Someplace between haste and delay… Investigating the Interactions of Road Users and Pedestrians in a Dynamic Rail Level Crossing Environment

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1. Introduction
There are currently 23,500 level crossings in Australia, broadly divided into one of two categories: active level crossings which are fully automatic and have boom barriers, alarm bells, flashing lights, and pedestrian gates; and passive level crossings, which are not automatic and aim to control road and pedestrianised walkways solely with stop and give way signs. Active level crossings are considered to be the gold standard for transport ergonomics when grade separation (i.e. constructing an over- or underpass) is not viable.

In Australia, the current strategy is to annually upgrade passive level crossings with active controls but active crossings are also associated with traffic congestion, largely as a result of extended closure times. The percentage of time level crossings are closed to road vehicles during peak periods increases with the rise in the frequency of train services. The popular perception appears to be that once a level crossing is upgraded, one is free to wipe their hands and consider the job done.

However, there may also be environments where active protection is not enough, but where the setting may not justify the capital costs of grade separation. Indeed, the associated congestion and traffic delay could compromise safety by contributing to the risk taking behaviour by motorists and pedestrians. In these environments it is important to understand what human factor issues are present and ask the question of whether a one size fits all solution is indeed the most ergonomically sound solution for today’s transport needs.

2. Method
A series of on-site observations were performed over a 2.5-day period at a 3-track active rail level crossing in a rural town 21km away from the centre of Melbourne. The level crossing was located directly beside a train station and was designed with a single pedestrian maze to gain access to the station.

Figure 1. Street and aerial views of the active level site where observations were conducted.
Data were captured using a specifically designed manual-coding scheme for recording and categorising violations at the intersection. Categories included: going through the crossing after it had been activated; going before the barriers had fully risen and the lights had stopped flashing; going around lowered barriers; and stopping or queuing over the level crossing when it was inactive. The data capture scheme also distinguished between road users and pedestrians that were the first to violate and included a time stamp of every time the level crossing was active.

Two researchers undertook the observations beside the level crossing for a total of 25h over the 2.5 days, at both peak (7-9am; 4.30-6.30pm) and non-peak (9.30am-4:00pm) time-points. Both researchers observed in peak times, whilst observations in non-peak times were undertaken in shifts.

3. Results:

Over 200 separate road user and pedestrian violations were recorded, with a large representation in almost every category. Whilst the violations occurred relatively consistently, the morning peak periods had the largest concentration. The roads in the vicinity of the level crossing were frequently congested, and analysis of time-stamping data revealed that the crossing was active for more than 65% of the time in all three of the 2-hour morning peak periods.

In many cases, trains took up to 3 to 4 mins to arrive at the level crossing following its first activation. Many pedestrians jaywalked under side rails and over the round, or around active boom gates and onto the railway itself. In numerous cases pedestrians put themselves at significant risk in order to beat or catch the approaching train, ignored the signs to stop walking when the lights were flashing.

4. Discussion:

Although many violations were recorded, the culpability did not necessarily reside with the pedestrian or road user. In many cases, violations such as stopping and queuing on the level crossing appeared unavoidable. Roundabouts situated either side of the crossing meant that many vehicles were forced to use the crossing to correct lanes. The surrounding environment was also poorly designed for the pedestrian. For example, the land on the opposite side of the road and pedestrian maze had been repurposed for “park and ride,” but the journey to and from the parking area did not include a road crossing or clear walkway. The intersection was poorly designed for both road users and pedestrians and many violations were more a reflection of very poor design ergonomics, systematic erosion of safety and normalisation of deviance (Dekker, et. al, 2011; Vaughan, 1997). This work offers insight into the reality behind the reality of active level crossing protection, and argues that whilst level crossings are being upgraded on a case by base basis, one size does not fit all.

References
