The city as a system

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Abstract
Contrary to popular culture, cities are not just pretty pictures such as those seen in postcards or travel advertisements: they are complex systems. A systems approach to the city makes planning more open and explicit.

1 Introduction
Through more than a century of postcards, travel advertisements, and personal photography we easily associate cities with their landmarks and ‘urbanscapes’ — the equivalent of the natural ‘landscape’. Image is powerful — Figure 1.

Figure 1 Some cities are instantly recognised by their ‘urbanscape’

Urban studies and planning literature commonly use city images on book or journal covers, and in much of their content. At the same time, social, economic, and environmental issues in the context of the city are dealt with in respective scientific specialities, as well as in journalistic news and documentaries, and this adds complementary dimensions to the visual. In fact, adding everything together, the city appears to be quite complex in the way that it is put together and functions as a whole. Approaching the city as a system looks beyond its form and well into its structure and function. This brings together all disciplines of study and practice into a single urban domain, with the added responsibility of coherent inter-disciplinary communication: an extraordinary feat. Let us take a brief look at what it means to consider a city as a system.
2  Form, structure, and function

2.1  Complementary facets

Form is perhaps the most popular facet of urban planning: it is self-evident. As it deals with the visual aspect of the city, form is made up of physical elements such as buildings, trees, roads, cars, underground train networks, and people. They make a city ‘look like’ the way it does. To the visible elements we could add other perceptible aspects of reality that complement or extend the form, such as sounds and smells, which can be notable characteristics of cities.

Urban structure is often expressed as spatial configuration. This is made visible in photographs, technical drawings, and thematic layers in geographic maps. The relative placement of the physical elements, whether fixed or mobile, describe the city’s physical arrangement or structure — for instance, ‘dormitory suburbs lie at a small travelling distance around a bustling business centre’.

Nonetheless, knowing an urban system implies familiarity with ‘how it works’: in general, how these elements interact to bring the city into life — or not quite, in the cases we call ‘problematic’. Function is the most abstract facet of a system, and hence the most difficult to work with — that is, conceive, visualise, communicate, and assess. Due to such difficulties, function could be merely implied, imagined (since the abstract is very much at home in the space of imagination), or even downplayed and neglected. After all, perhaps we could live in a less perfect city…

2.2  Seamless reality

Even though people have different perception and interpretation, for every city the reality is undoubtedly singular. Thus, all links are possible between the complementary facets of reality: form, structure, and function — Figure 2.

For many reasons, some of the facets of reality and the links or transformations between them are more popular than others. For instance, engineers usually start with a structure for a specific function, and then reach a form. Architects may start from the form, and then proceed to function and structure. Multi-path repetitions are also possible, if time is not pressing. In the end, no facet should be overlooked and all information should fit together seamlessly. To understand an urban system, some of the most difficult challenges are (a) capturing the dynamics among the elements, and (b) defining common concerns and objectives as the foundation for plans of action — for instance, in a problem-solving mode or as a regulation policy.
3 Documentation and exploration

Thinking of the city as a system with form, structure, and function amounts to much information to be understood and retained in memory. While most assistance is given in the representation of the form, which lends itself to visualisation, it is also quite easy (although not widespread practice) to represent system structure and function with appropriate diagrams such as descriptive causal diagrams (DCD), reverse blueprints (RBP) (Perdicoúlis, 2011a), or concept maps (Perdicoúlis, 2012) — Figure 3.

In the concept map of Figure 3, perceptible system elements such as those of the visible form or more abstract ones like culture are represented as text nodes. The structure is denoted by links between the elements. However, as a requirement of function, direction (‘from–to’) is marked on those links, so they turn into arrows; thus, function per se is marked by text (in italics) on those arrows.

Maps such as Figure 3 can be used to explore and document particular systems of interest. To ‘customise’ the system map, it is possible (and a good idea) to make annotations on them, such as a starting point to explore the function (top of the diagram), or a key assumption — which must be shared — that activities are essential for the city’s dynamics.

4 Applications

Exploring and documenting a system such as a city can be useful to elucidate ‘how things work’, which is a great academic exercise and produces various types of diagrams (Perdicoúlis, 2010, 2011a). While such knowledge is always required, urban planning and management applications employ system mapping mainly for problems (Perdicoúlis, 2010, pp.57–65) — that is, not merely as an exercise of documentation and/ or exploration. Planning problems may be related to current pressing situations, or simply be creating the ‘development plans’ for the future. In either case, the system is mapped with particular concerns in mind, which define its scope and consequently selection of the appropriate information: system elements and dynamics.
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4.1 Traffic

Let us consider an example of a planning problem in which car traffic reportedly has begun to dominate and spoil a city (Figure 4(a)) that until recent years has had a quite pleasant urban environment — clean, quiet, and definitely not stressful. Figure 4(b) shows the main elements, their links, and the key relationships in the particular system, filtered by the scope of the planning problem.

Figure 4  Reverse blueprint (RBP) of a city, created and marked for the particular planning problem

The diagram of Figure 4 is a ‘reverse blueprint’ (RBP) of the city — i.e. a ‘blueprint’ created after the existence of the object (Perdicoulis, 2010, p.104)) — filtered by the scope of interest in the particular problem. The planning problem itself is marked directly on the RBP in ‘XYZ’ terms (Perdicoulis, 2011a). The broader concern is quality of life (Y), which is being threatened. The objective of the problem (Z) is traffic-induced stress, identified as the major ailment: it must be reduced. Finally, the element where action (X) should be applied is considered to be the ‘cars’ — somewhat vague at this instance of ‘strategic’ (i.e. high level or abstract) planning phase.

The reasoning in this example — including (a) the description of the system as structure, function, and form, plus (b) the definition of the planning problem in an ‘XYZ’ format — may or may not be agreed upon by everyone. It is just one way to visualise the system, and one way to define the problem. This can serve as a base to expose the alternative points of view of the various stakeholders, discuss them concretely, and change the diagram many times until (reasonable) consensus is reached. This turns planning practice explicit: reasoning is exposed, shared, and subject to verification (Perdicoulis, 2010, pp.1–8).

4.2 Culture

It is possible — and sometimes necessary — to ‘zoom out’ from the city and see it in a broader context such as the regional or national space, or even beyond. As an example, let us consider an entire city in its abstract function as a candidate for the title of ‘cultural city’ in its administrative region — Figure 5.

A classification of a ‘cultural city’ would be beneficial for the city, as it would elevate its status and importance in the region, and perhaps also beyond that. As it usually happens in contests, already being a cultural city (to a reasonable extent) would be more than an objective (Z): it would also be
a requirement. This is a case of a reinforcing loop (i.e. positive feedback, or a ‘vicious cycle’) — Figure 5(b). Reducing the risk of failure, the stakeholders of the city unanimously intend to make investments (X) in cultural activities, to build up ‘cultural momentum’ or reinforce their tradition. This way their city could break the vicious cycle of anonymity.

As Figure 5(b) represents a strategic (i.e. high-level or abstract) and ‘external’ (or aggregated) view of the city, both the objective (Z) and action (X) must be sufficiently detailed at a subsequent operational stage.

5 Discussion

Seeing the city as a system is probably not the first, and perhaps not even a ‘natural’ view. It does require some curiosity and training to seek the invisibles, and some techniques to be able to visualise them. The investment pays off, though, as it creates the right conditions for an open, transparent, and explicit planning. Before anything else, we get to know the object of planning better: not only how it looks like, but most importantly how it is structured and how it functions.

Seeing the city as a system does not necessarily point towards more and more detail. We can indeed ‘zoom in’ to see the particulars of the system, but we can also ‘zoom out’ to see the city in context (Perdicoúlis, 2011b, p.11). In any case, a systems view reveals many invisibles that make the city what it is — or what it is known as — and is always ‘scoped’ to relate to the definition of the planning problem.

6 Conclusion

Despite owing (most of) its fame to form, cities are more than ‘pretty pictures’: they are complex systems. Learning to work with systems makes for more efficient, explicit planning: visualising the abstract, creating a base for discussion towards problem-solving, and actually solving the planning problems with open, shared, and verifiable reasoning. Great conditions for good planning.

References

