Participatory Road Design:
The road to a better future

Presentation
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Participatory Road Design

- Brief history of the car
- Road Safety Statistics
- Engineering, Enforcement, Education, and Self Explaining roads
- Participatory Road Design
- What I have found
- Questions and comments

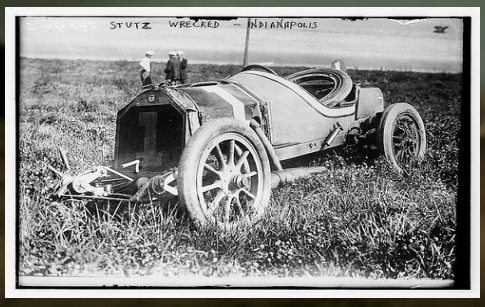
Brief History of the Car

- From the minds of Leonardo da Vinci & Roger Bacon
- It began transporting people en mass starting in the early 20th Century
- Unfortunately, it was also killing people very shortly after, due to reckless behaviour (Flink, 1975)

Brief history of the Car

- "In New York alone over a 1000 children were killed by cars before 1910." (Dog & Lemon Guide, 2007, p. 8)
- In 1903 W.K Vanderbilt casually knocked over around 100 spectators during a race and was disqualified for approaching the starting line on the wrong side of the timer (Dog & Lemon Guide, 2007)
- As a result of these kinds of incidents, legislation and laws were soon implemented (Flink, 1975)

Brief history of the Car

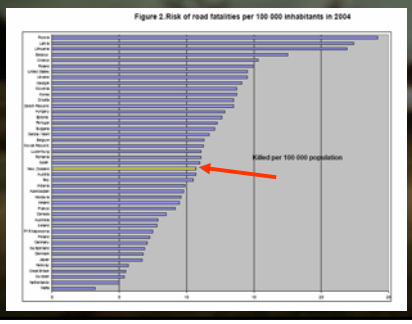


Statistics

- Road crashes still account for 180,000 deaths per year in OECD & ECMT countries and 1.2 million deaths per year worldwide (WHO, 2007)
- Many countries have ambitious goals to reduce their road tolls by 2010-2012, but many will not make it due to a levelling off of progress in reducing accidents (OECD, 2006)
- New Zealand was is on track, but the road toll for the past twelve months has already exceeded 400 per 100,000 more than the goal that was set in 2004 (LTNZ, 2007)

Statistics

- New Zealand is ranked in the middle of the OECD in terms of road deaths



Statistics

- This may seem OK, but consider that New Zealand ranks amongst many Eastern European countries that still have emerging road infrastructures and accompanying safety concerns, such as Romania

A Romanian Road

A Road in New Zealand

The 3 Es (plus 1)

- The legislation that was begun in the early 1900s in the US and Europe has changed and evolved over the past 100 years or so and since around 1915 has been put into three main categories of:
- Enforcement, Engineering, and Education
- A fourth category “Self Explaining Roads” has also been gaining prominence in the past two decades

Enforcement

- Enforcement is perhaps the most well known of the three Es. It is dealt with mainly by the police in most countries
- Main focuses in New Zealand are reducing speeds, drink driving, enforcing seatbelt use, and community interventions
- Techniques include speed cameras, mobile patrol units, breath testing etc.

Engineering

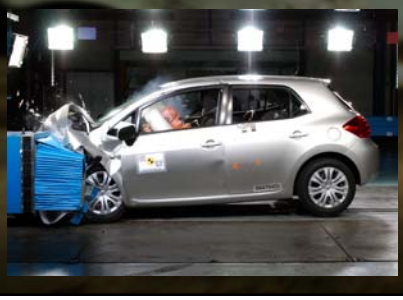
- Engineering focuses on improving safety by improving roads and vehicles
- Techniques for roads include, improving road design and surfaces, and traffic calming
- Techniques for vehicles include, crash testing and design, driver aids (such as collision avoidance, improved headlights etc)

Engineering

- The 2006 Brilliance BS6, an example of vehicle design gone bad. The makers claimed the sunroof caused the bad result

Engineering

An example of good safety engineering



Education

- Education includes:
  - Graduated driving licensing systems
  - Driver training
  - Driver education programs
  - Targeted advertising campaigns

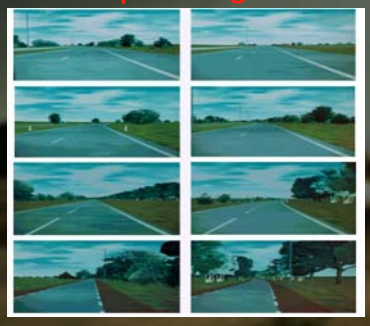
Education

Self Explaining Roads

- Self Explaining Roads (SER)
- " …a traffic environment which elicits safe behaviour simply by it's design." (Theeuwes & Godthelp, 1995, p. 217)
- SER advocates the use of set categories of roads to ensure drivers are not confused by different types of road with varying speed limits

A Non Self Explaining Road

Self Explaining Roads



An example of a set of road categories

Speeds for roads go from highest (top) to lowest (bottom) speed ratings

Issues With the 3 Es

- Road engineering strives to move people about quickly and safely (e.g. Transit, 2007;DFT, 2007; NHTSA, 2007) creating a conundrum when designing high capacity networks with a high speed limit. Sometimes roads end up being over-engineered, leading to higher speeds
- Vehicle safety improvements may make some drivers more complacent, thereby negating their effects, e.g. anti-lock brakes (Jonah et al., 2001)
- Enforcement only works as long as it is consistent (time halo effect) and visible (distance halo effect)
- Evidence for the efficacy of driver training/education is inconclusive (See Engström et al, 2003 for a comprehensive review)

Issues With the 3 Es

- Despite these issues, these techniques have saved thousands of lives. However, many thousands of people are still injured or killed in vehicle crashes and there is now a levelling off of progress in reducing road tolls around the world (OECD, 2006)
- Engineering and SER work implicitly, slowing drivers without their explicit knowledge
- Can explicitly involving drivers in road design by using their tacit knowledge, help to improve roads and driver behaviour?

Participatory Design

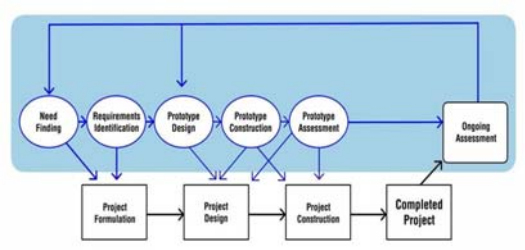
- Attempts to use people's tacit knowledge to improve an existing system/product or create a new one (Spinuzzi, 2005)
- Focuses on the democratic involvement of users in all stages of design
- Is used in a wide range of fields ranging from; computer science, workplace development, ergonomic interventions, and product design

Participatory Design

- In Participatory Design, users and designers work together through the entire development cycle of a product or system
- This allows for flexibility and ensures that users' needs are discussed and negotiated throughout development

Participatory Design

In this way, the process allows for quick and efficient responses to any changes that may occur during development



Experiments

- My experiments used Participatory Design to attempt to improve road designs and improve drivers' behaviour and attitudes
- This presentation covers results from the final experiment in a series of four

Methods

- The experiment involved 28 participants, with 12 taking part in two teams of 6 people and the remainder taking part as the audience
- The teams redesigned a road which had speeding issues in a Participatory Design workshop

Methods

Methods

Methods

- The goal of the workshop was for participants to use a scale model of the road to allow them to produce a prototype road so that they could reduce speeds and generally improve the road in question

Methods

Methods

- To determine the efficacy of Participatory Design, participants were asked:
  - To rate their own and other's designs and several other control roads. Roads were rated on safety, aesthetics, preference, livability and estimated speed
  - About their attitudes towards speed
  - About their driving behaviour using the Driver Behaviour Questionnaire (Reason et al., 1990)

Methods

- Before starting the road redesign, teams were given an outline of road safety facts and statistics, as well as an outline of currently used speed reduction and road safety improvement techniques
- They were then given approximately 40 minutes to redesign the road
- The audience was given 5-10 minutes to give feedback and suggestions halfway through the design process

Methods

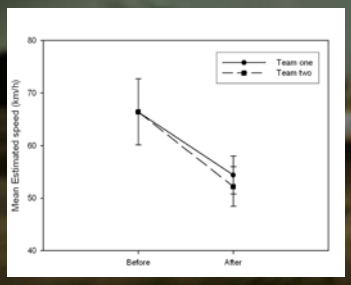
Methods

Results

- Both teams were able to significantly reduce estimated speeds for the roads they redesigned, both self rated and rated by others

Results

- Both teams were able to significantly reduce estimated speeds by more than 10km/h

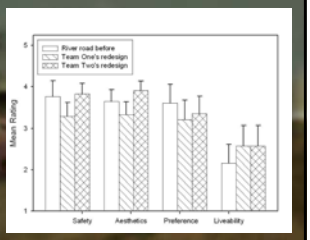


Results

Results

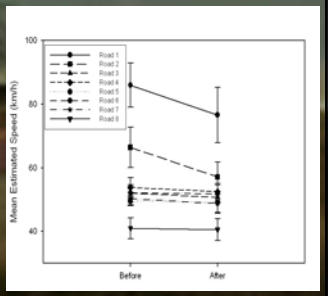
Results

- Both teams reduced speeds, but team one was rated lower than team two for almost all other ratings, by both themselves, the other team and the audience



Results

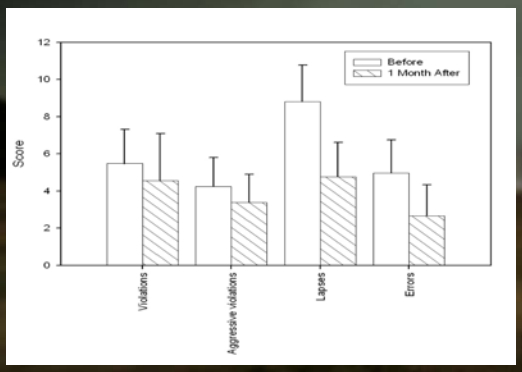
- Participants reduced their estimated speed ratings for other control roads were speed was an issue
- Participants were not aware of the speed limits for these roads
- Where speed was not an issue, speeds remained stable



Results

- The experiment found that self reported violations and lapses fell significantly after one month. Aggressive violations and mistakes also fell, but not significantly
- No reliable changes in attitudes towards speed were found, but there was a slight tendency for participants to be more pro-enforcement after the workshop

Results

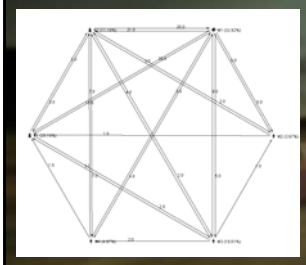


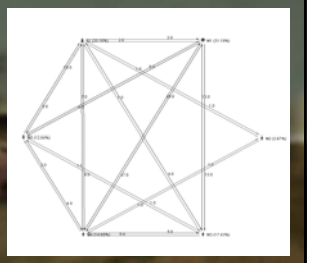
As the graph shows, all four measures were reduced, with violations and lapses reduced significantly.

Results

- Since both teams were working in the same environment and had access to the same resources, it was of interest to determine what caused these differences in ratings
- The communication and structures of the teams were analyzed using sociometrics.

Sociograms





Team One

Team Two

Results

- Number of interactions and comments made appeared to have little effect on how participants rated their designs
- Sociograms show that the teams were differently structured, with team one having one dominant person who largely interacted with only one other team member, indicating that team structure could affect the efficacy of the workshops in terms of road redesign

Results

- Only one team member (out of 12) in experiment 4 reported attitude change. Whereas 10 out 16 audience members reported an attitude change
- However, attitudes were largely unchanged according the attitude survey
- This maybe due to the fact that they were involved in only one workshop

Summary of results

- Participatory Design has the potential to aid in the redesign of roads where there are speed and accident issues
- It also appears to affect perception of roads in a positive way (i.e. reduced estimated speed ratings)
- Involvement in the Participatory Design process appears to improve self reported driver behaviour
- Attitudes appeared to remain largely unaffected by being involved in the process
- The structure of the group appears to important in the efficacy of Participatory Design

Future directions

- Real world application of the process, including the building of a road section redesigned using Participatory Design
- Further investigation in to the ability of the process to aid in improving driver behaviour via inclusion in driver education or re-education programs
- Wider application in other areas of the transport arena such urban planning and in the marketing and design of vehicles

Questions and Comments

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