Role of connected mobility concept for twenty-first-century cities—Trial approach for conceptualization of connected mobility through case studies

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ABSTRACT

This paper discusses the concept of mobility in twenty-first-century cities. Although the issues with which cities now grapple are vastly different from the problems that they confronted in the twentieth century, we continue to live on a foundation that was laid over the years of the past. From that perspective, we need to understand that the destructive reform—"innovation"—so crucial to the mobility on which urban activity depends cannot necessarily ignore the cumulative knowledge we have heretofore amassed.

The author defined the idea of "mobility design" in the scope of urban transportation and explored the concept of connected mobility through case studies that the author has been involved in or researched. Although many important connections in and approaches to urban transportation have come to light, the process of actually working on such projects has uncovered many issues to address such as sharing and social capital. The ability to design mobility as a connected entity and pursue our research topics from that perspective will be vital to overcoming the issues highlighted above and helping the concept of connected mobility flourish.

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1. Introduction

This paper discusses the concept of mobility in twenty-first-century cities. Although the issues with which cities now grapple are vastly different from the problems that they confronted in the twentieth century, we continue to live on a foundation that was laid over the years of the past. From that perspective, we need to understand that the destructive reform—"innovation"—so crucial to the mobility on which urban activity depends cannot necessarily ignore the cumulative knowledge we have heretofore amassed.

After explaining the need for innovation from a conceptual standpoint, this paper interprets past efforts, examines several Japan-based cases of urban transportation that I have had the opportunity to research, and uses these findings to induce an argument on twenty-first-century mobility. The paper centers on two key concepts: the idea of "designing" mobility and the assumption that mobility needs to be "connected."

2. Literature review

The most important piece of literature to any exploration of twentieth-century urban transportation is *Traffic in Towns* (often called the "Buchanan Report"), a report and book published by a team led by Sir Colin Buchanan [1]. Released in the 1960s in the United Kingdom, the report makes concrete arguments about how cities should incorporate cars in the developing context of motorization. The volume, which uses case studies to explain the relationships between roads and cities from the cross-sectional to city-block standpoints, remains a point of reference in university classes on urban transportation. The connections between cars and cities have always formed a major thematic construct, and that importance is as clear as ever today. Developing countries are currently coming to grips with urban motorization under much more exposed and vulnerable terms than developed countries have traditionally encountered.

Of all the great works on urban transportation policy, British architect Brian Richard's *Transport in Cities* [2]—a volume whose title is somewhat of an homage to the Buchanan Report—does a remarkable job of presenting the contemporary issues of urban transportation in a compact, well-illustrated fashion. The Japanese version of the book, translated and generously supplemented by Namiki Oka and his colleagues, has received high acclaim, as well. Richard's pivotal work also calls attention to the importance of framing urban transportation in the contexts of

environmental problems, poverty, multi-mode settings, urban policy, and more.

Since the publication of *Transport in Cities*, the research community has produced many seminal works that focus on narrower topics in specialized fields but relatively few that make comprehensive, far-reaching studies of next-generation mobility. Of the small number of works that fall into the latter category, Kenneth Small's *The Economics of Urban Transportation* [3], which takes an economic stance on urban transportation, Susan Hanson's *The Geography of Urban Transportation* [4], which foregrounds a geographical perspective, and several World Bank reports on developing countries are particularly enlightening.

I am still much too inexperienced to write anything approaching the standards of quality set by these works, but I hope to use the output of the pioneers discussed above as a foundation for addressing the future of urban transportation through a framework of past practical research and observational studies on the topic.

3. The conceptual conditions of designing connected mobility

3.1. The importance of "designing" mobility

The academic discipline of transportation planning was used to revolve around demand forecasting, which represented an important process in obtaining quantitative findings that could corroborate the need for road infrastructure, railroad facilities, and other elements of the social transportation infrastructure. Meanwhile, the study of traffic engineering has adopted a more practical perspective that sought to solve traffic flow and safety issues through the application of engineering concepts; it has taken an extremely dedicated approach to "motorization" and the problems of traffic accidents that come along with it.

Looking at cities themselves, one can also see how actual conditions and frameworks have continued to transform and evolve. The examples are many: years ago, the prominent thrust was the idea of vigorously pushing forward from industrial development to economic growth. That gradually gave way to, for instance, the idea of respecting cities as collections of valuable historical stock, the idea of focusing on urban poverty issues to promote social participation of the lower classes, the idea of encouraging the social inclusion of elderly people unable to drive their family cars, the idea of conserving supplies of limited resources, the idea of building "creative cities" that uncover new value through enhanced personal interaction and activity, and the idea of fostering sustainable cities that aim to cut down on carbon dioxide emissions in hopes of combating global warming and strive to balance economic efficiency. These are just several transitions that illustrate this evolutionary process.

From the perspectives of the environment, welfare, and urban economics, car traffic has become an increasingly important issue to confront. Many cities have changed their constructs and environments on the assumption that people would be using cars—and these cities are now experiencing the difficulties of the problems outlined above. Given these realities, it would be fair to say that any effort to establish the ideal form, circumstances, and orientation of a city has to take transportation into consideration. Buchanan underscored this idea in his discussion of central London with the concept of "traffic architecture."

Incorporating the transportation function into the city-formation process is an element of urban design. One could also very well say that transportation figures prominently into the process of weaving the complex web of interactions among residential housing, green spaces, and the resulting scenery into the larger fabric of the city landscape. Framing transportation too firmly as a purely engineering-oriented endeavor confuses the issue; although transportation has facets that belong squarely in the engineering category, researchers have to approach transportation from a more interdisciplinary vantage point. In this paper, "transportation" is thus best understood as "mobility." If urban design serves to shape people's lives and lifestyles by tweaking the positioning and configuration of buildings, roads, and

parks, "mobility" design would be a better fit than "transportation" design to describe the process of constructing environments and possibilities for movement. Mobility design, like virtually all other components of urban design, has to come to terms with an array of different conditions. The concept that fits these ideas most neatly is the UK's method of Comprehensive Traffic Management (CTM) [5], which uses maps to manage the capacity, demand, and priority levels of existing, historic central city areas in the larger consensus-forming process. For the city to control the cars—and not the other way around—on limited road space in a limited urban area, there is an obvious need for meticulously defined priorities governing road space capacity, the corresponding demand levels, and the corresponding zones and time periods. The resulting arrangement of these priorities is the design of mobility. Situated on the conceptual plane between demand forecasting and road safety, mobility design plays an integral role in keeping the two connected. In this regard, innovation of mobility is required.

3.2. The importance of "connected" mobility

The keyword of this paper is "connected mobility." Mobility designed in the context discussed above is an urban activity. Just as a city exists in a nexus of diverse elements, mobility also exists in a "connected" environment; this is the notion at the foundation of the idea that urban transportation demand is derived, not primary, in nature. As a "derived" demand has to come from something else, there is no feasible way to discuss it without addressing the underlying process of derivation. Intertwined with a multitude of different elements in the city setting, mobility is no exception—it cannot exist alone.

IATSS uses the term "mobile society" in a variety of settings, but it must also use its interdisciplinary and international character to lead the way in showing the global audience that "mobility" is a concept inherently embedded in a multitude of different connections.

In the ITS world, "connected" refers to "connected vehicles" linked by information and telecommunications technology. While the idea of "connected mobility" in this paper might often rely on the invocation of such technology to address the ways various elements relate to one another in the city context, it is important to understand that the "mobility" concept here does not always fall within the boundaries of this technical category.

4. Reading past case studies

In this chapter, I examine the idea of connected mobility through the lenses of past practice-oriented projects and a case study on policies in Curitiba, Brazil, where I conducted numerous field studies over a period of nearly 20 years. Allow me to note here that I arrived at the idea of connected mobility only very recently; the concept had not yet begun to emerge into my subconscious when I was working on the projects discussed below. I have also chosen to withhold some of the specific place names and other information pertaining to the studies.

4.1. Bus terminal design [6]

In Japan, projects aiming to design bus terminals often run into disagreements about how many bus berths the terminal should have and how the terminal should allocate activities to different operators. The objective function of the operators is to secure as many berths as possible. For the effort to design the Aobadai Station bus terminal (in Yokohama), which I started working on in 1987, I helped establish a theoretical foundation for minimizing the number of bus berths, given the land area and design conditions in play, and make sure that the extra space in the design would be available for pedestrians and waiting riders. The design intentionally interfered with the flow of drop-off station access ("kiss-and-ride" users) in hopes of reducing traffic volume in front of the station, but achieving this aim also required improvements in bus convenience; this meant facilitating bus–train