidplatz and Tivolistraße as unsustained nodes and Tegernseer Landstraße as an unsustained place.

Scheidplatz stood out as the sole unsustained node in the northern neighbourhoods of Maxvorstadt and Schwabing. Although the station is among the most important interchange nodes in the north of Munich, it is located between a quiet urban park on one side and a primarily residential area on the other. During the design process, an approach was taken to developing business and leisure in the area and to opening up the park, thereby increasing its attractiveness and usage. By relocating large allotments within the park to make room for new buildings, diversity and density values could be raised to make the area more balanced (Fig. 6&7). The tram stop Tivolistraße was found to have a similar urban setting. Being located in a thin strip of urban fabric bordered on both sides by the green spaces of Englischer Garten and the river Isar, the site is severely constrained in its development potential. A currently proposed tangential tram line across the north of Munich would pass through the station, further unbalancing its node-place values. This increase in connectivity would heighten the development potential of the area. An already existing business park immediately to the north of the station was chosen as the most suitable location for an architectural intervention. Redeveloping this area through a mixed use approach with high-rise elements enabled a significant increase in density of both residential and office space.

As the only unsustained place to be developed in our design studio, Tegernseer Landstraße required an entirely different approach. Further analysis of the site showed the results of our node-place model to be somewhat misleading in this case. While the tram stop is situated next to a dense urban neighbourhood, the immediate vicinity is characterized by one of the most congested road junctions along the urban ring road called "Mittlerer Ring". As this isolates the tram stop from its surrounding neighbourhood and two underground stations with much better connections to the city centre are located only a few hundred meters away both to the north and west of the site, we felt that to propose an increase in service to the station could not be the right way forward. The chosen proposal for the site was a pedestrian-oriented redevelopment of the public open space. This included strengthening walking connections across the entire site and between the residential/commercial areas and nearby nodes as well as improving pedestrian crossing times at the road junctions.

In the course of our design studio, we have come to understand that the first steps in the development of a certain area can be taken from the node-place-analysis. Following our basic assumption that a balanced and diverse place is best, we have tried across all three locations to take actions that increase the lowest values to receive the best results. However, in most cases the NPM could only serve as a starting point and further analysis was necessary to determine the best way forward. Nonetheless, we feel that the model did help us in our design process by offering an additional level of analysis and by bringing our attention to locations that we would not normally have looked at. While it is our belief that it cannot serve to define the qualities or shortcomings of a given site, it presented a different way of looking at a city and the way it's functioning. Whereas the place values are more of a micro look at an area, the node values are a macro look, connecting a small area to the perspective of an entire city. The NPM helped as a tool to understand the immediate needs of an area in the city and made us appreciate that there's an importance in thinking about each small area and how it functions as well as how the city works as a whole.

Figure 6: An overview of the urban development proposal in Scheidplatz station, project by Gal Biran

Figure 7: Night street view of new Business and leisure area in Scheidplatz, project by Gal Biran

3.3 EXPERIENCES OF THE SECOND STUDIO

The second studio started with the same task but for the entire metropolitan region of Munich. The project's first step was to set up a NPM for the railway network of the metropolitan region of Munich (MMR). This network consists out of the regional and long distance trains in the more rural areas on the one hand, and, on the other hand, in the main cities additionally of the underground and suburban rail infrastructure. Only trams were not respected in our analysis for reasons of data complexity. For the calculation of node values, we used betweenness and gravity measures for every railway and underground station in the MMR. The gravity measure assumes "that accessibility at [one specific station] is proportional to the attractiveness (weight) of [surrounding destinations] and inversely proportional to the distances between them" (Sevtsuk et al., 2016: 12). In contrast "the betweenness of a [station] is defined as the fraction of shortest paths between pairs of other [stations] in the network that pass by" (Sevtsuk et al., 2016: 12). With these two complex components, the calculation of the node-values could be quite standardized. To widen the node value's meaning we tried to add some extra information about the stations' inherent quality. Therefore, we analysed infrastructures and facilities of the stations like Park & Ride areas and the possibility to charge E-cars. However, adding more criteria to our analysis didn't make our analysis more accurate, so we decided to rely on the sum of gravity and betweenness.

Due to this extensive data analysis, it was easy to deduct the place values. In order to define it we examined the number of inhabitants living in the stations' catchment area, radius of 600 meters (Schwarze, 2005: 19), as well as the socio-economic services in this area, which was classified by a ranking system including all enterprises, larger concerns and educational facilities. Also, the cultural and leisure opportunities were considered. The first step was concluded by the set-up of the node-place-diagram and its interpretation.

Examining the data output of the first calculation, the results gave a consistent and argumentative overview of the railroad stations of the entire Metropolitan Region of Munich. Locations with a high frequency, line quantity and population density as well as services yield a high node and place value (each on a scale of 0 to 100), like the Munich central station (MHBF in the chart below, with Node =100, Place=88) or Marienplatz München (MMAR in the chart below, with Node=50, Place=94). Besides their high importance for commuters and travellers, these places also offer a high range of facilities such as high retail, office or housing density. Furthermore, stations with high node values and low place values in comparison like Ingolstadt central station (IHB in the chart below, with Node=68, Place=50) were identified (Fig. 8).

After a detailed reconsideration, we had a closer look at the type of the investigated cities and locations. This was reflecting the results in a new way, as you can see in the following illustrations (Fig. 9).

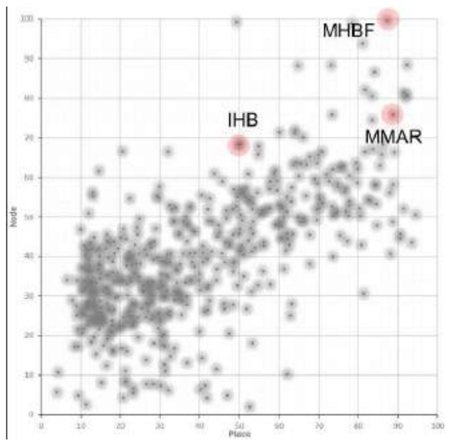

Figure 8: Node-Place-Diagram of the Metropolitan Region of Munich.
Source: own account

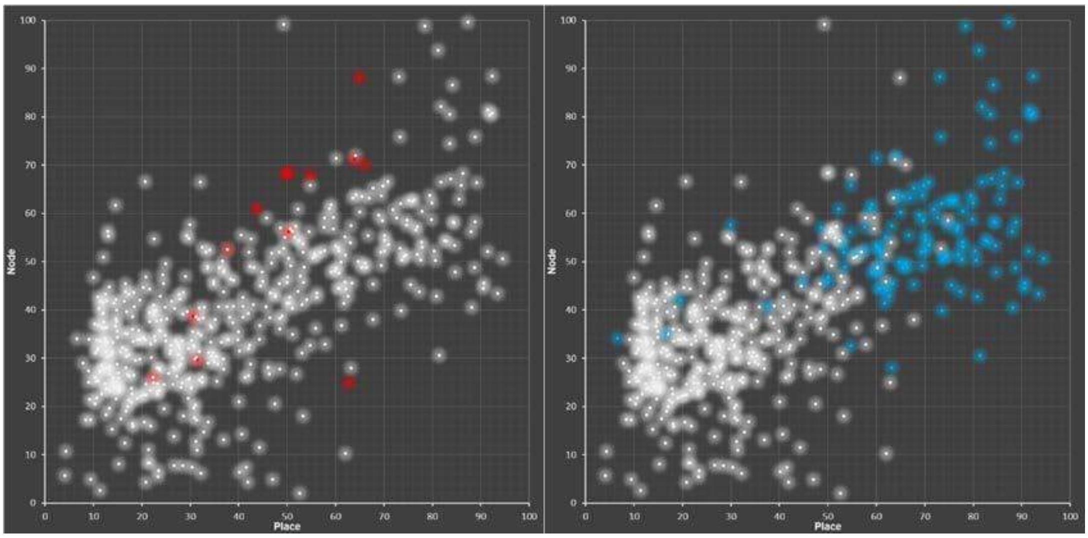

Figure 9: Munich’s stations highlighted blue, other smaller cities highlighted red. Source: own account

Some problems in the understanding occurred with the interpretation of the chart. Some stations are located in unexpected positions. By closer examination, we got to the point that Betrolini’scalculation model is disputable. With the metropolitan region being a very diverse area consisting out of dense city structures as well as extremely rural areas, it is questionable to compare the same data for stations, which are located in very different locations. Furthermore, in some areas the importance of the railway network is not as high as it is in other areas. For example, cities like Ingolstadt and Augsburg that are a lot smaller than the city of Munich are not covered by an urban railway system. This phenomenon is supported by our calculation of the inhabitants per railway station value. As you can see in Figure 10 a city like Ingolstadt would need 14 additional stations in its railway network to reach a coverage like Munich. Ingolstadt has fundamental problems with motorized individual traffic, but the essential information about the connection of public transport coverage and urban development could not be deducted from the previous model.

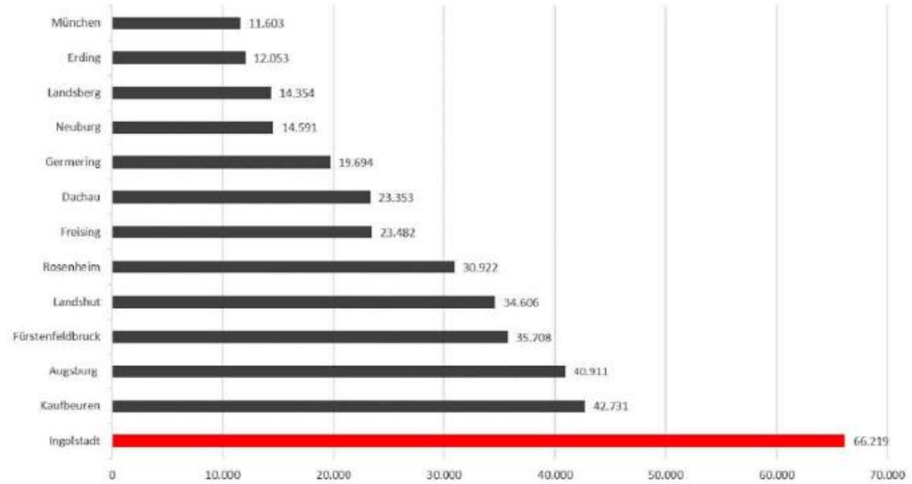

Figure 10: Inhabitants per Railway-network station in metropolitan region's cities. Source: own calculation

A new calculation is needed with adaptation in the examined public transport system and scale. The hypothesis was that a systematic adaption of the node-place model is needed for the suggestion of interventions to reduce the centrality and accessibility deficits in cities like Augsburg, Ingolstadt or Rosenheim in the MMR. These cities’ public transport is highly based on their bus network. We got to the conclusion, that an adaptation was necessary since the role of the bus system in these cities was not incorporated in the prior calculation.

Figure 11: Munich Metropolitan Region, INVG area highlighted. Source: own account

The main reason to choose Ingolstadt the examined city is shown by the calculation of inhabitants per railway station (Fig. 10), which is the highest in the metropolitan region. The conclusion that there is no working public transport would be misleading. Rather it is that the public transport is organized by the bus system, a system that was completely neglected in the first step's analysis. So, in the second step this system in the city of Ingolstadt was in focus. To get the values of place and node, all stations in the bus network of the INVG (the city's public transport corporation) were analysed (Fig. 11). The place value for each bus station consisted out of the same factors as it did in the first step's calculation, but the catchment area was defined smaller with a range of 200 meters (Schwarze, 2005, p. 19). The radius of 200 meters was chosen, because it is a reasonable walking distance for users of the bus-network. The data of gravity and betweenness, in accordance to the definition described above, were calculated by a GIS Analysis for every bus station in INVG's network done by the Urban Network Analysis Tool designed by the city form lab of Harvard University. We then set up a new node-place-diagram for INVG bus system (Fig. 12).

In the third and last step of the project the applicability of this new model had to be tested. Therefore a catalogue of very different planning tools (like settlement densification, founding of new settlements, changing frequency of bus lines and much more) in the field of public transport in spatial and urban development in common were introduced. Each single intervention of this catalogue was classified by its impact on the position of a station in the node-place model, whether if it is changing the node or the place value. To validate these, in other contexts evident actions, are working in Ingolstadt as well, some example station had to be highlighted. To select, a cluster analysis of all bus stations was done. Thereby, the clusters were defined by the station's position in the node-place-diagram in relation to the 45° line. Thus 7 different kinds of stations were identified: isolated places, over-sustained places, over- and highly over-sustained periphery, over-sustained centres, unsustained centres and places. For each of these clusters one extreme example was selected. Every suitable intervention (regarding to the aspired direction of development in the model-chart) of the catalogue was taken into practice. In some cases, this approach delivered logic and working solutions. But in other cases, the outcome was indefinite and, in some parts, even illogical, because the actions demanded by the station's position in the model did not fit to the actual real place and its surroundingIt does not make sense to desnifiy the urban structure around a station which is classified as an over-exploited place just because the chart is requesting this. Sometimes an overstated infrastructure provision has reasons far above planning mistakes. It just makes sense that, for instance a station near an attractive park, needs to have a high accessibility to open it up for the public. To claim densification here is not just illogical but even counterproductive.

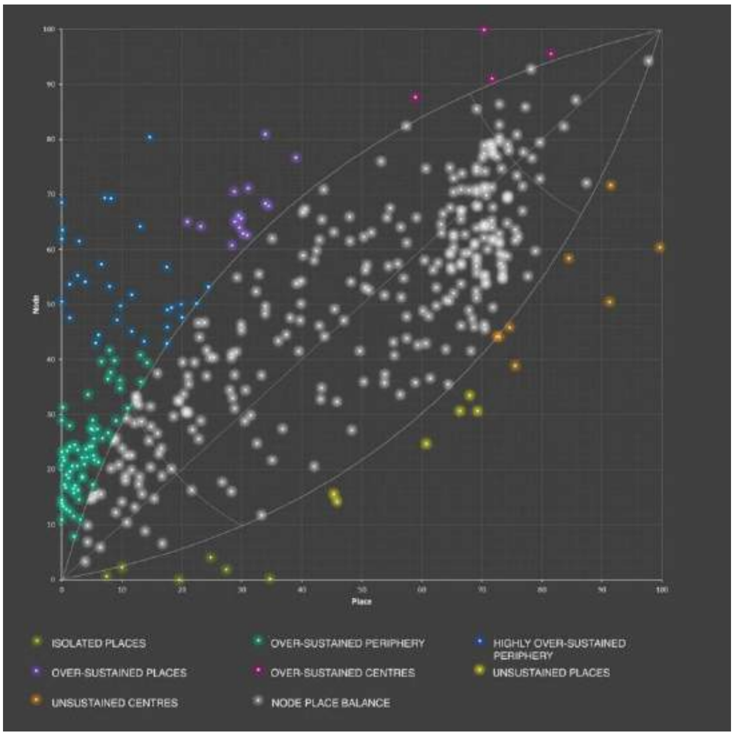

Figure 12: Node-Place-Diagram of INVG area

Figure 13 + 14: Useful Instructions deducted out of the model for the station Andreas-Schmöller-Straße (over-sustained periphery, left) and questionable instructions for the station Brückenkopf (over-sustainder centres, right)

To sum up, working with the NPM is on first sight a helpful tool for the analysis of the relationship between public transport and urban development. The model and especially the visualization in terms of a diagram is comprehensible and give a better understanding of the interdependency of transport and development. It offers a good base for discussion of the various participants in urban development. Urban researchers, municipalities, investors and all other actors in the development of cities have an easily discussable and understandable model.

However, there should be awareness of some problematic aspects. The diagram leads to quick and often false assumptions based on the oversimplification of a rather difficult and complex field. The simplicity of the xy-chart leads to reductionist conclusions. Another problem was identified, by expressing future strategies for the evaluated stations based on the model: The well-served station “Brückenkopf” in Ingolstadt (node=87, place=40) is a touristic place, where a museum and the nearby Klenzepark are located. The area is characterized by wide green and open spaces (Fig. 14). According to the model and the high node value a recompression was suggested to position the station in the accessibility area of the diagram. This case leads to the conclusion that the model gives first-hand a simple overview about the stations and their future strategies, but otherwise the spatial situation of all stations needs to be considered as well.

Furthermore, the systematical thinking of the calculation of node and place values only provides the current situation. Future investment and development are not considered. The model and diagram can only be seen as an initial research and an indicator for possible interventions. Additionally, the calculation results are only relative to each other. There are no absolute values. The selection of parameters for the calculations and the quantification can be questioned as more subjective than objective. To simplify the process only one city public transportation network (Ingolstadt) was examined. The interaction between different cities was not considered. Therefore, the gravity and betweenness values were not accurate, especially on the borders of the public transportation network of the municipality.

Further critique refers to the regarded type of traffic as mentioned earlier. In the case of Ingolstadt, the main public transport is provided by the regional bus system of the Ingolstädter Verkehrsgesellschaft GmbH, INVG. Though, in the earlier analysis just the rail-bound traffic was considered. Thus, the traffic system of Ingolstadt couldn't be evaluated on a smaller spatial level. This fact does not prove the model false, but makes it harder and more time-consuming to analyse and to calculate the values and comparable to the rest of the stations in the MMR. In which exact way a different assessment should be used, isn't suggested. This makes the model in a way vulnerable and the evaluation more subjective. The evaluation of node and place values for every city consequently has to be done always for a macro and a micro based spatial standard, however which makes the model less comparable in a wider spatial scale.

Furthermore, the calculated values are specific to the public transportation system. You cannot compare node and place values across systems. Another critical point consists of the fact, that the public bus network is a flexible and small-scaled system. The system of the node-place-model is based on the transport-oriented development. On the contrary, the bus system is not particularly based on this approach. Finally, all outcome - clustering as well as indicated interventions, - need further examination and discussion.

4 CONCLUSIONS

The reflections of both the architecture as well as the urbanism students point out various issues while operationalising Bertolini's NPM. These can be categorised into three groups: issues of underlying assumptions, issues of calculation and issues of interpretation.

Bertolini (1999: 201) defines node as the "potential for physical human interaction" and place as "realisation of potential for physical human interaction". Implicitly, he argues that public transportation infrastructure is a 'given' resource, which planners can exploit by redeveloping the areas around stations. Our analysis shows that this argument is plausible as long as the majority of public transport is realised on rail infrastructure. Both the railways and its stations are long-lasting investments relatively resilient to changes in funding and planning policy. It is therefore not only in the developer's interest, but also in the interest of public authorities to utilise the potential created by infrastructure investments. The studio work on Munich demonstrates that the NPM leads us to areas that are worthwhile undergoing redevelopment.

This has unfortunately not been the case for the city of Ingolstadt. The student's first attempt to identify potentials across the entire region becomes quickly limited by the extent of rail-based transport infrastructure. An initial NPM that only included rail services rendered most areas of major cities across the Metropolitan Region of Munich as undesirable for redevelopment, although these cities itself are important economic centres. Instead redeveloping should have happened around stations in peripheral areas. This would lead to a clustered, but disperse settlements structure, while potentials of general inner-city and brownfield developments in cities without rail-based public transport are neglected.

The inclusion of bus services puts the underlying assumption of public transport as a resource into question. Bus services require very limited specific infrastructure. Transportation authorities change bus services frequently to satisfy demands. Taking the bus-service-based public transport network as a given infrastructure is therefore unjustified and led us to conclude that the premise of the studio should be adjusted to development-orientated transportation (DOT). This is obviously a fallacy, because 'DOT' is the simple adjustment of public transport according to demands and – as argued before – this is only possible for bus services. The application of the NPM in the Ingolstadt case distracted us from the pressing main issue that the city is in desperate need of rail-based public transportation instead of ineffective optimisations of bus services.

We have to conclude that Bertolini's NPM should only be applied in regions, where rail services carry out the majority of public transit across the entire region. Even in case of the much more successful application for the city of Munich, we have to realise that despite the density of metro and tram services the calculation of the node value does not easily account for non-motorised transportation modes such as cycling and walking. An underlying problem of the NPM is that it is a mono-modal.

The second group of issues arise from applying the abstract NPM by calculating concrete node- and place-indices. Bertolini's (1999) paper implies the model's intent to be applied by citing the application as part of two master's theses at Utrecht University. He does however not provide a proven and tested way of calculation. It is suggested to use multi-criteria analysis. Contrariwise, our experience shows that it is not the case that the more criteria you use the better the calculation becomes. Choosing, collecting and weighing data requires a deep understanding of the interrelation of various criteria affecting public transit service and the traveller's behaviour. While we do not want doubt that advanced modelling could actually yield excellent results, we cannot verify our expectation for the NPM that it can be easily used by both transportation and development experts. Planners with limited expertise in modelling will quickly reach their limits and will just improve their calculations for the worse by introducing numerous criteria. Moreover, the more criteria you introduce the harder the interpretation of your values becomes. Perhaps, the success of the NPM is explicable by the intriguing nature of the most popular games that they are easy to understand but hard to master. This may be an excellent feature of a game but it makes the NPM less usable as an easy-to-use tool for planning across disciplinary fields.

Interpreting the results is the last but perhaps most important challenge while using the NPM. Both groups of students pointed out that the premise of Bertolini's model is easy to grasp. It quickly led both groups to discuss measures that could be taken to bring both node- and place-value of an area into equilibrium. A tendency to generalisation and oversimplification resonates however constantly. Almost all top-down approaches reveal that under closer inspection other criteria may play a bigger role than the ones calculated as part of the model. Obviously, it is not surprising that an area with a great potential for redevelopment according to the NPM cannot be redeveloped due to environmental, economic, social or aesthetic concerns. It would be unfair to accuse the NPM of being misleading in this case, because it does not promise to combine these domains with urban development. The NPM is however introduced as facilitating a transport-orientated development – so the interplay of transportation and development planning. As such, it delivers in many cases interesting results, but also fails in other cases. One of the Munich design projects demonstrate that the appropriate measure can be neither related to node- nor place-value but a qualitative improvement of public space.

After testing the NPM for two semesters, we have to conclude that the NPM cannot necessarily serve as the sole boundary object in order to connect the fields of transportation and development planning. We identified three reason:

1. Using the NPM as a calculation model requires a deeper understanding of modelling to be sufficient for robust interpretation.
2. The NPM comes with inherent shortcoming, which makes it only applicable under spatial conditions of dominant rail-based transportation.
3. The NPM is prone to oversimplification. Working across the boundaries of development and transportation planning requires a multi-method boundary practice.

5 FURTHER RESEARCH AND IMPLICATIONS FOR PLANNING

Spatial planning bases upon various disciplines holding valuable conceptual and methodological knowledge. Planners are therefore constantly challenged by the need to get deeper insight into a specific discipline while keeping an overview and an interrelated understanding across various of them. It is important that educators raise awareness for this duality of knowledge in planning among students. Otherwise, planning graduates may fall into the trap of applying planning principles and concepts blindly.

Planning principles can be described as the application of various disciplinary knowledge for a typical planning case. It is well established among planning scholars that besides universal challenges local specificity plays an important role for planning practice. Basically, there is no typical planning case. Planning problems are essentially unique (Rittel and Webber 1973). Internationalisation of research and practice has led to an increase of transnational flows of ideas (Healey 2012). As such, scholars in Germany as well as other countries have picked up Bertolini's NPM. Although the contexts of the Netherlands and Germany seem to be very similar, local differences are enough to let us question some of the underlying assumption of the NPM.

The key learning outcome is perhaps not the application of the appropriate boundary object to link transport and development planning but the awareness that multi-methodological planning approaches across disciplinary boundaries need to be developed. The NPM can be a valuable didactic instrument. Its simplicity prompts us to think about the connection of transport infrastructure and land-use development, but it also reveals quickly the insufficiency as a singular tool to bridge the gap between disciplines.

Preparing students for the interdisciplinary field of planning practice requires the development of fully-fledged cross-boundary experts. Bringing together disciplinary experts such as architects and engineers in a course is a valuable exercise to raise awareness for each other's disciplines but it does not replace the planner as the mediator between the spatially relevant disciplines. Spatial development requires a boundary discipline (Gilliard and Thierstein 2016) that is able to broker between various disciplines.

Thus, we recommend that planning educators look further into two issues:

1. The core of the planning curriculum could be competencies for brokering between spatially relevant disciplines – such as boundary objects and boundary practices. We feel that these competencies are more likely of methodological nature. We should therefore shift our focus from better planning outcomes to better planning processes. It may be the built city that we should study as planner but the way this city has formed over time.
2. Planning degrees must connect to other disciplines. Learning to broker between disciplines requires disciplines to broker between. This trivial statement is easily being neglected, when planning as a discipline establishes its own unique ways of thinking and doing. Perhaps, a planning department must sit horizontally to the otherwise vertically organised universities.

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ID 1506 | CHALLENGES AND INNOVATION IN THE ARCHITECTURE AND URBANISM RESIDENCY: WORKING TO OVERCOME THE GAP BETWEEN PLANNING AND IMPLEMENTATION

Maria Lucia Refinetti Martins[1], Sofia Arrias Bittencourt[2]
[1]Professor at University of São Paulo / LabHab
[2]Research Assistant at University of São Paulo / LabHab
malurm@usp.br ; sofia.ab@gmail.com

1 INTRODUCTION

The Residency Program in Architecture and Urbanism: Urban Planning and Management, is a proposition of a community outreach initiative outlined in the University of São Paulo's Statute. Aimed at deepening the knowledge and social action of the architect-urbanist through a set of academically supervised practical and theoretical activities, inspired by the Healthcare Residency model.

Consists on work-education program, during one year, after completion of the graduation in Architecture and Urbanism. It allows for the young professional to act on public policy development activities that