Systems Thinking for Accessible Journeys

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Introduction and Objectives

This study sets out to define the system of transportation delivery in New Zealand using a systems approach, with a particular focus on outcomes that create barriers to accessible journeys. Study objectives are to:

a) Highlight the importance of delivery of accessible journeys
b) Identify examples of current system failures that are contributing to barriers to access
c) Demonstrate by comparison that system improvements are achievable

The term 'accessible journey' is defined for this paper as *a door-to-door journey able to be undertaken regardless of mobility, sensory or intellectual impairment.* Accessible journeys are often discussed in the context of disabled pedestrians. This paper relates primarily to networks of footpaths, road crossings and public transport provision, and how system components and processes contribute to (or prevent) accessible journeys on those networks.

The study results contribute to an improved understanding of how barriers are built into new infrastructure, and unaccounted for in existing networks. This understanding can subsequently be used to prioritise not only funding, but as a tool for transportation professionals to inform decisions on how best to provide accessible journeys in the course of their everyday work.

The paper includes a background to the systems approach, followed by a description of the system of transportation delivery, and the research question upon which this paper is based. The .research methods to address this are then discussed, (including focus groups, a case study, and a comparison to a similar transportation delivery system in New Zealand) followed by a discussion, conclusions and recommendations.

Background

Who needs accessible journeys?

A report by the New Zealand Human Rights Commission based on an Inquiry into accessible public land transport found that

a) barriers in the built environment unfairly prevent many disabled people from full independent participation in society, and
b) there is growing understanding that improving access to transport will benefit all New Zealanders (Human Rights Commission,

Around 17% of New Zealanders identify as having a disability of some kind (Burdett & Pomeroy, 2010), including 45% of those aged over 65 years (Statistics NZ 2006). In addition to these figures, many people endure temporary disabilities (through accident or illness), are involved with caring for others, or have particular access needs (for example, caregivers to young children) which result in less than optimal mobility. The need for accessible journeys is widespread.

Why a systems approach?

Typically, engineers will approach site-specific problems with convergent thinking. That is, the optimal solution will be teased out through standardised analytical procedures. While this is

appropriate for solutions to clearly defined problems, issues relating to provision of accessible journeys are not site-specific or exclusively technical in nature. Divergent thinking (a systems approach) draws on ideas from across disciplines and organisations, to reach a deeper understanding of what the real problem is, from the outset. Specific problems relating to access can, and have often successfully been solved with a singular approach. This paper sets out to improve transportation professionals' contribution to accessible journeys. The scope is wide and the issues are complex. A systems approach is warranted.

Research Question

Given that the need for accessible journeys is widespread; that a systems approach is considered most appropriate to address those needs, and that this paper focuses on the role of transportation professionals, the research question is:

How can transportation professionals best contribute to an accessible transportation system?

Overview of the New Zealand Accessible Transport System

Before discussing methods to address the research question, the following Figure is presented to show some of the components and processes that exist in the current New Zealand transportation system. This Figure can be used to represent any component of transportation delivery (for example, Road Safety, Public Transport, Accessible Journeys). It is by no means a complete representation of all components of the system, and its processes are not assumed to be static; it is simply provided as a base for discussion in the following sections of this paper.

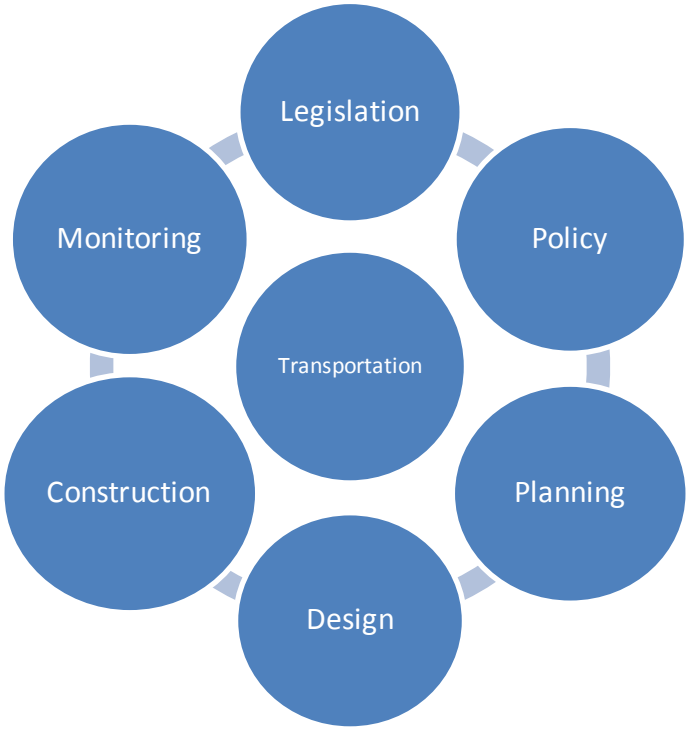

Figure 1 The Transportation System

The individual components selected for **Figure 1** typically (though by no means exclusively) involve similar people and organisations, distinct from those involved in other components. For example,

legislation involves politicians and lawyers. Design involves transportation engineers, arguably more so than for any other component shown. Within the individual system components, there are several layers of complexity involving other components and processes that are not shown. As an example of this, the 'Design' component of the system is expanded in **Figure 2** to represent some of the typical aspects of life as a transportation system design engineer.

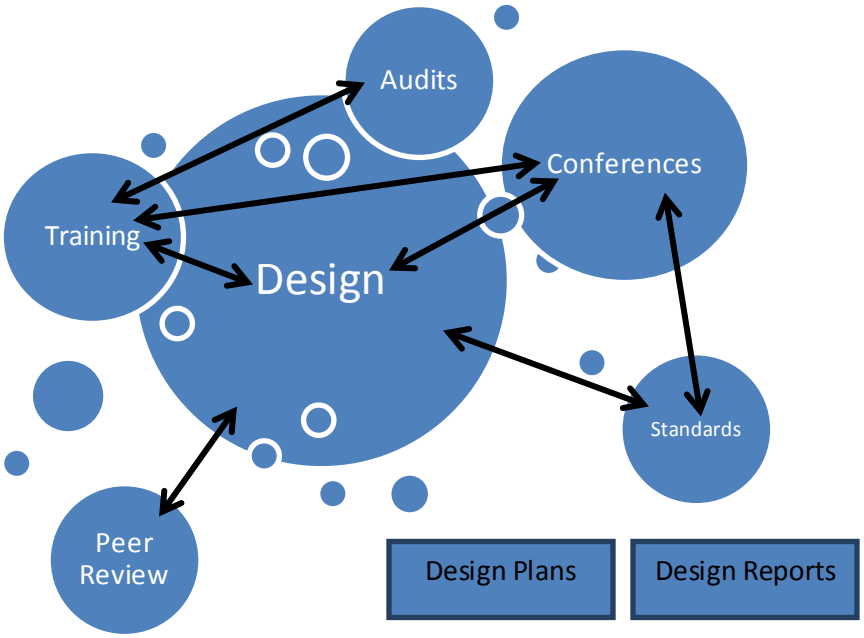

Figure 2 Example components and processes within Transportation System Design

In addition to links within a system component such as design shown above, this system (like many others) contains feedback loops. Consultation is an example of a process whereby information is fed between components. Feedback loops are important as they can be a relatively strong way to effect change in any system (Meadows, 1999). An example of how consultation works as feedback for transportation is shown in **Figure 3** below.

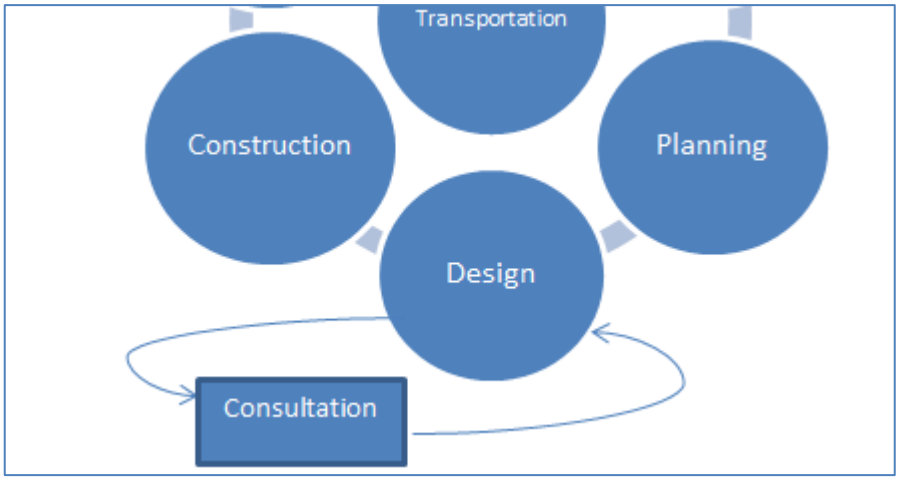

Figure 3 Example of a feedback loop

The importance of consultation as a real feedback loop (that is, where changes can and do result in the system process or component being consulted on) is therefore evident, as without it, the system goals can remain unrealised. While feedback loops may add time and cost to the process, they can most certainly add value if they better contribute to achieving system goals. Without feedback, it is more likely that the time and money invested is not optimised for best system outcomes.

Study Methods

Bearing in mind the transportation system as described earlier, and in an effort to answer the research question *How can transportation professionals best contribute to an accessible transportation system?*, the following methods were selected:

1. Case Study: Analysis of system workings in a real transportation project
2. Focus Group: Workshops and survey to discuss system components, links and gaps
3. Comparison: The New Zealand Road Safety System

Case Study: Hamilton City Council Minor Safety Program 2010/2011

The Hamilton City Council carries out a program of minor safet works most financial years. Typically, this involves treatment of a cluster of connected local streets, with some form of traffic calming. The following processes took place for the 2010/2011 program of works, in the order stated:

1. Data gathering
2. Participatory Design (Consultation with resident community and other stakeholder groups)
3. Data analysis
4. Concept design
5. Consultation
6. Detail design
7. Construction
8. Survey

Note that item 5 above is an example of the feedback loop shown in **Figure 3** previously.

These processes contributed to delivery of a localised transportation network with the following features for accessible journeys:

- Slower traffic speed environment
- Lower general traffic volume on through-roads
- Accessible bus stops (hard surface, adequate kerb height, seating)
- Flush pedestrian crossing locations with tactile paving

Of course, accessible journeys within a ‘cluster of connected local streets’ as described above, are only useful for journeys that start and end in the treated cluster. Outside of the local, treated network, no meaningful improvement was able to be made to journeys. For this reason, the improvement to bus stops is considered to have the greatest positive effect on accessible journeys for this case study, as it has the potential to connect people living in the treated community to the greatest number of facilities, enabling their participation and thereby improving accessibility.

The system processes that contributed most to this outcome was *participatory design*. For this project, consultation involved blank aerial maps and conversation with residents, disabled road user advocacy groups and the bus controlling authority (regional council). This process enabled direct identification of 'tack-on' improvements that could be made during the course of the works, to promote accessible journeys. If this process had not been utilised, the focus on the objective of safety meant that the opportunity for access improvements (at minimal incremental cost) would likely have been missed.

Other outcomes of the project are likely to have made gains on objectives other than improvements in accessible journeys, but the meaningful effects for a localised project such as this are necessarily limited by the geographic scope of the physical works.

Focus Group

To help define which links in the accessible transport system could be improved to help achieve system goals, a focus group was convened in Hamilton. This enabled a conversation among people from many different organisations, and therefore parts of system delivery. Attendees were invited from the following organisations:

- New Zealand Transport Agency, Planning and Investment
- Waikato Regional Council, Transport Planning
- Hamilton City Council, Transportation Unit
- Hamilton City Council, Community Development Unit
- Fulton Hogan (Construction company)
- Beca Group, Transportation Engineering
- Beca Group, Planning
- CCS Disability Action
- Waikato District Health Board, Population Health
- Rauawaawa Kaumātua Charitable Trust

Representatives from all organistaions listed attended the workshop, with the exception of Rauawaawa Kaumātua Charitable Trust. The focus group involved every participant answering two questions in a round-table conversation:

1) How do you see your role in the delivery of accessible transportation?
2) How does your organisation work with others, for example those represented here, in the system?

It was intended that Question 1 would help to define the system at a local (Hamilton) level, and Question 2 would help to identify links and gaps in that system, as a starting point for improvement.

The focus group highlighted several issues around delivery of accessible transportation. For many particpants, it was the first time that they had talked to others involved in the system, working towards similar goals. It was therefore very helpful in creating awareness around the complexity of individual system components (as shown for example in **Figure 2**).

However, it was evident that it is much easier for people to talk about their role, and issues specific to their role (ie, component-specific links and gaps), than it is for them to see the existing links

between theirs, and other components of the system as a whole. Even more difficult, is identification of gaps in the system, as these are by their nature less self-evident from the perspective of individual components.

Some specific outcomes of the focus group are included in the Discussion chapter below.

Comparison: The New Zealand Road Safety System

Accessible transportation is but one system within the greater system of transportation delivery generally. Another part of transportation is road safety. It has many similarities to accessible transportation in its components and the nature of its goals, and many differences in terms of the relative strength of its processes and feedback loops. Some of these similarities and differences are discussed in Table 1. It is stressed that these comparisons are examples only. The complexities within each system are referred to further in the **Discussion** chapter below.

Table 1 System comparison, road safety and accessible transport

System component	Road Safety	Accessible Transport
Design component: people	Typically involves transportation professionals in consultancy, and in road controlling authorities	
Policy: Documents	Nationally directed policy setting out system goals, vision and action plans (currently *Safer Journeys* (Ministry of Transport, 2010))	No known national policy. Some evidence of policy at local level (eg, Hamilton City Disability Strategy (Hamilton City Council, 2011))
Links from policy to practice	Strong links between policy and design. Practitioners are aware of the policy through external and project-specific training, and understand policy implications for their role.	Very weak connection between policy and practice. Few practitioners aware of any policy or its relevance to their role.
Feedback within design processes	Strong feedback loops regularly adopted and well understood (eg, safety audit process)	Limited awareness of the importance of feedback. Some consultation and auditing (vulnerable user audits) though their implementation is ad-hoc
Monitoring: Data quality and quantity	Data collection is constant, comprehensive and well-reported through other components of the system (crash data)	Very limited data collection (no known data on existence of accessible journeys or need for accessible journeys (number of barriers in built environment, nature and extent of disability))

As an example of the effect of weak system links and processes, the absence of good data is critical to the performance of transportation systems. This was identified in a report by the Human Rights Commission based on an inquiry into the accessibility of public land transport:

> *Incomplete information is a major hurdle to accurate cost/benefit analysis of the social and economic costs of both the barriers to accessible public land transport, and the opportunities inherent in the removal or reduction of barriers* (Human Rights Commission, 2005)

Two measurable indicators for accessible transport are barriers in the built environment, and road users with 'obvious aids' (for example wheelchairs, guide dogs, canes, crutches, mobility scooters). The absence of users with obvious aids is a sign that a journey is not accessible. Assessments of footpath condition can incorporate measures that amount to barriers (for example, absence of kerb cutdowns, steep pavement crossfall, temporary or permanent obstacles (light poles, advertising)). It is likely that the absence of good data on accessibility for transport is one factor contributing to a lack of focus on accessible transportation generally.

Discussion

How can transportation professionals best contribute to an accessible transportation system?

The methods used in this study showed that a system approach can identify strengths and weaknesses for any system in delivering on its goals. Several deficiencies in the system of accessible transportation were identified through this study. Overall, it is tempting to conclude that the complexities are so vast, and components so swamped by their own objectives and issues, that is simply too difficult to start to address accessible transport goals at a whole-system level. However, the needs identified at the start of this paper are greater than the challenges faced in addressing them. These needs are only going to increase in their extent and severity as our population ages, and as barriers continue to be built into our land transport environments.

The case study of a local program of minor safety works showed that value can be added at a local level through enforcement of feedback loops (consultation and participatory design), though the nature of delivery of these projects at a local level limits their effectiveness in delivering accessible journeys. There is potential for gains in this area by changing the focus from local works, to city-wide accessibility models so that the physical works investment results in the best value gains for transport as a whole.

The focus group showed that there is huge benefit to be gained from interaction between system components. Focus groups and workshops – even among people working in different parts of the same organisation – can help to realise efficiencies in the way that we work, by identifying opportunity in existing processes.

The comparison of accessible transport to road safety as transport systems highlighted the power of a healthy system. One of the most powerful levers in any system is cultural shift; changing attitudes in support of system goals. Clearly the way that road safety is owned as an issue by transportation professionals, and by society as a whole, is a huge factor in the strength of delivery of system goals.

Conclusions

It is concluded that transportation professionals can best contribute to an accessible transportation system by:

1) Continuing to promote good, effective consultation with stakeholders as a strong feedback loop

2) Consider 'improved accessible journeys' as a measurable outcome of transportation projects, in a similar way that reduced crash number and severity are outcomes for road safety projects,
3) Promoting and talking about accessibility as an important component of the transportation system generally, to raise its importance and therefore start a cultural shift in the way that transportation needs are understood
4) In the writing of planning and policy documents, use a system approach to measure system health, and to identify opportunities for efficiencies in meeting the goals of system subsets simultaneously.

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