What if we can influence safe travel behaviour through architectural design?

RAIL & TRANSIT CANADA

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Design of urban-style Light Rail Transit (LRT) is evolving beyond barricades and physical warning devices by incorporating architectural elements that influence people's awareness and encourage safe behaviour. The use of architectural elements to promote safe behaviour should be part of any future urban-style LRT.

Can we design an urban-integrated LRT system that operates safely within the public realm?

The LRT system consists of tracks, trains, stations and signals that serves the purpose of transporting passengers from one place to another within a city.

Future community development in the public realm will be transited-oriented, giving pedestrians and cyclists increased accessibility to the LRT system from proximity and convenient placements of LRT stations.

By 2030, public transit ridership in North America is projected to increase by approximately 30 per cent[i] , and transit networks will subsequently grow from urbanization and the demand for efficient, low carbon transit.

To meet the needs of transit development, the LRT system and the public realm will converge, resulting in an increase of walking and cycling activities in and around the LRT system as shown in *Image 1*. There are safety risks with LRT trains and pedestrians sharing the same space, including:

- The risk of pedestrians and cyclists being hit by a light rail vehicle when there are no barriers between the train tracks and the walkways or cycle paths.
- The risk that cyclists can be injured if a bike tire gets caught in the rails when crossing a track at an acute angle[ii].

Image 1 – Trains, cars, and pedestrians all interacting without any active intersection control in the Netherlands

At the speed of five kilometres per hour, a typical LRT train still requires at least four metres to come to a complete stop[iii] and cannot swerve to avoid a collision. Collisions threaten the lives of pedestrians and cyclists. LRT passengers are also subject to potential injury from the impact of an LRT vehicle's emergency brake.

Convergence increases the chances of fatalities or injuries but these incidents can be prevented from well-designed LRTs and their surrounding environment. *Figure 1* illustrates how safety behaviour is influenced by societal and environmental factors, which can help reduce the number and severity of collisions.

Societal factors include physical and mental health, time management, age, sex and culture. These combine with environmental factors like weather, traffic patterns, convergent spaces and common distractions. The wrong combination of social and environmental factors can result in behaviours, including increased human error, recklessness and intentional disregard for safety. This paper discusses innovative design solutions to address these behaviours.

Nudging Behaviour

"Nudging" uses subtle positive reinforcement and indirect suggestions to nudge people towards safer behaviour.

Can we use Nudge Theory to influence safe passenger behaviour on transit systems and in the public realm around LRT infrastructure?

As an example, Transport for London (TfL) launched a "poetiquette" campaign in 2013[iv] to minimize delays on the underground network. Poems were displayed in trains and recited at some of the busiest station platforms, encouraging people not to obstruct doors[v]. Initial feedback was positive, and the "poem and poster" campaign was part of an overall reliability program, contributing to a decrease in passenger delays[vi].

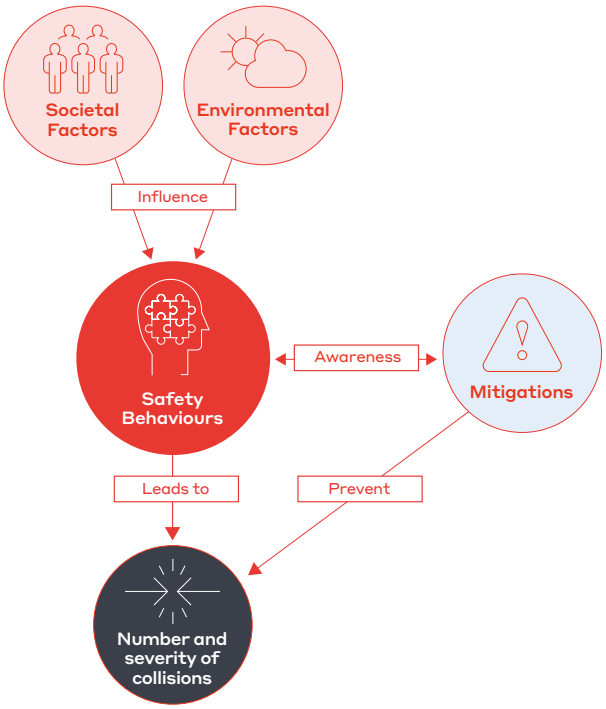

Figure 1 -Safety behaviours and influences

TfL also carried out a study on escalators at Holborn station, asking people to stand on both sides instead of standing on the right side and walking up the left side with highlighted escalator tread markings, as shown in *Image 2*. The study showed this increased capacity by up to 30 per cent due to the length of the escalators[vii].

Image 2 – Escalator treads nudging users to stand on both sides rather than standing on the right and walking up the left

However, it was extremely unpopular with passengers as over 60 per cent of London commuters claimed they preferred to walk up escalators for exercise purposes[viii], especially on shorter escalators. The trial was terminated[ix] and use of the escalators reverted to standing on the right and walking on the left as indicated in *Image 3*. The topic of rider health is further discussed in the Future Ready™ thought paper, "What if We Can Design Transit to Improve our Health?[x]".

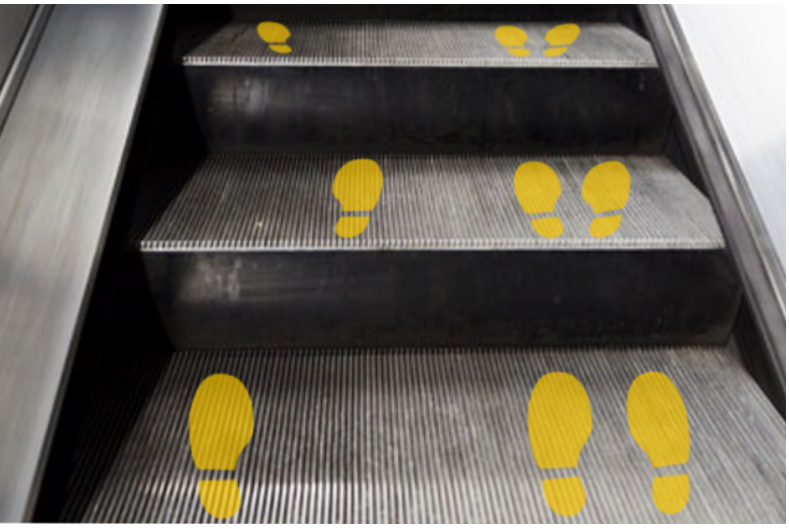

Image 3 – Escalator treads nudging users to stand on the right and walk on the left

A study of passenger behaviour entering and exiting the Perth railway station in Australia identified how different types of passengers move (e.g., tourists moving more slowly than seasoned commuters who know where they are going) and then looked at how movement can be influenced by introducing a directional arrow sign[xi]. The effectiveness of the arrows varied depending on the placement of the sign and whether it was static (a simple, unlit white arrow), dynamic (internally lit green arrows), or responsive (flashing arrows triggered by people near the influencer).

The Toronto Transit Commission (TTC) recently launched a pilot project involving painted lines and arrows on the platforms at the approximate location of the train doors, guiding people on where to stand while waiting to board to allow passengers to exit the train more quickly[xii]. The lines and arrows in conjunction with instructional decals on the train doors are intended to alleviate common congestion during peak operating hours and speed up boarding and alighting.

In 1989, a major rail operator in Japan commissioned a composer to create tuneful melodies to replace the harsh buzzing sounds preceding public announcements[xiii] to introduce a calming influence and promote better behaviour in a stressful, busy environment.

Vancouver recently used popular local comedian, Seth Rogen, to make announcements on some SkyTrain routes[xiv] to 'improve the daily commute'. This initiative was not associated with a formal behavioural study but nudged transit users to be more respectful to other passengers.

Hard and Soft Landscaping

The environmental design must facilitate the instinctive flow of distracted users because they're either in a hurry or looking at their mobile device instead of paying attention to their surroundings. Starting with the station location, designers must consider lighting, landscaping and surface treatments to help steer users to safer behaviours like the example shown in *Image 4*[xv]. People tend to gravitate to well-lit spaces with clear sightlines.

Image 4 – Tactile warning indicators and coloured pavers used to attract attention to crossing and instruction

Bodegaven, a town in the Netherlands, has progressed the scenario shown in *Image 4* a step further by installing LED lights into sidewalks that turn red or green to direct pedestrian movement at crossings[xvi].

Desire Lines and the Behaviour They Drive

People will want to choose the shortest route to their destination – a desire line[xvii], which may not be the safest choice.

Image 5 - Desire lines formed by frequent foot traffic taking the shortest path

Can we design an LRT corridor where the safest pedestrian paths are also the most desirable?

Desire lines develop for several reasons[xviii]. They may represent shortcuts in places where the constructed routes are circuitous (as shown in *Image 5*[xix]) or they could be easier to travel, avoiding undesirable conditions such as puddles or overhanging tree branches. Attempts to prevent the use of desire lines through signage or physical barriers can have mixed results, and sometimes lead to the creation of new alternative paths. LRT designs can take advantage of desire lines to influence behaviour by creating the safest and most desirable path for pedestrians and cyclists.

Information Technology to Improve Safety Awareness

Conversations around safe behaviour often focus on what distracts us from the task at hand and create an unsafe environment. People are more connected to their mobile devices than ever, which will not diminish in the coming decades[xx]. According to the American Society of Orthopedic Surgeons (AAOS), pedestrian injuries related to phone distractions have doubled since 2004, and 60 per cent of pedestrians are engaged by some form of distraction while walking[xxi].

Many hazard signs are placed on the ground rather than at eye level because people are focused on their mobile screens. But are people seeing past their screens to the pavement? What if they don't have to?

Can we use mobile devices to drive better behaviour?

Transit agencies commonly utilize technology, but with the focus directed toward infrastructure to reduce operating costs. As mobile computing, GPS, data analytics and other technologies change, there are new ways to improve service and attract riders, and information technology is transforming from a facilitating tool to an overall strategy.

Three general areas exist in which transit agencies are advancing technology:

- Real-time transit vehicle and ridership tracking technology can streamline transit service scheduling, routing and fare collection.
- Technology solutions allow transit to appeal to all earning classes, not just the traditional riders with lower incomes.
- Two-way interaction through developing social media will increase transparency and accountability towards increased rider satisfaction.

The goal is to keep riders well informed and to use social media to improve services. Can transit agencies use Bluetooth technology to "push" information to the surrounding mobile devices to alert customers and the public at large of approaching trains and encourage a safe movement?

Can safe public behaviour be encouraged through passengers' personal mobile devices?

Designing The Future

In the future, as urban population density increases, more people will choose public transit. New technology will offer different modes of transportation and alter how these modes are perceived and connected. The demand for public transit will force LRT corridors to converge closer with pedestrians and vehicles. There will be little space and a public preference to minimize the use of conventional safeguards such as gates, bells, warning lights and barricades.

Seeing this future more clearly will allow Future Ready™ designs to focus on influencing safe human behaviour, designing safer infrastructure, and leveraging new safety and information technology. As part of these Future Ready™ designs, the look and feel of architectural elements surrounding the LRT corridor will be a strong influence on the safe interaction between people, vehicles and the LRT corridor.

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