Research Paper

Behavioural policy design for a car-dependent transport regime

Shifting to sustainable alternatives

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Abstract

Our experiences in an urban setting are driven by the choices we make and the perception we have about the urban-spaces. This paper is an attempt to illustrate the immediate need of putting personal experiences and community needs with respect to mobility in the forefront by prioritizing their travel behaviour models for city planning. The paper aims to present a deeper insight into how behavioural design when inculcated into traditional policy designs as 'behavioural nudges' help in reducing the level of car pride among residents, taking into consideration the learnings from global examples about factors that drive people towards car-pro attitude. This paper attempts to establish human-focused design as a driver for better transport policy outcomes by tapping onto the social values, past experiences and habits, and mental models. Lastly, the study outlines the application of behavioural sciences to facilitate a shift from a 'car-dependent' to a 'sustainable' transport regime, driven by gamified information systems and digital paradigms built for the people by using drivers that motivate the very same people. The question here is how people collectively make decisions about travel choices since the key to the behavioural design is to make these community-driven decisions simple, easy yet effective.

Keywords

Behaviour, Car pride, Cognition, Nudge, Socio-cultural values

1. Introduction

Our experiences in an urban setting are driven by the choices we make and the perception we have about the urban-spaces. Although classical economics is followed by urban planners to study the transport choices made by the residents of an area, yet very recently attention has been drawn towards the irrationality in the decisions within the transport framework of the city that has cropped up. The 'rational character' of users have failed to explain the complex and variable nature of the urban issues that seem to be impossible to solve (Thaler & Sunstein, 2008). However, the complex linkage has been simplified manyfold by coming down to the level of behaviour-driven choices. Behavioural economists have suggested that behaviours (such as notions of fairness, trust, commitment, adherence to social norms, overweighing low-probability events, etc) lead to results that may not conform with traditional economics. Establishing a framework of planning within which changing human behaviour and influencing the decisions that they make habitually is a key to secure the future of the sustainable cities that we envision today.

2. Background Research

Being the backbone of the economy, transport reflects the growth of the country. As the country develops, the need for transport infrastructure increases resulting in an unprecedented growth of vehicles. The increased number of private transports resulted in a rise in the emissions from the transport sector, 14.6% in 2005 to 17.8% in 2015 (Sharma, 2020). The one way to reduce the escalating emissions is to enhance public transport usage but it is a difficult job Adopting public transport is a new way of life for many and therefore, requires a 'behavioural change'.

Although behavioural sciences have been applied to fields such as economics, psychology, sociology and even design to a certain extent, however, the application of behavioural sciences have been negligible in urban planning. According to a study conducted in Mumbai, India, behavioural scientist, Anand Damani pointed out that individuals do not correct incoherent behaviour despite awareness, as decisions are not taken by humans rationally (Hemrajani, 2018). In a study conducted by Damani, he targeted to reduce the rampant car-honking issue in Mumbai. Buzzers were fitted in cars that went off every time the horn was pressed and then, the driver had to manually turn off the buzzer which was an additional nuisance (Hemrajani, 2018). This caused drivers to reduce honking by 61%; the method was simple but in the long run subconsciously useful.

Another instance of improving rail safety with behavioural nudges was seen at the Wadala station in Mumbai. On an average, nine to ten people in Mumbai die each day from accidents related to trains and railway lines, many involving individuals trying to taking a shortcut across railway tracks (Hemrajani, 2018). The Indian Railways with the help of a behavioural architecture firm, Final Mile positioned big hoardings with images showing horrifying facial expressions of a rider being run over by a train. Although the images were staged, they seemed alarmingly real and resulted in a reduction of deaths at the station by over 70 per cent.

Although the idea that humans are irrational beings go against classical economics, there is enough scope to use behavioural sciences not just as a manipulation, but for other benefits too. The same firm, Final Mile has also used techniques from behavioural science to control speeding on the Mumbai-Pune Expressway. For this specific case, they opted for a different approach – they painted sets of parallel lines across the highway road and as they approached the accident-prone zone, they reduced the distance between the lines (Hemrajani, 2018). This subconsciously forced the driver into thinking that they were speeding and would involuntarily press the brakes, preventing chances of accidents. These simple yet impactful techniques have created roads safer in India and at the same time successfully altered human behaviour for the better.

3. Methodology

The first objective of the paper is to establish the co-dependency between car ownership and use with various social, psychological and behavioural factors by elucidating examples from around the globe. The case studies discussed as part of the research are studies from China, USA, Europe and Australia. The second objective of the research is to understand how behavioural insights from commuters can be used towards the formulation of effective mobility solutions. Lastly, the paper shall establish the extent to which behavioural solutions can be used to reduce the car-dependent nature in cities of today. With examples of human-focussed interventions towards the mobility planning of cities, the research establishes how gamified elements may be used in transport systems and their possible impacts.

4. Cognitive aspects of human behaviour linked with Cars

Car is seen as one of the foremost desired "cultural goods" around the world and is seen to have beyond its instrumental functions of transport and mobility; it holds the symbolic meaning of pride – of social rank and up-gradation of the personal image by means of owning and using a vehicle (Beira˜o & Cabral, 2007). The utility-based behavioural modelling supported the functional value of the car has been the dominant framework. However, the deeper context of the symbolic relationship between people, cars and transit has largely been ignored – a relationship that offers rise to emotions that drive choices to car purchase and usage.

4.1. Personal Image linked to Car Ownership

Several studies in China and New York have found links between attitudes of individuals who drive and buy a car and their intention to shop for a car. The attitudinal factors are more deeply rooted in beliefs and notions instead of personal and situational factors related to mobility. People express their position employing a car and compare it to other social norms as they imbibe feelings of pride among the people. Moreover, among people who own a car, higher car-pride is related to them choosing cars as their most preferred mode of travel, leading to longer distance travelled and a larger share of car trips (even for walkable distances). It was during the 1970s that transport researchers realized the relationship between attitudinal factors and people's travel behaviour. "Alpha or hubristic pride" is associated with one's "subjective feelings of superiority" in reference to others (for example, "Driving a car makes me feel superior to people who don't"), whereas "beta or authentic pride" is expounded to one's legitimate feelings of self-esteem and self-worth (for example, "Driving a car positively affects my perception of myself").

A strong driving factor for car use for commuting to the workplace was the supply of free workplace car parking which encouraged even people staying near their workplace to also commute by car. Present-day cities are designed to cater to motorized transport and policy design cater immensely to the requirement for personal modes of transport. The massive infrastructure developments for the smooth movement of personal cars have left long terms impacts on the ever-increasing growth of motorized private transport. Human behaviour analysis could be a key tool for selecting between alternatives. According to the "Theory of Planned Behaviour", the probability of a selected behaviour being performed particularly in contexts is strongly correlated with an individual's intent to undertake the behaviour. In a study conducted by Pojani et al. (2018), it had been highlighted that the intent to undertake a behaviour will be accurately estimated as a derivative of three independent concepts: "behaviour beliefs (beliefs about consequences of behaviour)", "normative beliefs (beliefs about expectations from others)" and "control beliefs (beliefs about factors which will hinder/alter your behaviour)". The formerly mentioned theory views human behaviour as reasoned and rational, however people's beliefs are mostly biased and irrational. Habits, morals, personal norms, self-image and lifestyle also are drivers of certain behaviours. From the speculation, it's been seen that there's a weak relationship between intention and behaviour. While the highest influence on travel behaviour came from family or parents, conflicting messages from parents and teachers perceived to trigger divergence in beliefs (Pojani et al., 2018).

4.2. Pre-teens and Car-pro Attitudes

A study was conducted on preteens in Flanders, Belgium to illustrate the close correlation between "attitudes, intentions, and behaviour" which rooted from their past experiences. It showed that cycling and driving were preferred, whereby only those citizens mostly sided with cycling who did not know to drive (Pojani et al., 2018). Another research from Sweden revealed travel perception stemmed from their individual family car-ownership status wherein, all families justified and promoted their stance, in the long-term impacting the travel decisions among their children. However, both in car-free and car-owning

families, the parents didn't differ in their attitudes towards teenagers' independent use of any form of conveyance. Having said that, it is also noteworthy that their parents' belief made a difference as their children enjoyed more independent mobility if they had a strong support from their families to do so. Similarly in the United Kingdom, a study of preteens showed that they were partially educated about the health effects of transportation (He & Thøgersen, 2017). Even though the younger generation preferred active transport options as it provides the opportunity to socialize, they tend to form some negative stereotype about public transit and alternate transportation before the age of thirteen. This age cohort tends to use these stereotypes and apparent demerits to prove their support towards the use of cars as their primary mode. Cars have transformed into a part of mainstream travel culture within the U.K. and incorporated as an indispensable item in major social institutions (Pojani et al., 2018). This would manifest into a large section of youth owning or at least aspiring to own a personal car after they grow older, either as a symbol of social status or just for the sake of it. A Danish study conducted with fifty adolescents used the "deductive–inductive thematic narrative analysis" to support the "socio-ecological approach" towards car-ownership and use in the short and long term (Sigurdardottir et al., 2014). The results illustrated three distinct segments which were in conformity with the "market-diffusion model": "intended early car users", "intended early license holders and later car users" and "intended late license holders and car users". The first group are "car enthusiasts" who believe that cars have high social, instrumental and symbolic values, live in car-oriented social networks and envision a car-oriented lifestyle. The second group are "car pragmatists" who again associate cars with a high degree of relational values but perceive car expenses as a barrier given their current status of living and thereby, envisions a car-oriented lifestyle only within the long-term. The third and the last group refers to "car sceptics" who have a low importance of cars in life, either due to barriers or personal opinion, and therefore, align towards a transit-oriented or cycle-oriented future.

The qualitative nature of the study however, concluded that the results can serve as an "indicative or diagnostic tool", rather than a statistical model. Additionally, adolescents are in the process of developing permanent habits and this nascent stage opens opportunities for adjustment and changes to current social constructs about travel. The outcomes can catalyse dialogue about policy implications and suggest the expansion of social interactions and community engagements that may allow adolescents to build unique travel habits that promise a sustainable mobility space. Efforts could be channelised towards finding new techniques that help develop the extent of sustainable initiatives through participatory planning models using the social media and awareness campaigns, that tend to change the behavioural structure and existing mental models.

4.3. Social Status and Car Pride

A study in Australia explored how youngsters visualise and mention about cars, about getting a driver's license and owning a personal car in the near future draws the attention towards three hypothesized key attitudinal shifts: (i) the evolving position of the car in lives, (ii) the developing impact of e-communications and (iii) an increasing awareness about climate change amongst teens. Further studies have suggested that in most parts of the Global North, license issuance, automobile use and ownership are at a gradual decline. Few reasons that may have contributed to this trend are – lower household incomes, household structural changes, location of residences, and sharing of vehicles. On the contrary, some researchers have also begun to think and understand as to which kind of mind-sets may have caused this decline on car reliance. As seen from the study, the following three hypotheses were made from the attitude shift in the younger generation –

1. The car and status: Analyses showed that pricey cars conveyed higher social status, however, the fundamental act of "owning a car" was not seen as a status symbol but rather a depiction of responsibility, adulthood and freedom. Individuals who didn't own a car weren't inferior, but rather were spoken of as dependents.

2. Travel and its role in communications: Discussions and grey literature tend to award e-communications as the reason behind the decline in the number of young drivers. However, e-communications are only seen as a medium to initiate conversations and build physical friendships: they are never seen as a substitute for travel, especially driving.

3. Travel and environmental attitudes: Environmental concerns in association with travel failed to come up spontaneously in any conversations and when presented, were often responded with mixed ideas. Even non-drivers never attributed environment as a motivator for choosing to not drive and instead, car drivers tried to justified their stand. The sense of hopelessness among the car drivers and commuters may be attributed as a major cause behind the ignorant behaviour towards the contribution of personal travel choices on the environmental degradation.

5. Using Behavioural Insights for Mobility Solutions

Mental shortcuts are the key to decisions that an individual makes and this is why blending insights from psychology and economics reveal hidden forces that shape decisions. The term 'nudges' was coined by Richard Thaler and Cass Sunstein and was later used to test behavioural insights as a way to practice demand-side management.

In order to understand how behaviour impacts the public transport system, it is crucial to create a 'behavioural map' or a 'cognitive map' that identifies various psychological barriers that act as 'pain points' preventing individuals from using public transport. This allows behavioural interventions at the correct points without necessarily altering the supply chain. Interventions work best once the user groups may be classified based on their 'travel habit'. For example, an individual may be a low-frequency user and therefore, the incentive should be to encourage them at trying it again. But in case he is a mid-frequency user, the incentive should focus on making the person a regular user so that it becomes a part of their 'habit'. Alternatively, if they are high-frequency users, the focus should shift to making their experience better so that they may not shift to other travel habits. To test whether behavioural interventions are working in a real-case scenario, it is necessary to understand in a manner such that the outcomes are segregated based on 'control' and 'intervention'.

The key to implementing a behavioural intervention is to realise the barriers that prevent users from relying on sustainable mode choices; these factors may be economical, social or environmental. The public transport system is a complex process of friction points that make it inconvenient to use and not preferred by users. In behavioural terms, cognitive load is defined as the total mental effort needed by the working memory. When a task becomes complicated due to minor details and challenging sub-parts, the cognitive load increases. Making the task simpler is an incentive so that the person may consider a behavioural change. There is another similar cognitive bias that causes individuals to prefer driving called, the halo effect. This bias makes people consider certain judgements to be 'more attractive' than others such as driving a car highlights a positive feeling and a better standard of living as compared to using public transport.

Another behavioural barrier that must be overcome to make using sustainable modes is mental accounting. Since humans are dependent on their perception of things, we tend to allocate 'cost' to bundles in our mind. But we tend to prioritise the 'sunk cost' over real costs; this is called the sunk cost fallacy. Our future decisions about spending money on transport are dependent on the costs that have been incurred in the past. For example, using public transport even after having a car at home seems 'wasteful'. As soon as an activity generates a feeling of positivity, individuals are more likely to recurringly engage in the behaviour in the future, thus forming a loop of self-reinforcing habits.

Another research to test the incentives that work best for giving up driving was tested using behavioural insights (Riggs, 2020). The individuals to be surveyed were divided into cohorts with similar

characteristics and were asked to choose as to which mode they'd wish to shift from driving a car and three of the modes had a certain monetary incentive attached to it while one had an 'altruistic' incentive (i.e., identified as environmental ethos) (Riggs, 2016). The result was that combining financial incentives with compliance and social norms caused both the actions to be less effectual. Thus, this suggested that travel-demand modelling must rethink as to what kind of incentives work best for their stakeholders – it may be financial or it may be deep-rooted within the social norms. In similar research as part of the same study, the perception of street safety for cyclists was surveyed using behavioural factors driven by social values. The results showed that the correlation between the perception of the safety of the streets to the actual level of safety on the streets was low, showing that perception was a major cause for them to choose a particular route for riding a bike (Riggs, 2020).

The questions that need to be asked during policy formulations should be directed towards how people perceive and prioritise their decisions about important travel choices. Identifying key social norms is crucial and therefore, one must identify the most effective way to do so such that the social norms can be used as a way to improve their level of concern regarding the environment. Moreover, we cannot consider a particular community or a neighbourhood as a 'herd' and therefore there shall always be a variety in the demands and needs. But the real solution lies in tapping into a particular social norm or behaviour that is most prevalent. The key to the behavioural design and influencing choices is to make these decisions simple, easy and effective.

6. Human-focussed solutions for the 'shift away'

Providing commuters with only infrastructure provisions do not ensure that they shall be able to convert their habits into sustainable ones – however, persuasive techniques that use psychological influences such as gamification, nudging, health framing, incentives, etc. target particular behavioural models and change them so that people may adopt to more sustainable travel habits. There have been several instances whereby only nudges failed to create a positive behavioural change in transportation and were needed to be complemented with restriction of choices, promotion of behavioural modification using campaigns and altogether form what is essentially called the "nudge theory". A study by Ortmann & Dixit (2017) showed that non-pricing (behavioural) transport demand management (TDM) strategies were most effective when they tapped on nudges along with telecommuting, information architecture and incentives (gamified environments). The study enlisted the effects different behavioural intervention strategies had on transport systems – incentives (economic), transport disruptions (defaults), and information & design (information architecture) has high impact on behavioural change; gamification (novelty) has medium impact on behavioural change; however, time pressure, changing defaults, competition/embarassment and loss aversion do not have enough evidenc to suggest their applicability (Ortmann & Dixit, 2017).

Say, a child at the age of twelve or a college graduate at twenty-one is asked to take any route that he thinks is the best. What might be the best-case and worst-case scenarios? Either he fails and takes two extra trips but ends up warning others of the route being not a good idea or he discovers a new route and reduces fuel consumption by 20 per cent and informs others about the same saving fuel exponentially!

This one of the many examples of how gamification can be used in transport systems to increase motivation, strengthen trust, encourage participation, support community building and promote efficiency by crowd-sourcing information and generate socially-driven design alternatives (Game.UP – Gamification in Urban Planning, 2019). Gamification, on the other hand, refers to using some features of game theory into an interactive system (non-game) without having a full-fledged game as the end result or outcome. Simply put, gamification refers to "the use of game elements in a non-game environment" to achieve results associated with behavioural changes (Yen, 2016).

Since games have the only purpose to satisfy the individual playing them which is why gamification has a wider impact as they please the users by using game elements while fulfilling the needs of the policy. There have been several examples around the world that have used transport gamification to nudge behaviour using psychological and social theory as part of gamification. As seen from the case studies, mental barriers form during early years, between the age of 12 to 21 years and therefore, gamification has immense potential given that this age cohort is well acquainted with the digital space.

7. Conclusion

The research from various cities around the world illustrates that the dependence on cars arise from societal norms, individual experiences and stereotypes that turn into habits. The underlying concept of the gamification framework in this research is to shift users from a car-dependent regime built on social constructs to a mobility regime where mode choice is based on sustainable shared experiences. The purpose, however, remains the same – present alternatives that are appealing to users based on their personal habits and experiences. The theoretical diagram in Figure 1 is an illustration of how gamified elements can be used in transport systems by balancing utility and motivation, however, further evaluation and trials are crucial to establish its impact in transport context (Yen, 2016).
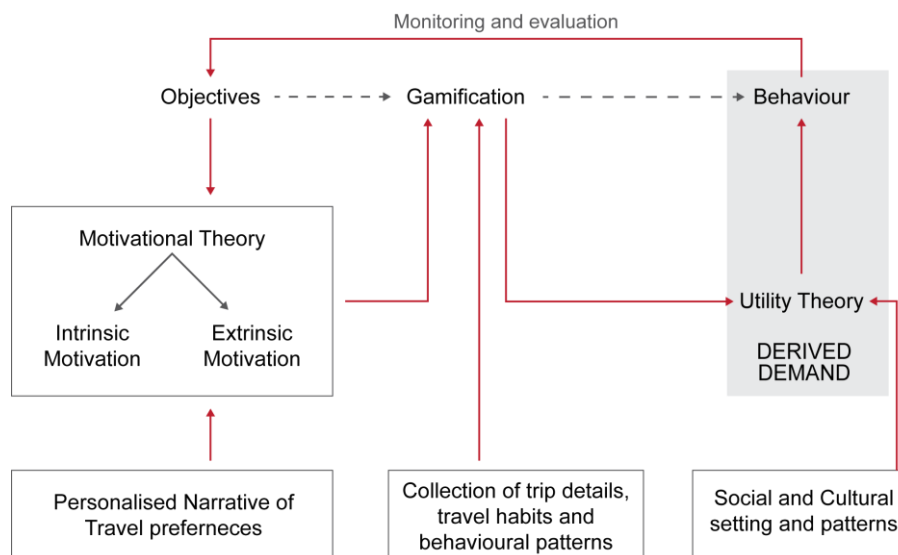

Figure 1. Theoretical Framework for gamification in transport context. Source: Author.

The intent of the research was to establish a conceptual framework for using nudge planning within the paradigm of transportation. Low-cost trials and pilot schemes that inculcate behavioural interventions are necessary to figure whether games and motivations are preferred and/or how they may benefit the stakeholders at large. However, this research may be elaborated for the preparation of a nudge-based transport policy that may be referred to for drafting the comprehensive mobility plans for cities.

8. Acknowledgement

9. References

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