Hierarchical Level of Transportation Planning: A Review

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Abstract- A road hierarchy has, for some time, been accepted as one of the important tools used for road network and land use planning. It is a means of defining each roadway in terms of its function such that appropriate objectives for that roadway can be set and appropriate design criteria can be implemented. These objectives and design criteria are aimed at achieving an efficient road system whereby conflicts between the roadway and the adjacent land use are minimised and the appropriate level of interaction between the roadway and land use is permitted. The four level road hierarchy, as presented herein, expands the use of the road hierarchy as a tool for a broad spread of uses ranging from network/land use planning to asset management.

Keywords- Planning, Level, Hierarchy, Management, Function, Appropriate etc.

I. INTRODUCTION

Roadways serve a variety of functions, including but not limited to the provision of direct access to properties, pedestrian and bicycle paths, bus routes and catering for through traffic that is not related to immediate land uses. Many roads serve more than one function and to varying degrees, but it is clear that the mixing of incompatible functions can lead to problems.

A road hierarchy is a means of defining each roadway in terms of its function such that appropriate objectives for that roadway can be set and appropriate design criteria can be implemented. These objectives and design criteria are aimed at achieving an efficient road system whereby conflicts between the roadway and the adjacent land use are minimised and the appropriate level of interaction between the roadway and land use is permitted. The road hierarchy can then form the basis of ongoing planning and system management aimed at reducing the mixing of incompatible functions.

A four level road hierarchy has been developed by Eppell Olsen & Partners and adopted by a number of planning agencies in Queensland. This paper outlines the basis behind this road hierarchy and how it can be used to assist in areas of transport/land use planning and asset management.

Hierarchical levels of grouped data are a commonly occurring phenomenon (Osborne, 2000). For example, in the education sector, data are often organized at student, classroom, school, and school district levels. Perhaps less intuitively, in meta-analytic research, participant, procedure, and results data are nested within each experiment in the analysis. In repeated measures research, data collected at different times and under different conditions are nested within each study participant. Analysis of hierarchical data is best performed using statistical techniques that account for the hierarchy, such as Hierarchical Linear Modeling.

Hierarchical Linear Modeling (HLM) is a complex form of ordinary least squares (OLS) regression that is used to analyze variance in the outcome variables when the predictor variables are at varying hierarchical levels; for example, students in a classroom share variance according to their common teacher and common classroom. Prior to the development of HLM, hierarchical data was commonly assessed using fixed parameter simple linear regression techniques; however, these techniques were insufficient for such analyses due to their neglect of the shared variance. An algorithm to facilitate covariance component estimation for unbalanced data was introduced in the early 1980s. This development allowed for widespread application of HLM to multilevel data analysis. Following this advancement in statistical theory, HLM's popularity flourished.

HLM accounts for the shared variance in hierarchically structured data: The technique accurately estimates lowerlevel slopes and their implementation in estimating higher-level outcomes. HLM is prevalent across many domains, and is frequently used in the education, health, social work, and business sectors. Because development of this statistical method occurred simultaneously across many fields, it has come to be known by several names, including multilevel-, mixed level-, mixed linear-, mixed effects-, random effects-, random coefficient (regression)-, and (complex) covariance components-modeling. These labels all describe the same advanced regression technique that is HLM. HLM simultaneously investigates relationships within and between hierarchical levels of grouped data, thereby making it more efficient at accounting for variance among variables at different levels than other existing analyses.

A. Hierarchy

A hierarchy can be described as:
A system or organization in which people or groups are ranked one above the other according to status or authority.

And when we translate this to how hierarchy works in design, we can adapt it a little to something like this:
A system or organisation in which the elements in our design are ranked one above the other according to status or importance.

By establishing a hierarchy we are aiming to display all of the different elements in our design effectively, according to how important they are and what level of focus or attention needs to be placed on them.

Hierarchy is also about storytelling; it's about our user's journey through the website and the user flow we create. We can leverage a strong hierarchy when trying to get our users to go where we want them to go.

Hierarchy also relates not only to the visual layout of our elements, but also the site structure to begin with, where we rely on the planning we did in our content stages. It's at this point we can look at the content hierarchy, how the content should be split and managed and that helps us to move to our visual hierarchy and structure, where we look at the main layouts, grids, typography and imagery such as icons, buttons and photos.

B. Hierarchy of Roads in India

A good planned city/town reacquires an efficient transport system. This can only be achieved if the town planner is well acquainted with different hierarchy of roads. Thus a town planner and transport planner must have a good understanding of hierarchy of roads in urban and rural areas.

A productive urban way system, accompanies an order. The hierarchy of road is dependent upon the function that the street is required to perform, and the kind of movement and the way users present. The outline speeds , way widths and other geometric characteristics are adapted to suit the way work. These guidelines are dependent upon the accompanying characterization of urban way:

1. Arterial Roads: They are the primary roads & are on top in hierarchy of roads for guaranteeing versatility capacity. They convey the biggest volumes of movement and longest treks in a city. These are characterized by through movement with confined access from carriageway to the side. In such cases, unique provisions ought to be acquainted with decrease clash with the through movement. These roads have the most extreme right of way around the four classes and cater speed of 50-60 km/h and a ROW of 50-80 m.

2. Sub Arterial Roads: This class of street takes after all the capacities of an Arterial Urban way and are portrayed by portability, and indulge through movement with confined access from carriageway to the side. It conveys same movement volumes as the arterial roads. Because of its overlapping nature, Sub arterial roads can function as arterials. This is setting particular and is dependent upon the capacity and the area use advancement it passes through and caters to a velocity cutoff of 50 km/h(same as arterial roads) .The ROW of this classification of streets changes from 30-50 m.

3. Distributor/collector Roads: As the name recommends, these are connector ways which circulate the activity from access lanes to arterial and sub arterial roads. They are portrayed by portability and access just as. They are portrayed by a speed limit of 30km/h and have a ROW halfway of access lanes and two sorts of arterials i.e. 12-30m. It conveys moderate movement volumes contrasted with the arterial roads. Because of its covering nature, merchant streets can go about as a sub arterial roads and as access lanes, contingent on the capacity and the area utilization of the surroundings

4. Access Streets: These are utilized for access capacities to bordering lands and regions. A greater part of excursions in urban regions normally begin or end on these streets.They cater to velocity of 15-30km /h and have a ROW of 15m-30m. They convey generally lower volumes of movement at low speeds. They are described by access prevalently; they could be utilized for gatherer capacities.

C. Transportation Planning Activities/Initiatives

Roads and other transportation facilities generally balance two competing functions, traffic movement (mobility) and direct access to land (access). Commuter and goods movement traffic prefers to move quickly and safely from one location to the next with minimal stops. Multiple traffic lights, property accesses and mid-block pedestrian crossings can impede this.

Local traffic has a different purpose. Travel speed is a lower priority, but safe access to various destinations is critical. Local trips may be negatively affected by commuter and goods movement along major corridors.

Development Plans of the Provincial Planning Regulation identifies three transportation activities and initiatives as requirements or considerations in the development plan preparation process. They help to balance both mobility and access functions while reducing conflict and improving user safety. The three activities include:

- functional classification/road hierarchy (requirement)
- access management plans (consideration)
- transportation master plans (consideration)
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D. Integrating Transportation with Land Use Planning

The functional classification system, access management plan or TMP must reflect and be co-ordinated with land use plans, including the development plan, any secondary plans, the zoning bylaw, subdivision design and site-specific development, to ensure the policies are mutually supportive. This section of the guide focuses on integrating key transportation issues at each stage of the land use planning process at the rural/regional and urban/municipal levels.

II. CONCLUSION

The overall framework for a new four level road hierarchy. It also presents a sample of the desirable criteria suggested for each roadway classification. These criteria and the overall four level framework can be used in a broad range of transport planning and road system management areas. Transport planners and road authorities are encouraged to consider the use of this hierarchy framework to plan and manage their road networks.

III. REFERENCES

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