

FINAL
REPORT

How should transport be regulated in 2025?

Research Reports on Specified Topics

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1.0 Executive Summary

This paper was commissioned as part of the Ministry of Transport overarching Strategy Project 2015: Regulation 2025 the main objective of which is to address the question: 'How should transport be regulated in 2025?'¹ This paper explores major social and technological pressures on the transport regulatory system in New Zealand and internationally focusing on five questions below:

- a. Are there examples of governments **regulating ahead of the technology or social curve**? If so what factors led to these decisions and what were the outcomes?
- b. What are the keys to success when using **social marketing** rather than regulation to change behaviour? What are the implications for transport of experience in other sectors?
- c. How is **new technology** being used in regulation and what new technologies are emerging which could add to the regulatory toolbox including enforcement?
- d. In what ways are **social media** being used in regulation now? In what circumstances could they be used to deal with problems of information asymmetry previously dealt with using regulation?
- e. What are the alternative **models to pay for the cost of regulation**? Are there new models emerging? How do these models balance competing objectives (such as efficiency, natural justice and equity)?

Before proceeding to these questions the report first addresses three more fundamental questions which help frame the discussion:

1. what regulation means;
2. why we regulate;
3. how to regulate.

Key themes and emerging findings

What is regulation?

Regulation includes the use of the state's coercive powers to allocate legal rights, and enforce them. Fundamentally, it is about influencing behaviour of individuals or organisations. It takes various forms such as Acts, regulations and rules made by Ministers.

Alternative means of government influence include state ownership and control, co-regulation, social marketing or advertising, and collective action for nonmarket production by private individuals.

In the transport sector, ownership of assets in support of public production of transport services, has been prevalent. It is important to delineate state

¹ The term regulation refers to legislative and non-legislative interventions.

regulation which is independent of ownership, and that which is a function of it.²

Why and how do we regulate?

We answer this partly by reference to government strategic outcomes. For example, the Ministry of Transport's high level objectives are to develop a transport system that maximises the economic and social benefits for New Zealand and minimises harm. These objectives apply to transport regulation as much as to other government instruments such as transport funding. The rationale for regulation also depends on the (transport) markets in question and the competitiveness of these markets. Regulation is sometimes intended to address monopoly power i.e. one important example of market failure. Overlaid on competition concerns are other forms of market failure such as the negative externalities (safety, noise, emissions) associated with transport. The relevant question for a regulator however is not whether market failure exists, but how to address an issue of concern using the most efficient institutional arrangement

Regulation provides the framework and permissible set of conditions under which decisions can be made on such features of transport markets as entry, price, access obligations and quality or conditions of service. To be efficient over time the regulatory framework will need to evolve as technological and social change expands the feasible set of opportunities, or introduces new constraints limiting them.

The social and technological context for transport regulation

The evolution of information and communication technology (ICT) is a key influence on transport and other sectors and the way they are regulated. This technological change:

- Increases the power of the individual to capture and use information: social media are altering how we think about information asymmetry. The circumstances in which government has a useful role in dealing with such asymmetries is changing.
- Brings forward the development and uptake of automated vehicles on land, and in air and maritime applications.
- Changes the boundaries between different transport modes. Convergence and greater intermodal competition can be foreseen. For example, Remotely Piloted Aircraft Systems (RPAS) may become intermodal – used to pick and deliver goods and perhaps move them from point to point on land.

²We recognise, of course, that the extent and nature of public or state production provides a major context for the regulation of other activities.

- Have implications not just for how we regulate transport services but also for the regulation of transport infrastructure or transport rights of way across multiple modes.
- Contributes to increasing unbundling of transport services, e.g. information from service, vehicles from infrastructure. Users can access service on demand and also potentially design their own bundles and switch back and forth between being users and providers. The same is happening in other sectors, especially media.

Regulating ahead of the technology or social curve

This section addresses the question whether there are examples of governments regulating ahead of the technology or social curve? If so, what factors led to these decisions and what were the outcomes?

Fundamentally this question is understood to be about the timing of regulatory change in response to technological or social change. The question for a regulator confronted by new technology or social change is whether new regulations need to be introduced or whether current regulations need to be adapted, or removed? The problem however is that with new technology or social change the regulator faces information problems and uncertainty about the existence of a market problem, and the effects of regulation. To regulate ahead of the curve may prevent a well functioning market from emerging. Sometimes it is better to wait and see. Regulatory failure can be worse than market failure.

Sometimes technological or social changes may clearly reduce the probability of market failures. These will reduce the net benefits of current regulation and therefore justify deregulatory processes, including steps to reduce the scope, breadth, depth, duration, frequency and intensity of current regulation over time. In transport, ICT developments have had three effects which potentially support a reduction in regulation: increased competition and reduced natural monopoly, safer roads and other transport networks, and less information asymmetry.

Good examples of regulation ahead of the curve include the common law and general competition law which seeks to minimise harm while facilitating market entry, competition and innovation. It does this by enforcing property rights and contracts ex-post. In the case of statutory regulators the best examples of regulation ahead of the curve which facilitated efficient technological and organisational change have involved "general and light handed" regulation. In transport examples of such regulation ahead of the curve have been more common in relation to "carriage services" rather than infrastructure services e.g. New Zealand's regulation of the taxi industry has allowed greater competitive entry like Uber, while the U.K.'s proposed light touch non-regulatory approach seeks to provide the clarity industry needs to invest in further research and development for driverless vehicles. On infrastructure services examples of regulation ahead of the curve appear to include early adopters of regulatory approaches permitted by recent

developments in technology especially ICT that enable greater private sector involvement in transport infrastructure. These include early adopters of private providers in transit (e.g. Hong Kong), in roads (Melbourne's CityLink, which combined tolling with a public private partnership structure, Norway and Spain), and in airports (e.g. Australia).

The first minimal step to achieve leadership in regulatory policy is a regulatory stock take, which would subject current regulation to a forward-looking cost benefit analysis, particularly in light of opportunities created by recent developments in ICT. A current example of technological change prompting the need for a regulatory stock take is the prospect of automated vehicles including driverless vehicles on smart networks. Automated vehicles may deliver significant economic, environmental and social benefits. But current regulations may (unnecessarily) impede market entry of these new vehicle technologies. Globally, reviews of current regulation affecting such technologies are gathering pace. The US has been the first country to introduce legislation to permit testing of automated vehicles. In contrast, the UK found that current legislation already permitted such testing.

Uncertainty about regulation is a key problem *for investors* in new technology. This is especially so when there are multiple regulators. Attention thus needs to be paid to ensuring an efficient structure of regulation, ownership and control, which minimises transaction costs and facilitates markets.

There are thus examples of regulating "ahead of the curve" in carriage services, but regulating "ahead of the curve" in infrastructure services has been more difficult. The factors that affect success depend on the form of the regulation. The common law and general light-handed regulation tend to foster more innovation while safeguarding the public interest.

Changing behaviour – social marketing rather than regulation?

This section provides an overview of the regulatory issues raised by *social marketing* including the implications for transport of experience in other areas.

Social marketing involves activities aimed at changing or maintaining people's behaviour for the benefit of individuals and society as a whole. These activities can occur across various media platforms including radio, television and social media. They can be undertaken by government (including regulators) or private sector parties.

The world of smart phone and tablet 'apps' is an especially fertile field in social marketing. Information about transit schedules and traffic conditions are already mainstreamed. But technology is going well beyond this. An app has been developed targeting young male drivers to record their driving behaviour, and give them real time-feedback intended to encourage safer driving. An example of an initiative exploring social marketing is the UK government 'nudge' unit established in 2010 that was specifically designed to design policies in such a way as to account for known human decision-making

tendencies, which include a preference for the status quo, a “present bias” and aversion to loss.

The problematic issue (for social marketing, as for conventional regulation) is changing behaviour in ways which may not be aligned with their self-interest. The broader issue is the appropriate role of government in influencing people’s behaviour through nudging, social marketing, or conventional regulation. The use of social marketing should be subjected to the same tests as traditional regulation. Social marketing involving even simple interventions that focus on improving consumers information needs to be subject to considered cost benefit analysis, randomised trials and effectiveness reviews. Questions that need to be asked include whether the Government is better at social marketing than the private sector, and whether Government sponsored social marketing may drive out private sector social marketing?

New technologies and the regulatory toolbox

The rise of ‘big data’ and ‘big data analytics’ is key to transport regulation and management. Most transport systems comprise many individual transactions that are now amenable to direct physical measurement and can typically be monetised as well. Widespread digitisation has made possible real-time accumulation of very finely grained and precise micro data.

New technology has expanded the scope for better transport pricing, enhanced competition, and increased transport privatisations within and across modes. Examples include expansion of private providers in transit (e.g. Hong Kong) in roads (e.g. Spain) and in airports (e.g. Australia). In each case, increased competition and private involvement has resulted in and driven improvements in project delivery and oversight.

Privacy of personal information stands out as a major concern affecting the use of big data and smart transport networks with automated vehicles. Individuals will be concerned with who can monitor their movements and what might be done with such information. These privacy issues are not easy to address adequately either in terms of types of data collected or inadvertent release of information.

Use of social media in regulation

This section addresses how social media are being used in regulation now, and in what ways it could be used to deal with problems of information asymmetry previously managed by regulation.

Social media are mainly being used by regulators as an information delivery device to affected parties and other users and as a means of listening to their communities. Social media in transport are still mainly used towards shaping behaviour, e.g. getting people to use public transport, rather than overseeing regulated people/entities to make sure they comply or to collaborate with them to design efficient regulations. The public health sector is further advanced – in transport governments tend to be reactors rather than actors.

Models to pay for the cost of regulation

This section discusses alternative models, whether new models are emerging, and how the various models balance competing objectives such as efficiency, natural justice, and equity.

It is important here to distinguish between the direct costs of regulation and indirect costs. Direct costs include the administrative costs to government of the regulatory process plus the compliance costs to those being regulated. Indirect costs of regulation, sometimes referred to as efficiency costs, are welfare losses attributable to regulations, and are typically much greater than the direct costs of regulation.

Models or principles for funding regulation depend on the nature of the regulation. For example, 'user pays' might be efficient and equitable in the case of private good transport regulation. Taxpayer funding, or partial taxpayer funding, may be more appropriate for public good legal regulation.

There has been a tendency recently for the costs of sector-specific statutory regulation to be financed increasingly by the industry being regulated rather than out of general taxation. If most of the benefits of regulation accrue to the industry this can be efficient. It reflects the underlying benefit principle and can be seen as the analogue of 'polluter pays'.

2.0 Introduction

The New Zealand Ministry of Transport, in collaboration with transport crown entities has embarked on an overarching Strategy Project 2015: Regulation 2025 which focuses on regulation. Its main objective is to address the question: *'How should transport be regulated in 2025?'*

Ultimately driving this work is the Ministry's objective of doubling the contribution to the economy and society from transport initiatives. Further relevant context is the recent Performance Improvement Framework (PIF) Review of the Ministry of Transport which in relation to regulation recommended that as a purely policy ministry, the Ministry should focus its attention on frameworks, policies and quality of regulation in the sector, as these are its core business, while leaving more "retail", or day to day operational work on regulation to responsible Crown Agencies.

2.0 The Research Questions and Topics

Further related questions raised by the Ministry in the call for Registrations of Interest (RoI) for this project were:

- what regulation means
- why and how we regulate, and
- major social and technological pressures on the transport regulatory system in New Zealand and internationally.

This gives us what we see as the four core questions for this project,

1. what regulation means
2. why we regulate
3. how to regulate, and
4. major social and technological pressures on the transport regulatory system in New Zealand and internationally.

On the last question, the Ministry identified five further subsidiary questions outlined below as indicative areas of interest. We see these five further questions as mainly relating to the fourth overarching one identified above. Our discussion of them is subsumed under that heading.

The five further specific questions include:

- a) Are there examples of governments regulating ahead of the technology or social curve? If so, what factors led to these decisions and what were the outcomes?
- b) What are the keys to success when using social marketing to change behaviour rather than regulation? What are the implications for transport of experience in other sectors?

- c) How is new technology being used in regulation and what new technologies are emerging which could add to the regulatory toolbox including enforcement?
- d) In what ways is social media being used in regulation now? In what circumstances could it be used to deal with problems of information asymmetry previously dealt with using regulation?
- e) What are the alternative models to pay for the costs of regulation? Are there new models emerging? How do these models balance competing objectives (such as efficiency, natural justice and equity)?

These last five questions or topics were identified as *indicative of areas of interest*, with the Ministry seeking to avoid specifying in any detail what should be covered under each topic. The Ministry instead sought our advice on

- approach and
- coverage.

On review we have concluded the last five questions or sub-topics do not merit equal treatment in terms of their value add and importance to regulatory strategy. Rather than drop any question, however, we have allocated space to the issues in accordance with their perceived value add. In particular given question c) overlaps with, and significantly duplicates other questions it is given a shorter treatment. The same is true of question d) which is also given a shorter treatment.

3.0 Outline

In what follows then we divide the report into four major sections, where we shall subsume the above questions as follows:

Section 4 - what regulation means

Section 5 - why we regulate

Section 6 - how to regulate, and

Section 7 - major social and technological pressures - including specific questions or sub-topics a) – e) outlined above. For reasons noted above questions c) and d) are given shorter treatment relative to others.

In each section we will seek to meet the Ministry need for expert guidance on

- the conceptual and
- practical dimensions of this work.

This is to entail research that:

- is authoritative
- reflects latest international thinking on regulatory theory, strategy and practice
- expands knowledge and understanding

- challenges existing thinking and approaches in New Zealand transport regulation
- is strongly focused on policy relevance, the Ministry does not want purely theoretical approaches.

The opportunity is to contribute expertise in ways which will

- support long-term improvements in transport regulatory systems in New Zealand,
- as well as to the broader debate about regulatory quality in this country.

4.0 What is Regulation?

Although the Ministry's call for Registrations of Interest (RoI) identified a broad conception of forms of regulation, it is important to realise that too wide a definition will ultimately make the concept less useful. In the first instance, it is important to recognize that there are already meaningful definitions or concepts of regulation that can be drawn on from law, and economics, and it is important to first ensure consistency in their use. If one is going to retain a broad approach to defining regulation, and incorporate a number of different forms it will be important to distinguish these different forms using different definitions and potentially "first names" or epithets like "legal regulation" etc. And then try to identify and focus on the more important forms of regulation in terms of economic consequences and potential role in Government policy.

In this regard, economics suggests that the fundamental problem for social organization including regulation is scarcity relative to human wants. This is as true of the transport sector as others. Given scarcity, confrontation over the use of scarce resources appears inevitable and enforceable rights that define the sanctioned relationships between people with respect to scarce "transport systems" and their use, and sale (i.e. legal rights), will be both necessary and inevitable. The state's coercive acquisition of rights of way to build roads, and the state's regulation of safety on the roads, are examples of the potentially productive use of state coercion. Nobel Laureate economist Douglass North defines a state as the contestable monopolist of violence whose geographic boundaries are defined by the limits of its ability to tax. It is thus uniquely or solely able to create enforceable rights, which requires an obligation backed by a state sanction. Allocating a legal right to one person requires imposing a legal obligation on others. Obligations are the reciprocal of rights. The classical definition of law and regulation moreover is that it is an obligation backed by a state sanction.

Enforceable rights then require state enforced sanctions - or the exercise of state coercive powers to regulate behavior. The creation and enforcement of tradable rights however can be productive; indeed, they are understood in law and economics to underlie the formation and operation of efficient markets, investment and growth, in all markets including transport systems. Given scarcity the legal regulation of coercion can thus improve social welfare,

facilitating the operation of markets, particularly to the extent transaction costs may otherwise prevent efficient private ordering.

It is thus appropriate to begin answering the question what is regulation, by answering it certainly includes the use of the coercive powers of the state to allocate legal rights, and enforce them. The use of the coercive powers of the state is the subject matter of public law which addresses two deeper questions namely, how are the rights of individuals to be decided, by what institutions following what rules? As we shall see in public law many different forms of legal regulation can then emerge out of a sequence of different decisions over each of these core questions. The state can also of course be subject to so-called private law in that the state can own property, enter contracts, commit torts, and must abide by the private law rules in this regard too. But our focus here is on public law or the rules governing the use of coercive regulation by the state, which in turn defines legal regulation.

If one traces legal regulation back to its source in public law it is found in a jurisdiction's constitution. The constitution does many things but essentially it addresses the core question identified above namely 'what institutions according to what rules decide who should have what rights and how they should be enforced'. The high level institutions identified in the constitutional law of New Zealand are the legislature, the crown or the executive, and the Courts, forming the three branches of Government. The source of all law or regulation in New Zealand therefore lies in

- the legislative power of Parliament and
- the prerogative power of the Crown or the Executive, and/or
- the judicial power of the courts.

So to find the answer to our question what is regulation in New Zealand one should probably start looking for

1. First Acts of Parliament or legislation, which become law (regulate) only after they have been passed by Parliament. Parliament is all powerful and can make any rule or law it wishes. Parliament can remove and change any prerogative powers of the crown, or delegate new regulatory powers to the Crown as the Executive, and may change the structure and powers of the Courts, and change the rights and obligations of its citizens or any legal entity (e.g. local authority) within its jurisdiction.
2. Second Regulations made by the Governor-General as Orders in Council, on the recommendation of Cabinet. Regulations can identify what is an offence and if it is, what penalty applies. Regulations may also set fees and charges. Under the New Zealand Constitution the head of the Head of State is the Governor General in lieu of the Crown. The Governor General in Council acts on the advice of Cabinet. The Cabinet by constitutional convention is the peak decision-making body of the executive branch in New Zealand. The Prime Minister as the head of the Cabinet, is selected by the Legislature, and recognized by the Governor General, with

members of Cabinet selected by the Prime Minister, and recommended to the Governor General.

3. Third are the Common law rules made by judges using the judicial power to create law, or interpret and apply legislation and regulations
4. Finally there are Local and Regional Governments. New Zealand has a unitary state so technically these are created by Parliament and may be delegated powers and functions, but have to act strictly within their delegated rule making authority.

Below this one may have “rules” made by a Minister, like the Minister of Transport, which may set out requirements. Associated regulations however specify whether a breach of a requirement in a rule is an offence and if it is, what penalty applies. As noted regulations also set fees and charges. It is important to be aware that under the common law then, the term regulation is narrowly defined as anything made by Order in Council further to a prerogative or statutory authority or power, subject to supervision by the Courts.

Many different forms of legal regulation can thus emerge out of basic constitutional arrangements. In this sense already we can see there are alternative forms of regulation to choose between. They might be seen as alternative instruments for pursuing objectives like economic efficiency or social welfare. We turn to objectives and why we regulate in the next section.

Alternatives to the above forms of legal regulation by the state are often raised such as

- state ownership and control of assets, involving public production of services
- co-regulation;
- social marketing or advertising, or
- collective action, involving non market production by private individuals

These activities may be said to affect or “regulate” human behaviour. The questions that arise however are

- The role of government – for example in social marketing
- What are its benefits and costs?
- What is its comparative efficiency compared to classic legal regulation?
- Is it a complement and/or substitute for classic legal regulation?
- Who should pay for it? And how?

Take state ownership of assets. As we shall see this is quite prevalent in the transport sector in support of public production of transport services. It may be that much of the “regulation” overseen by the Ministry of Transport is thus actually a function of state ownership of assets and should not be confused as the kind of regulation outlined above. In the same way that the private owner

of a private road, railway or bridge would regulate safety, and control use to protect asset values, so too might the state when it owns these assets. But this form of regulation is ownership-based regulation directed at the goal of public production. In the same way owners of a road, railway, port, bridge, airport or plane may “regulate” the assets’ use, essentially based on their property rights, and contractual agreements with users, - so too can the state when involved in public production. The state can wear “two hats”. If the state sells an asset (e.g. an airline, airport, railway bus company or road) then ownership-based regulation will pass to the new owner, leaving the state only with the type of legal regulation outlined above.³

Thus, one needs to delineate state regulation, which is independent of ownership, and that which is a function of it. In this paper we shall focus on the former. The definition of regulation given above is neutral with respect to the ownership of assets. A transfer of ownership should presumably not change the role of the state in relation to legal regulation. It may however change the performance of the asset, depending on how it is regulated before and after a point we consider later when considering means to achieve the Ministry of Transport’s objectives for New Zealand’s transport system. But first why regulate at all – what are the objectives.

5.0 Why Regulate? Or Policy Objectives

In the transport context, the Ministry of Transport is accountable to the Minister of Transport and through the Minister to Cabinet for oversight of its regulatory framework. The Ministry of Transport’s strategic outcomes framework states that the high level objective of the Ministry is —to develop a transport system that maximises the economic and social benefits for New Zealand and minimises harm.⁴ The Ministry’s Greatest Imaginable Challenge (GIC) is to create the environment to double the value from transport initiatives. These objectives apply to transport regulation as much as other Government instruments such as transport funding.

The Government Statement on Regulation: Better Regulation, Less Regulation released on 17 August 2009 further established the government’s objectives for reforming the way that government regulates in New Zealand. This includes a commitment to review existing regulation and robustly test new proposals. In summary, the statement challenges the transport sector to find new ways of approaching regulation. The government is committed to:

- introducing new regulation only when satisfied that it is required
- regulation that is reasonable and robust

³ We recognise, of course, that the extent and nature of public or state production provides a major context for the regulation of other activities.

⁴ From an economic point of view this can be summarized more simply as involving the pursuit of economic efficiency, or optimal economic and social outcomes. The goal of minimizing harm is subsumed in the higher level objective of economic efficiency, as harm is measured by divergences from the efficient or social optimum.

- reviewing existing regulation in order to identify and remove requirements that are unnecessary, ineffective or excessively costly.

The Ministry's challenge to create the environment to double the value from transport initiatives may be applied to the review of regulation. This clearly places an emphasis on economic efficiency under which intermediate goals include

- better utilisation of existing capital and
- more and better investment offering higher returns.

Key requirements for both of these are

- better information or signals for asset use and investment decisions
- better incentives for use, and investment decisions

With the tight budget the government is operating under and the limited capacity of the public sector there may also be a desire for

- More private sector management of existing transport to free up public resources
- More private sector investment to enhance the amount of infrastructure

Given the above objective and goals, a focus or priority might be on using technology to improve information and incentives to ensure better utilization and investment in transport infrastructure. It may also allow for greater market based participation in regulatory design and management.

On other objectives, the Ministry's call for registrations of interest mentioned other possible higher level objectives relating to paying for the costs of regulation where it is asked "How do these models balance competing objectives, such as"

- efficiency,
- natural justice and
- equity?

A key issue in relation to equity as an example, may be how do small and declining local communities pay for road maintenance necessary to achieve regulatory standards for safety on the roads?

Given the above overarching objectives of efficiency and equity, to ensure policy relevance from our advice it is important to clarify

- Context,
 - the current situation in New Zealand and
 - how it has changed, and
 - how it is expected to change;
- The constraints therefore in achieving objectives;

- Priority areas, where the current system diverges most from an optimum;
- Alternative forms of regulation available to help - by significance/importance;
- The best feasible alternative form of regulation given expected costs and benefits.

To identify priority issues for regulation in terms of objectives it is further important to clarify market definition, and what is being regulated, according to the main dimensions of any market to help frame discussion and analysis as follows:

- Product – land (road, rail, active), air, sea
- Function or supply chain – port, transport, input, output, wholesale retail
- Geography – urban, inter-city, rural, remote
- Time – short run, medium term, long term

There are clearly potentially many different markets in the transport system.

A critical rationale for regulation or reason why one might regulate any of these markets is the competitiveness of the specific market in terms of the extent of barriers to entry and current degree of market rivalry. What markets are competitive and what markets are not competitive? What drives that? How are they regulated? Generally a different regulatory approach is relevant in either case, and both regulation and ownership decisions may influence the degree of competitiveness. Focusing on competitiveness of the market requires one to be clear first clear about market definition.

Let's start with product definition, at the level of the customer the desire in a sense is to get a service that gets you from A to B, at least cost (price and time) controlling for quality including safety and comfort etc. As distance increases then inter modal competition presumably will increase. Most people would walk short distances. Beyond that cars, buses, trams, trains, air and sea travel become closer substitutes. At retail then consumers (for leisure or commercial uses) are simply looking for "delivery services" that transport themselves, and their possessions or property. One can distinguish retail transport markets then on the demand side by how close substitutes are the alternatives. The role of new technology in creating new substitutes ("share" cars, and RPAS), stronger rivalry (more fuel efficient cheaper cars) or new entrants (Uber) lead to convergence between modes, affecting retail market definitions, and therefore the competitiveness of retail markets and the need for regulation over time. Would a small non-transitory increase in price induce switching on the demand side of a significant amount from one mode to the other so they are in the same market now? Or would there be entry to a market by providers from another mode? The more competition between modes the less need for regulation.

On the supply side of any retail market many inputs need to be combined in any mode to offer transport services. These inputs are complements. On the

supply side then one can distinguish upstream markets in terms of function or the supply chain. Whatever product one is talking about land (road, rail), air, or sea, it is possible to distinguish two broad types of input markets to retail delivery services; these are

1. Carriage services involving private/public transport service providers
 - i. Land
 1. Road – passenger cars, buses, taxis & freight trucks etc
 2. Rail - passenger trams, subways trains, overland trains & freight trains etc
 - ii. Air - airplanes
 - iii. Sea – Ships, boats etc
2. Platform or Infrastructure services
 - a. Port (seaport airport, rail or bus station, hub)
 - b. Transport “routes”, “corridors”, “ways”, “lines” streets etc

Once again there may be differences in competitive conditions here. Carriage services may be more competitive than platform or infrastructure services. Also technology can affect competitive conditions in input markets.

The markets of course are likely to be less competitive the more narrowly one defines them, and technology may be justifying wider and wider market definitions. Take geographic dimensions.

Transport services within New Zealand’s shores might seem to be part of the non-tradable sector in that imported services may not compete which implies less competitiveness. This was certainly true 100 years ago. However this has always been less true of transport markets, than say electricity markets, where imports of electricity are impossible, and it may be less true of transport over time. Aviation and maritime markets are potentially quite tradable, global and competitive at least in some segments for example.

Technology is moreover changing competitive conditions, justifying wider market definitions. Capacity sharing platforms such as Uber now allow individual automobile owners to switch to become suppliers of carriage services for hire. This has implications not just for competitive conditions in an immediate sense (probably increasing competition) but also in a longer-term sense. Traditional categories of transport regulation that are based on historic assumptions, categories and conceptions may have to adjust.

So one needs to be very clear about market definition before one tries to answer the question why regulate?

Overlaid on competition concerns are other public good or externality concerns that are the rationale for regulation of transport services including, the external effects of transport activities on

- Safety and health of third parties

- The environment

A key issue that regulators may be required to address is: the conditions under which new transport services are delivered, potentially in new or emergent 'informal' transport sectors involving sharing. While these developments offer the possibility of more responsive supply to rapidly changing demand - they may also pose possible problems of untrained drivers and bad working conditions that could result in degraded safety and environmental concerns.

6.0 How we regulate?

The four key decision variables in the regulation of any transport market in terms of their economic consequences are

- 1) Entry;
- 2) Price;
- 3) Access obligations; and
- 4) Quality or conditions of service.⁵

Regulation provides the “framework” and permissible or feasible set within which such decisions can be made. The primary role of a policy Ministry like the Ministry of Transport then is to understand, monitor, review and advise on reform of the framework. Decisions within the legal regulatory framework, are to some extent less important or economically consequential than decisions about the regulatory framework itself, as to some extent the framework may largely predetermine likely specific regulatory decisions – given the facts – even though subordinate instant decisions may be difficult or complex.

In the transport context the Ministry of Transport is accountable to the Minister of Transport, and through the Minister to Cabinet. The Ministry of Transport administers a number of laws and regulations and rules including:

- 22 Acts of Parliament
- 102 Regulations, made by the Governor-General as Orders in Council.
- 146 Rules made by the Minister. Ordinary transport rules made by the Minister are administered by
 - the New Zealand Transport Agency,
 - Maritime New Zealand and
 - the Civil Aviation Authority.

The Ministry is also responsible for preparing changes to any legislation within the Transport portfolio, and collaborating with relevant departments on

⁵ Quality of service regulation can be driven by competition concerns, information asymmetry concerns, or externality concerns, including safety, and environment impact.

changes to legislation that may relate to the wider transport law area. It also advises on the development of regulations and rules. Rules set out requirements, and associated regulations specify whether a breach of a requirement in a rule is an offence and if it is, what penalty applies. Regulations also set fees and charges.

The Minister of Transport, in annual consultation with Cabinet, also sets a programme for the development of all regulations and rules in the transport sector using the powers delegated in Acts of Parliament or sourced in the prerogative of the crown. Cabinet considers the programme, which forms part of the annual agreements for rule development between the Secretary for Transport and the transport agencies.

To be efficient over time the above regulatory framework will need to evolve as technological and social change expands the feasible set of opportunities, or introduces new constraints limiting them. Thus better car technology leading to greater reliability and safety may change the frequency, and intensity or focus of warrant of fitness testing. Driverless cars may change the focal point of regulation from the individual to the software and communications networks. The technology of production in other sectors may impact the environment in which transport operates (climate change, flooding etc.) and change the nature of regulation (carbon emissions trading systems). This means the key basic decisions about the regulatory framework need to be revisited including whether to regulate, what to regulate, how to regulate, when to regulate, how much to regulate, how to pay for regulation, how to monitor regulation etc.

Given any relevant technological and social change however, it is always best to start with detailed analysis of the existing regulatory system⁶, and understand how it works, its economic consequences in terms of costs and benefits in light of the new technology or social change, to isolate problems regulation may pose for any new technological or social development, or vice versa, and scope for solutions, involving regulatory change with suitable transition paths. Given the extent of the regulatory framework overseen by the Ministry of Transport outlined above, any such review is not a small task. It is not possible within the limited parameters of this study to conduct such a detailed regulatory stock take. It is however, something we strongly recommend in light of the extent and nature of technological change affecting transport systems at this time. Such an exercise however needs to be prioritised and focused on areas of highest potential payoff from any such review, including areas we discuss further below.

7.0 Regulation and its technological and social context

⁶ The Ministry's strategy project Regulation 2025 is a three-phase project. It is currently in phase one, which paints a blue skies picture of the future of transport and transport regulation. Phase two will involve assessing the current state of transport regulation and considering what needs to change in light of our picture of the future. Phase three will involve implementing any regulatory changes determined in phase two.

In the section we proceed to address the five sets of questions or sub-topics on regulation and its technological and social context as identified in the ROI as indicative of areas of interest. Before proceeding to address the specific topics, it is useful to first review a number of key factors providing context and motivation for the project.

The importance of ICT

First and foremost innovation and developments in information and communications technology (ICT) are increasingly impacting the transport and other sectors. The rate of technology change in ICT is very fast, and challenges the way we develop and apply regulatory frameworks. It is increasing the power of the individual and new business models are being created that may require fundamental reviews of regulation, including different approaches and tools. Social media, for example, are changing how we think about information asymmetry and are providing a new tool kit regulators can use. Increasingly, and as we shall see below, it appears the transport sector is lagging behind these ICT developments, with outdated regulatory frameworks standing in the way of more rapid developments.

The implications for intermodal regulation

As we shall see the boundaries between different transport modes are clearly changing, and blurring, and one can easily foresee convergence and greater intermodal competition. It is likely that the market will for example offer the first automated road vehicles by 2020 that, under certain conditions and in specific traffic environments, will be capable of performing the entire task of driving, i.e. level 3 automated road vehicles.⁷ It is unclear as to when driverless, or fully automated level 4 road vehicles – where the vehicle manages the entire task of driving throughout the entire journey – can be expected to emerge onto the market. However this may not be too far off, and is certainly something that will need to be attended to before 2025. In parallel, aircraft that can be operated with a relatively high degree of automation have already been used for air traffic purposes for a long time. Aircraft which can be operated unmanned are also used, under various names. Such aircraft are sometimes termed RPAS. Level 4 automated land vehicles are thus land-based RPAS, or the land equivalent of an RPAS. It will not be long before we will hear more of sea remotely piloted systems, or level 3 and 4 marine craft.

Technological change is however not only changing the way we need to regulate carriage services, like, air, land and sea remotely piloted systems. It also has implications for regulation of infrastructure or transport rights of way.

⁷ It is common to use four levels to describe the degree of vehicle automation going forward. Levels 1 and 2 relate to vehicles with self-driving functions which support drivers in certain situations, and vehicles of this type can already be found on our roads. Level 3 relates to vehicles which perform the entire task of driving under certain conditions. The driver should be able to do other things in the meantime, but sit in the driver's seat and be able to intervene. At level 4, the car handles the entire task of driving throughout the entire journey. It is likely that the market will offer the first vehicles which, under certain conditions and in specific traffic environments, will be capable of performing the entire task of driving, level 3 in around 2020. It is unclear as to when level 4 vehicles can be expected to emerge onto the market and how they will be owned, but this is likely to be both within the timeframe of this project, being 2025 and influenced by regulation.

The prospect for the commercial use of RPAS to deliver *goods* by air appears real in the near term, due in part to the growth of online shopping, which has led to soaring demand for just in time delivery of *goods*, and other related logistical services. Clearly to make such RPAS deliveries requires the use of rights of way in the air, i.e. airways, or air lanes that are potentially scarce if such demand grows - implying the need for regulation. One of the most obvious air-routes, or air-space rights of way for delivery RPAS to follow then may be the “air lanes” that sit above roads ground-based rights of way. Thus there is likely to soon be demand for RPAS to use the airspace above roads to deliver goods in cities.

It does not then seem long before there will be a demand for RPAS to become intermodal, or land on roads to make deliveries of goods. At this point RPAS become land remotely piloted systems - or level 4 automated vehicles. There may even be fully inter-modal or land-sea-air remotely piloted systems in the not too distant future at which point the boundaries between air and road and sea transport of goods blur completely, and the need for full inter-modal transport regulatory co-ordination becomes transparent. This need will soon presumably extend to passenger transport, where for example a light weight level 3 automated passenger road vehicle might simply take to the air above a certain speed. This would obviously greatly reduce congestion on roads if passenger and goods vehicles could simply ascend or leave the road to occupy the air space above the road. Such land-to-air level 3 vehicle developments call out for coordinated strategic work on air transport and road regulation including coordinated air to land based vehicle regulation, traffic regulation and driver licensing.

ICT developments in transport are not only blurring the lines between transport modes. There is also an increasing blurring of boundaries between transportation system functions and between users and providers. The traditional model of transport delivery has been more or less a utility model in which a provider of a fixed network provided a schedule of services passively consumed by users and occasionally adjusted according to periodic demand studies or changing conditions. Now services can be increasingly unbundled from one another, e.g. information from service, vehicles from the infrastructure they use etc. and users can not only have service on-demand but can potentially design their own bundles which can be met by providers in real-time. With sharing technologies, consumers can also switch back and forth between being users and providers as economics and preference permit. This is exactly what is happening in other businesses; especially media, where consumers are both driving and creating content and providers are fragmenting and re-aligning as a result. The same appears to be happening in the transport domain putting real pressure on existing organisations.

The increased scope, and need for competition, with private sector involvement

As transport services become more on-demand and unbundled, it is now technologically possible to source more and more in creative and dynamic ways. Indeed the logistics, freight and supply chain sector has been doing this

for decades now, using networks of providers to carry freight, including third-party logistics (3PL) and fourth party logistics (4PL) firms that service one another and are in some cases breaking down the very distinction between freight carriage and production. There are some firms, such as Dell Computer, that are effectively supply chain companies that happen to ship product, with almost all activities dynamically outsourced to third parties. There is no reason why this cannot be the case for passenger transport as well, as technological change is making this not just possible but economically superior in many cases.

At this point, the boundaries between public and private sectors in transport become more porous. It is possible to see more private sector ownership, management and regulation upstream, in air, land and sea based infrastructure or rights of way (air, road and sea lanes) which automated vehicles and RPAS may use.

Emerging social expectations

Partly as a result of developments in ICT, society's expectations are also changing. The old fixed network with fixed schedules, over even fixed fleets with waiting and delivery times are becoming less acceptable to consumers and more possible to transcend technologically. People expect greater freedom and more opportunities for individual achievement but at the same time expect higher levels of safety and consumer care. Transport sits at the heart of this as it seeks to move goods and people based on a combination of domestic and international law built around the old paradigm of regulation.

The role of international boundaries

International boundaries are also becoming blurred, increasing the demand and need for international regulatory frameworks. Large multinational transport service and infrastructure providers, such as Veolia and Transurban, to name only two of many, operate around the globe and are employed by many governments across the entire modal spectrum. Of course national and local jurisdictions are still relevant but technological development, application and diffusion occurs trans-nationally more and more.

For a small country like New Zealand, a long way from major population centres, the ability to be a major originator, or player internationally in underlying technological developments related to transport may be limited. New Zealand however could be a *fast follower*, adopter, implementer and contributor to such technological developments. If New Zealand is an early adopter of the best regulatory practice in transport, this could enable it to capitalize on new technological developments before other countries. Thus other countries may be the source of the original invention but slower at adoption than New Zealand because of their comparative regulatory failure.

New Zealand has a demonstrated capability in good government and by leading the world in best regulatory practice it can stand to benefit more and faster from innovation in transport technologies originating overseas. Given

NZ dependence on transport for export, best practice transport regulation could become a source of added comparative advantage. The question then may not be how to regulate “ahead of the curve” - but rather “ahead of the herd”. Keeping in mind the old adage that “the second mouse gets the cheese”.

Regulation as a barrier and enabler - An historic moment requiring leadership?

The rate at which regulatory models change however is typically slow. Once a regulatory system is in place it evolves, with small changes to the existing regime and, by definition, has to apply to given entities. In transport the old distinctions between 'government' and 'private sector' and 'transport provider' and 'user', are, as noted above, more malleable than ever. Yet current regulatory models reference these as if they were fixed for all time. The opportunities when a jurisdiction steps back and has a thorough review of a regulatory system are very infrequent but often driven by technological breakthroughs. Historically this approach has worked, involving periods of closer regulation, typically following a market failure, to regulatory loosening in response to pressure from business and society to minimise the costs and inconvenience created by regulation. This historic time for major regulatory change appears near, if not here, for transport, as the developments and spread of information and communications, technologies (ICT) has changed what is feasible, and intelligent systems, and the internet of things take greater shape. It is not the regulation of ICT that is stopping this development so much, and the regulation of transport systems.

7.1 Regulating ahead of the technology or social curve

The question posed by the Ministry’s call for registrations of interest under this heading addressed in this section is:

- a) Are there examples of governments regulating ahead of the technology or social curve? If so, what factors led to these decisions and what were the outcomes?

Regulating ahead of the technology or social curve?

This begs the question what is meant by “ahead of the curve”. Fundamentally this question is understood to be about the timing of regulatory change in response to technological or social change, but also the facilitation of such technological or social change where it is beneficial. For example due to technological change in communications it is now possible to mobilise previously underutilized privately owned capital or resources into various markets, through an increase in sharing. We have seen this in accommodation with AirBnB providing a means for people to advertise and search for accommodation, and complete transactions from a distance to use housing assets more efficiently. The same is true with Uber, where private cars can be turned to hire cars through an electronic communications and financial transactions service. Some of these opportunities also reflect social

change. For example smaller families leading to lower occupancy rates, or excess capacity at the housing unit level, and changing social norms that mean people are more mobile and more prepared to engage with strangers in their cars and homes.

How should regulation respond in time? Early in any new development, or late? Proactively (i.e. ahead of the curve) or reactively (behind the curve)? The problem confronting a regulator due to new technology or social change may be whether new regulation needs to be introduced to cover a new activity or market, or whether current regulation covering an existing activity or market needs to be adapted. Technological or social change that exacerbates, or introduces a new form of market failure, may change the costs and benefits of regulation, justifying new regulation, or an extension of existing regulation. On the other hand technological or social changes that reduce the probability, or extent of any market problem (e.g. reduce monopoly power, externality/safety or information asymmetry concerns) are likely to reduce the net benefits of *current regulation* and therefore justify *deregulatory processes* or moves to reduce the scope, breadth, depth, duration, frequency and intensity of current regulation over time.

The aim should be to ensure law and regulation is in place to respond to classic transaction costs problems that may lead to inefficiency, missing markets or market failure, including information asymmetry, abuse of market power, and public good or externality issues. This may appear straightforward in that all a regulator needs to decide is whether the market has or is about to fail and whether regulation can improve things. The problem however is that the case for, or against regulation is never that certain.

The fundamental problem - regulatory uncertainty

The problem is that with new technology or social change the regulator faces information problems and uncertainty about the existence of a market problem, and the effects of regulation. Regulation in particular has costs and benefits. One can thus have regulatory failure – or regulation can make things worse. Take for example a proposal to build a new road or port, which has emerged because of the development of a new form of technology which makes the development feasible when previously it was not. Should it be allowed, and if so should access to the facility and prices of its services be regulated? Standard economic theory suggests regulation may be needed if it is a local monopoly that may abuse market power. But how does one know whether the market will be a monopoly or a competitive one until the investment occurs and any market is up and operating and sufficiently mature. To regulate (or de-regulate) “ahead of the curve” may prevent a well functioning competitive market from emerging.

The economics of uncertainty offers insights that help to support a considered approach to the timing of regulatory change relative to technological and social change. First of all it is important to note that although regulatory intervention is often justified by reference to “market failure”, in that market failure has to exist before regulatory intervention is considered, market failure is not a sufficient condition for regulation. Where the market fails, other institutions, including various forms of regulation, may fail as well or indeed may fail more spectacularly than the market. Thus, the relevant question for

the regulator is not whether market failure exists, but how to address an issue of concern using *the most efficient* institutional arrangement. This is referred to in the literature as the comparative institutional approach. The comparative institutional approach recognises that all institutions are flawed. The challenge is to find the most efficient one, efficient in the sense that no superior feasible alternative can be described and implemented (Williamson, 1996).

Any regulator's decision problem can be simplified then as requiring the identification of the efficient option from two broad institutional alternatives: regulation (R) or no regulation (N).⁸ There are two possible states of the market:

- a) Market failure - e.g. the market suffers from monopolistic behaviour, safety externalities, or asymmetric information or
- b) No market failure - i.e. the market is competitive, safe, and well informed and no superior feasible alternative regulatory option can be described and implemented.

We assume that the regulator is uncertain about whether the market will fail or not, and can only assign a probability (p) to the likelihood the market will fail. This assumption may appear to be unrealistic as presumably the regulator can observe the state of the market. In fact, the latter assumption is (unfortunately) often untenable for a number of reasons:

- (1) The regulator sometimes has to make a decision before the state of the market is fully revealed.
- (2) The regulator sometimes has to make a decision when the state of the market is changing rapidly, and it may be hard to judge how the changes will affect the state of the market.
- (3) Bounded rationality means that there are inherent risks of regulatory error arising from, for instance, incomplete information, limited time, resources and ability to process the available information.

The point is a regulator must choose whether to regulate, but remains uncertain as to the state of the world, that is whether the market is failing or not. If we assume the regulator's starting assumption is that the market is ok,

⁸ The model outlined can incorporate any form of regulation one may want to consider - hard to soft regulation, prescriptive to performance based regulation, nudging, incentives-based, policy statements with implied threats of regulation etc etc – it is still regulation - versus no regulation - actual or threatened. Any state action involving regulation however conceived still involves some form of tax or penalty (coercion) actual or threatened. For example. nudge units are "tax funded", regulators and ministers decision making time is tax-funded, and expenditure on social marketing programmes is tax-funded. A penalty on regulated parties actions involves the same thing - a tax. The tax however is typically on the party seen to be causing the harm. In the common law of course damages remedies not only tax or penalize those causing harm, the damages award or money raised is paid to compensate those harmed. With any form of regulation there is no such thing as a "free lunch". When it comes to Government regulation the question is whether the costs exceed the benefits. The key point in all forms of regulation is that the regulator does not really know the state of the market – and the effect of the regulation. So uncertainty remains. All a regulator knows is the choice they make about the form of regulation –they don't know the state of the market and how it will evolve or the effects of their regulation.

there are four possible regulatory outcomes each associated with a different social value (V) or payoff. The first two outcomes are associated with a decision to regulate, and the second two with a decision not to regulate as follows:

1. False positive: This is the situation where the regulator chooses to regulate – but the market is not failing and regulation is not justified. The regulator makes a Type I error (of rejecting a true hypothesis).
2. True negative: This is the situation where the regulator chooses to regulate when the market is failing. This decision will produce some efficiency gain, but the net payoff can be positive or negative depending on the costs associated with regulation.
3. True positive: This is the situation where the regulator chooses not to regulate when the market is not failing. This is a correct decision.
4. False negative: This is the situation where the regulator chooses not to regulate when the market is failing. This may or may not be a correct decision depending on the cost of regulation.

Of course, regulation should never be chosen if it cannot produce a net benefit even when the market fails - as then there would be no expected benefit from regulation at all. The problem remains however even if regulation would produce a net benefit when the market fails, the regulator does not know with certainty that the market is failing. The regulator must instead form a judgement about the likely state of the world, or the probability the market is failing (p). Assuming the regulator's objective is to promote efficiency or maximise the expected social value, the regulator should choose to regulate if and only if the *expected* payoff from regulation is greater than that of no regulation. This means one has to factor in the risk of error and seek to minimize the costs of error – using a so-called error cost approach. Given assumptions about the net social value or payoffs under each of the four possible scenarios outlined above, theoretically one can calculate a “threshold probability” (of market failure) above which regulation would be desirable. If one regulates too early in the development of a new technology one may not have sufficient information to judge the probabilities and pay offs – and as a result be prone to regulatory error and regulating too far “ahead of the curve”.

An implicit assumption in the above regulatory decision rule is that the decision is made once and final. In reality, regulatory decisions can be revisited at a later time. A decision to regulate now can be reversed by removing the regulation in the future. Similarly, a decision not to regulate now can be reversed by imposing a regulation later. There are, however, important differences in the costs of decision reversal. If the original decision was not to regulate, more information will emerge in the future to inform the regulator about the state of market in the absence of regulation. If the new information points to a market failure, the regulator can choose to regulate then. That is, the regulator has an option to wait and see. The option of waiting can be quite valuable. If the regulator does not take the option to wait and decides to regulate at the outset, it will not learn more about the state of the market in the absence of regulation, consequently regulation is likely to

continue even if it is harmful until serious problems surface prompting a major regulatory review. Hence the lesson is to be careful of regulating ahead of the curve where it is hard to exit regulatory interventions and the costs of regulation may be quite uncertain, with greater certainty requiring more information than presently available.

Managing the risk of regulatory capture

Further complicating any legitimate attempt to standardise and regulate to protect the public good ahead of the curve - or the herd - in response to new technological or social change is regulatory capture. Regulation is often more about special interests potentially trying to hamper what they perceive to be competition, by promoting regulation that offers them special benefits, for example by limiting entry, but imposing greater net costs on the rest of society. The various local government battles in North America and in Germany with respect to car sharing services such as Uber is one example (which also applies to homesharing schemes such as Airbnb). At the moment much of this regulatory push seems to be driven more by incumbent taxi industries seeking to protect their current market position. There is an analogy here with attempts by developing country governments such as South Africa to formalise their informal transport sectors. A balance must be struck between entrepreneurial problem solving and the need for public standards of safe operation, environmental quality and fair wages and working conditions. But the political economy or “public choice” dimension is probably the big issue here. The problem of rent seeking and regulatory capture.

On the technology development and infrastructure investment side there is a brighter picture with governments from developed and developing governments being pressed by increasing demand and ever scarcer resources to seek out technological fixes. Alternative fuels, smart systems, and self-driving or automated vehicles are examples here. Since the commercial opportunities are fairly great (though risky) there is overall sufficient private capital available to draw upon. But, again, one has to be wary of regulatory of policy ‘capture’ by very large operators creating barriers to entry, and innovation, delaying the realisation of potential gains.

The Common Law

The obvious example of regulation “ahead of the curve” that probably works well is the common law system combined with general competition law. The common law is ever present. As any new technology or social trend comes along it is regulated by the common law instantly. But the law is enforced ex-post, on a case by case basis, using an established set of principles, that stand ready to “regulate” any new technological and social development. Common law principles are general understood to serve to minimize harm or promote efficient outcomes. At the same time the common law approach to regulation *facilitates greater ease of market entry, competition and innovation*, as it is relatively “light handed” ex ante, and instead relies on enforcing property rights and contracts ex post. It thereby supports greater private ordering or private regulation, and the operation of markets. Thus the common law regulated the use of new roads, new vehicles, new railways and

new airways and new airports allowing their development relatively freely, prior to the creation of transport specific regulators. If a new road was built the owner and its users were simply liable for harm caused to others from inception, under the basic common law principle that they had a duty of care to others where the costs of their precaution were less than the cost of the harm avoided. This principle covers nearly every imaginable problem conceivable from information asymmetry to safety. The duty of highway owners to meet this standard of safety was established in the middle of the 20th century when the liability of highway owners to road users was formally recognized in a case. Before then it was a latent duty. The common law is moreover fact intensive and case based, thus as the facts of technology change legal duties and standards of care may be amended over time in particular cases.

General or light handed regulation

So-called general or “light handed” approaches to regulation, like the common law, or general competition law, rather than more sector specific regulation, may be termed “ahead of the curve” to the extent they have been demonstrated to enable greater ease of market entry, competition and innovation. General light-handed regulation facilitates technological and organizational change more, offering fewer barriers to innovation ex ante. New Zealand regulation of the taxi industry has for example been more light-handed than other countries or states and as a result has enabled more new entrants to the market – including Uber. A further example of such light-handed regulation ahead of the curve in the future could be driverless and autonomous vehicles. In this regard the UK Government for example is developing “a light-touch non-regulatory approach which provides the clarity industry needs to invest in further research and development, while maintaining safety... through the use of a Code of Practice “⁹. Also in the US earlier government led programs in Intelligent Transport Systems (ITS) and Automated Highway Systems (AHS) as early prototypes helped set a framework which might have advanced timing of current developments. Government in these countries have also played a light handed role in ICT developments, including the development of telecommunications standards, and spectrum markets that have supported markets for mobile telephony, and the spread of the internet, which can now support the development of the smart networks, and technologies in other sectors - like driverless and autonomous vehicles.

The New Zealand Government has clearly signaled an inclination to avoid regulating too quickly or too heavily. The Government Statement mentioned earlier notes

“We will introduce new regulation only when we are satisfied that it is required, reasonable, and robust.... We will also be looking for significant changes in the approach both Ministers and government agencies take to regulation. To this end we will:

⁹ Department for Transport (2015) “The Pathway to Driverless Cars: Summary report and action plan” ISBN 978-1-84864-153-2 at p33

- Resist the temptation or pressure to take a regulatory decision until we have considered the evidence, advice and consultation feedback, and fully satisfied ourselves that:
 - the problem cannot be adequately addressed through private arrangements and a regulatory solution is required in the public interest;
 - all practical options for addressing the problem have been considered;
 - the benefits of the preferred option not only exceed the costs (taking account of all relevant considerations) but will deliver the highest level of net benefit of the practical regulatory options available;
 - the proposed obligations or entitlements are clear, easily understood and conform as far as possible to established legislative principles and best practice formulations; and
 - implementation issues, costs and risks have been fully assessed and addressed;
- Require there to be a particularly strong case made for any regulatory proposals that are likely to:
 - impose additional costs on business during the current economic recession;
 - impair private property rights, market competition, or the incentives on businesses to innovate and invest; or
 - override fundamental common law principles;

-The impact of ICT and the need for a regulatory stock take

In the area of transport recent developments in the information and communication technology (ICT) industry and in the transport sector, have had three effects which potentially support a review of transport regulation for the purpose of reducing regulation.

- i. *Competitive effects*: First technological advances are making transport networks more competitive, with greater competition both within and between transport modes. This is likely to reduce the typical ‘natural monopoly’ or market power rationale used in the past to justify current levels of regulation and state ownership in transport markets.
- ii. *Safety/externality effects*: Second new technologies are enabling greater internalisation of externalities, for example making roads and other transport networks safer. Thus for example smarter networks and automated vehicles lower the probability of accidents, and the harm resulting from them, and have therefore potentially justified lower regulation, and lower enforcement activity over time.
- iii. *Information asymmetry effects*: Third new ICT technologies have increased the availability of information, or lowered costs of obtaining

information, reducing the problem of *information asymmetries*, and transaction costs, potentially justifying greater reliance on markets, and less regulation.

The second and third trends to greater safety, and more information justifying lower regulation, in turn further reinforce the first trend to more competitive networks, and thus less regulation for competitiveness reasons too. More safe networks for example justify lower regulatory compliance costs, such as licensing requirements. This in turn implies lower barriers to entry to markets, and more competitive markets, justifying less regulation for competition reasons - with more competition in turn implying even better safety and information over time in a virtuous circle.

In relation to sector specific regulation like transport regulation, a key minimal step to keep regulatory frameworks “ahead of the curve” or optimal relative to any emergent new ICT technologies is a *regulatory stock-take*, which subjects relevant *current regulation* to a forward looking cost-benefit analysis.

In what follows we discuss a few key examples of governments regulating in response to developments in ICT, what were the outcomes and what factors led to these decisions.

Enhancing competition in carriage services through better regulation

A current example of technological change posing the need for a regulatory stock take, and decisions about the need for and timing of regulatory change is the prospect of automated vehicles including driverless vehicles on smart networks. Automated vehicles may release significant economic, environmental and social benefits, if they make driving easier, allow people to be more productive, help improve road safety, reduce emissions, ease congestion, and offer greater mobility to a wider range of people than ever before improving social inclusion. The nature of current regulations governing traffic management, vehicle licensing, and driver licensing (including the absence of rules for self-driving vehicles) however may be one aspect which might impede market entry of new automated vehicle technologies, and may therefore be imposing significant economic and other costs as a result. It may be suggested for example that the current provisions with respect to on-road and off-road traffic, based on the notion that the driver must have control over the vehicle, and requirements in respect of driver competence are not suited to future phenomena. The absence of rules for self-driving vehicles for example is one aspect which it is thought will impede the market entry, or market launch and development.

Globally, reviews of current regulation affecting such new automated vehicle technologies are gathering pace. In Europe for example Germany, Sweden and the UK are known to have completed a review of their legislation in the area of automated vehicles, with a further three countries currently progressing one. While the USA has been the first country to introduce

legislation to permit testing of automated vehicles, ¹⁰ only four states have done this. Fifteen states have rejected bills related to automated driving. By comparison the UK found their current legislation already permitted testing of automated vehicles, and is proceeding with such testing, viewing it as an opportunity to seize a global competitive advantage while preserving transport safety. An important first step in relation to facilitating transport competition, innovation and market entry of automated vehicles is thus a regulatory stock-take, as regulatory starting points matter, and variation in approach may be required across countries as a result. New Zealand is at least not lagging far behind the pack in this regard in terms of such a regulatory stock-take although such a task is clearly already a high priority.

Enhancing competition in infrastructure services through better regulation

Turning to infrastructure regulation, it appears more often than not there are examples of failures to adapt regulation, with regulation preventing the realization of gains from ICT developments. In particular, in the past 30 years new technological developments especially in the ICT sector have significantly expanded the scope for better infrastructure pricing (e.g. toll roads), enhanced competition, and as a result increased the scope for transport privatisation, both within and across modes, all of which can contribute to more efficient outcomes when properly designed.

If one looks back to 1985, the scope for road pricing for example was more limited due to the limited means for collecting road charges. Since that time the spread of mobile telephony, smart phones, broadband internet, and e-commerce has made e-payment for road use by distance traveled, characteristics of vehicle used, time of day and congestion level easily implementable in many jurisdictions. Most countries however still have no toll roads.¹¹ Where there are toll roads the tolled network typically comprises less than 5 percent of the road network.

Some countries have however responded “ahead of the curve” or at least responded quicker to these new technological opportunities than others. One can thus readily point to early adopters of regulatory approaches permitting greater private sector involvement in transport, which recent developments in technology especially ICT have allowed, including early expansion of private providers in transit (e.g. Hong Kong), in roads (Melbourne’s CityLink, which combined tolling with a public private partnership structure, Norway and Spain), and in airports (e.g. Australia). In relation to road pricing New Zealand appears to have lagged the leading countries and is at risk of falling “behind the leaders”. New Zealand only has three toll roads, the Tauranga Eastern Link, Route K in Tauranga and the Northern Gateway Toll Road north of Auckland¹², which is only 7.5 kilometers long. New Zealand’s regulation of

¹⁰ The National Highway Traffic Safety Administration (NHTSA) has issued a preliminary statement of policy which advises states against authorising members of the public to use self-driving vehicle technology at this time.

¹¹ http://www.worldbank.org/transport/roads/toll_rds.htm

¹² see <http://www.nzta.govt.nz/roads-and-rail/toll-roads/toll-road-information/where-the-toll-roads-are/>

road financing and restrictions on tolling are a barrier to entry. In most countries with toll roads the private sector has been heavily involved in development of the roads and often thereafter in their operation. In Latin America, in particular there has also been extensive involvement of the private sector in maintenance and on-going operation of roads that were built by the public sector. The USA, Japan, and France are the key exceptions to this rule, where most toll roads are owned and operated by public corporations.

Changes in approaches to infrastructure regulation in transport are likely to be required to support the development of smart networks and smart vehicles and realize the full benefits from recent developments in ICT. There is clear scope for greater competition and private sector involvement in the development of smart infrastructure or smart networks, as much as in smart vehicles or carriage services. Adapting regulatory frameworks to allow an increase in competition in infrastructure services, by for example allowing greater market entry, and the transfer of ownership of more transport network services to the private sector would also entail transferring greater responsibility for direct regulation of smart transport network services, and smart vehicles to private ownership. Technological development in transport industries would be likely to speed up if greater competition was extended beyond carriage services to network services, with competing private owners of networks remaining subject to more general law on competition, and safety.¹³

Intellectual property law and regulation

Smart transport networks and smart vehicles (air and land based) are likely to require major investment in intellectual property (including software, hardware, design and branding) which is less likely to occur if it is not adequately protected with patent, copyright, trade mark and design law enforcement. The major threat here is the ease of illegal copying, or piracy and theft for example posed by digitization and the internet, and by 3-D printing. One could argue that government's best role in regulating "ahead of the curve" is in better facilitating *basic* innovation, where it is difficult for innovators to appropriate the returns to innovation, and free riding may undermine the development and flow of new ideas. On the regulatory side, clearly important then are *intellectual property rights*, that safeguard and protect returns to innovation, and facilitate and encourage the dissemination and marketing, or commercialisation of new ideas. This is the best space to look for regulation ahead of the curve that can add value.

Recent experience from regulation of standard IP rights (like patents, copyright, trade marks and design rights) on the "information highway" or

¹³ This includes roads where there is considerable and increasing scope for unbundling creating competition throughout the road value chain, including the network, and intermodal network competition, with lower barriers to entry, more contestability and more players in the market.

internet is relevant here. Legislative changes in the late 1990's affecting IP rights that were seen to be "*ahead of the curve*" at the time, in fact weakened copyright protection, by granting immunities to information highway service providers on the internet. This has had significant adverse unforeseen effects by undermining incentives to invest in IP in digital networks. A similar mistake has to be avoided on transport networks. Rather the law should follow the common law rule that the highway owner like others face liability ex-post for the costs of harm to third parties that they could have avoided at lower cost.

Regulatory complexity, and multiplicity of tiers and levels of regulation

It is clear that one of the key problems for investors in new technology is uncertainty around how it will be regulated. Uncertainty about whether, and if so how new technologies enabling more efficient use of transport assets will be regulated slows down their speed of development, adoption and diffusion. It does this by reducing the expected risk adjusted returns to investment in innovation, and as a result slowing down and preventing the realization of the social benefits from such investment. This is worse when there are multiple regulators. When several decision makers (including regulators) control the fate, or market value of an innovation, this raises uncertainty and transaction costs, especially where some of these decision makers (like regulators) do not bear the full costs of their decision-making, or have poor information or have weak incentives to take risks. Attention thus needs to be paid to ensuring an efficient structure of regulation, ownership and control that minimizes transaction costs and facilitates markets.

An example of a key factor delaying optimal regulation over time then may be the institutional arrangements including the levels of government involved and their relative capacity to cope with change. Thus, in transport assets in particular one sees the involvement of several levels of government – including federal, state and local governments not to mention the role of international agreements -that may in itself impede co-ordination. There may thus need to be greater national leadership in developing national strategies to address emergent new technologies in transport. In New Zealand, for example, small scale local authorities have a significant role to play in transport ownership and regulation decisions but may lack the capacity to keep pace with rapid technological developments. The innovation process may also be quicker and more efficient to the extent regulation allows entrepreneurs to acquire private ownership and control of underlying transport assets, co-ordinate or "regulate" the use of the assets on a decentralized basis, and price access to the assets, and appropriate returns to better performance and innovation, subject to competition, or low barriers to entry or open market entry by others, and general competition and safety regulation at a national level.

E-Governance

Another example of a method to regulate ahead of the curve in a way that may minimize costs, is the concept of collective action or co-ordination through E-governance that has been around the public sector since shortly after the widespread diffusion and adoption of the internet in the late 1990s.

E-governance, short for 'electronic' (in this context meaning 'digital' or 'internet'), is a broad term that refers to digital interactions between individual citizens, which support collective action, and co-ordination. Social media and big data collection and analysis in real-time has greatly expanded the potential of private collective action and regulation by e-government. The academic literature notes three major possibilities for such technology: (1) Democratic participation and engagement, (2) Co-production, in which governments and the public jointly create and deliver government and (3) Crowd sourcing solutions and innovations that tap into latent knowledge bases contained in dispersed social and institutional networks.¹⁴

In practice thus far, and especially in the transport sector, only (1) and (2) have been developed and even then largely focused on relatively passive transmission and receiving of information. Some of this is, of course, quite useful, and valuable to users. Real-time transit schedules are an example of this as are automated complaint, query and suggestion platforms. For those currently being regulated, such as freight and transport providers, e-government has streamlined registration and compliance in many instances. But genuine co-production and crowd sourcing, which probably has some of the greatest potential in terms of efficiency and regulatory design, have not been tapped yet to any great degree.

¹⁴ The impact of polices on government social media usage: Issues, challenges, and recommendations, John Carlo Bertot, Paul T. Jaeger, Derek Hansen, *Government Information Quarterly*, Volume 29, Issue 1, January 2012, Pages 30–40

Conclusion

Broadly speaking, yes there are examples of regulating “ahead of the curve” in carriage services, but regulating “ahead of the curve” in infrastructure services has been more difficult. The factors that affect success depend on the form of the regulation. The common law and general light-handed regulation tend to foster more innovation while safeguarding the public interest. Other forms of regulation ahead of the curve have been a huge mistake. Similarly there has been regulation that “removed” common law liability, and provided immunity from regulation, or which provided special advantages to new investors in new technology which proved to be a mistake. This is a subtle problem. Some forms of regulation ahead of the curve are not per se good, nor always permissive, nor restrictive. The first minimal step to achieve leadership in regulatory policy is a regulatory stock take, which would subject current regulation to a forward-looking cost benefit analysis, particularly in light of opportunities created by recent developments in ICT.

7.2 Social marketing to change behaviour rather than regulation?

- a) What are the keys to success when using **social marketing** to change behaviour rather than regulation?
- b) What are the implications for transport of experience in other sectors?

Social marketing involves activities aimed at changing or maintaining people's behaviour for the benefit of individuals and society as a whole. These activities can occur across various media platforms, including radio, television and social media. Social marketing may or may not be undertaken by Governments (including regulators). Thus private individuals, private charities, private non-profits and private for profit firms including owners of transport networks can engage in social marketing.

Examples of social marketing in transport

There have been examples of social marketing that claim to have been successful. In transport, one set involves advertising campaigns for example to promote road safety among young males. Whether their cost-effectiveness has been tested using truly experimental empirical testing designs is unclear. In the end however an evidenced-based approach to policy rarely provides a conclusive result, as the evidence is not available, too costly to acquire, unreliable, or inconclusive – requiring the exercise of judgement at the end of the day.

Another example, which is far more preliminary, is in the active transport arena, and mainly still confined to the NGO and academic sectors with some

early commercialisation by private providers.¹⁵ These are prototypes for real-time reporting of cycling route conditions and accident hot-spots. There is an analogy here with existing transit network condition reporting systems. And, indeed, Uber and other social transport networks are essentially private versions of transit and road condition reporting, for variable demand-driven networks as opposed to fixed supply systems.

The world of smartphone and tablet applications (apps) are an especially fertile technological field in many areas. One might predict that purely information driven needs are very well served by social marketing, especially smart phone apps that deliver information about transit schedules, traffic conditions and so forth. These are effectively already mainstreamed with further development to be seen mainly in user interface and back office data collection. Payment systems are another rapidly growing and developing area. In both these cases social marketing essentially combines service delivery and messaging and motivation into one.

But technology is going well beyond this. For example, an app has been developed targeting young male drivers to record their driving behaviour and give them instantaneous real-time feedback to hopefully reduce their speeding, with early promising results¹⁶. Apps measuring calorie expenditure resulting from exercise are already well-established and adopted by the marketplace, usually tied with wearable devices that do things like measure walking steps taken and provide immediate estimates of energy outgoing matched against a target to the user. And 'smart' vehicles tie into this as well, as they can sync with these other devices and provide not only information to the user but can automatically adjust vehicle response. Cruise control is an older example of this technology but now users are living in a completely wired world, and the feedback-response potential is far greater. Finally the whole network can interact with individual users and vehicles to provide a systemic as well as an individual optimum.

Factors affecting success

The problematic issue is changing user behaviour in ways those regulated may not want to do at the moment. People do not need to be pushed to seek out and respond to system capacity information and respond appropriately. That is aligned with their self-interest. Where the social good does not so easily align with private want, as with travel demand reduction overall to serve environmental goals, this is a more difficult task. Safety in particular can be a public externality that some sort of collective guidance may be needed to foster, which is the intent of some of the nascent active transport network prototypes described above.

¹⁵ Google already collects location information from android phones and produces real-time information - goglemaps

¹⁶ Reducing speeding behavior in young drivers using a persuasive mobile application. Bergmans, Anne; Shahid, Suleman (2013) Human-Computer Interaction. Applications and Services: 15th International Conference, HCI International 2013, Las Vegas, NV, USA, July 21–26, 2013, Proceedings, Part II, pp. 541–550.

Pure private marketing campaigns do not tend to translate well to public domains because of their purely private interest appeal, but the ability to brand, re-brand and provide a desirable image for things once thought undesirable definitely have some lessons for successful transport regulation. Of course public service campaigns have been doing this for a long time, with varying degrees of success e.g. “Your Country Needs YOU!”. To some degree, social media has made that job easier by allowing targeted and personalised messaging, but in other ways the job has become harder since fragmented media platforms have reduced the importance and reach of big ‘portals’ such as commercial or national television networks which used to carry ads with maximum exposure.

The increasing interactivity of devices and the ability to provide feedback and reward can have the potential to 'nudge' users in ways they may find attractive rather than try to 'sell' them on a public good or force them into it. And the growing field of behavioural economics is playing a part here as discussed in further detail below. As an example people do tend to respond to salient and immediate feedback. In the energy utility field, the use of 'ambient orbs' that turn green when energy use is low and turn amber when it is high has shown real effects on reducing energy usage as compared to less frequent monthly or quarterly bills that provide static information on usage patterns. Feedback like this could be used to encourage more energy-efficient driving and the technology is already there in automobile dashboards today.¹⁷

Distance tracking systems have the potential to improve driver behaviour and regulatory compliance in a similar way.¹⁸ These systems are currently oriented towards internalising the costs that lorries impose on the roads by charging for that use. But providing instant feedback about emissions created by in-the-moment operating could have the effect of causing more efficient driving. And one could conceive of possibilities for encouraging and guiding other sorts of 'public good' behaviour as well.

Experience in other sectors and implications for transport

Focusing specifically on government use of social marketing, it clearly raises issues that private use does not. Many of these issues have yet to be deeply explored as significant developments in this area are relatively recent. The UK government for example established a 'nudge' unit in 2010 that is specifically designed to design policies in such a way as to account for known human decision-making tendencies, which include a preference for the status quo, a “present bias” and aversion to loss. The nudge unit was however seen to be so successful at finding clever policy insights that it was part-privatised and has been advising other governments. An OECD report in January 2015

¹⁷ Avineri, E. (2012) On the use and potential of behavioural economics from the perspective of transport and climate change. *Journal of Transport Geography* 512-521.

¹⁸ Distance tracking has been mandated in various parts of Europe for freight lorries. Telematics are already used by some NZ truck firms for fleet logistics and personnel management. It provides real-time information on speed, location, weight, driving style, fuel consumption.

indeed declared Britain a world leader in applying behavioural economics to regulation.

Behavioural economics is changing not only the way UK regulators think about how they do regulation (e.g. “nudge”, and social marketing), but also how they see the markets they regulate. These two impacts of behavioural economics are closely intertwined, but need to be more carefully distinguished, and recognised, as they may not have equal merit. For example, the UK Financial Conduct Authority (FCA) concluded that borrowers who suffer from “present bias”, may take out pay day loans at astronomical interest rates, expecting to pay them back quickly. When tomorrow arrives and they have not paid them back, they still have the same skewed “present bias”, or enduring optimism about the future, spend more than they planned, and end up in financial trouble. The FCA’s evidence was that some people were worse off 6 months to a year after taking out a pay day loan, leading to lower credit scores and greater risk of default on other loans.

In response to these insights the FCA deployed some fairly heavy handed regulatory tools. It thus introduced tough new affordability checks, limited lenders access to borrowers bank accounts, and in January 2015 imposed a cap on interest rates. Wonga, a pay day lender, had to write off nearly NZD500 million in October 2014 after the FCA said it lent without adequate affordability checks. The FCA itself further predicted that after implementation of the cap on interest rates all but four of Britains 400 pay day lenders would exit the market.

In a similar type of case, the UK Office of Fair Trading (OFT) in March 2014 intervened to prevent furniture and carpet retailers from claiming shoppers were benefiting from big discounts, when hardly any sales had occurred at the undiscounted or “reference price”. The OFT had found in an experiment that reference prices led to less shopping around, benefiting traders who deploy them. The OFT suggested competition would thus lead to a race to the bottom, with scrupulous firms falling behind their crafty rivals.

The above examples involve quite heavy-handed interventions in the market by regulators, based on applying behavioural economics insights to the markets they regulate rather than simple “nudge”. The examples however illustrate the apparently strong influence of behavioural economics on regulators, providing the apparent rationale for heavy-handed regulatory intervention. Behavioural economics “discovery” that people are not fully informed and perfectly rational decision makers however is quite simply “not news” in many respects, as it was always known that people were boundedly rational, and driven both by irrational and non-rational impulses. Adam Smith and David Hume were aware of this in the 18th century. The key question from a regulatory point of view therefore remains “what institutional arrangements work best?” The more traditional regulatory economics question remains in other words, when left alone, how well does market competition work over time to alleviate the problems facing “boundedly rational” consumers, compared to regulatory interventions – including social marketing.

There are of course examples of Government using nudge, or forms of social marketing based on behavioural economics, to influence how a market operates, particularly in the UK. The UK Competition and Markets Authority for example intervened to establish a price comparison website to address the perceived problems in pay day loans market outlined above. In a similar vein OFGEM, Britain's energy regulator used the behavioural economics insight that people suffered from "loss aversion", where they dislike losses more than equivalent gains, to explain why the average British consumer on a single fuel energy tariff would save nearly NZD 200 a year by switching, yet in the second quarter 2014 only 2% did so. As a result OFGEM wanted firms to simplify their tariffs, with the goal of nudging consumers more towards action. One also sees social marketing in health markets, for example including tobacco product health related warnings.

This does beg the question what is the role of government (regulators) in influencing peoples' behaviour through nudging and/or social marketing? Are such measures costly or risky? Are expected benefits in fact realised? Do the benefits exceed the costs? Is the Government better at social marketing or the private sector? Will Government sponsored social marketing only simply drive out private sector social marketing? In short the use of social marketing should be subjected to the same tests as traditional regulation. The costs of social marketing can theoretically of course in some instances exceed the benefit. There is indeed another word that may be used to describe such social marketing which is indoctrination. Behavioural economics when applied to regulation is indeed proving controversial because it can suggest interfering with personal choices ("nanny state") when some might prefer to learn from their own mistakes.

Finally behavioural economics needs to be applied to better understand how regulators actually regulate, or how well regulators make decisions such as whether to use social marketing campaigns. In the same way behavioural economics may be used to understand the way consumers and markets work it *simultaneously* needs to be applied to understanding how regulators behave, to avoid an asymmetry, or "grass is greener" fallacy or so-called "nirvana" fallacy. Basically regulators are human too. Regulators may make mistakes. It should not be assumed they know better than consumers, that they even readily understand consumers, or that social marketing campaigns can make markets work better. Given it should not be assumed that social marketing will be costless, nor low cost, or high benefit, or more cost effective than markets – it should also not be assumed that estimating the costs and benefits of social marketing is easy, or itself not subject to bias. Regulators may be as overly optimistic when it comes to the effects of their own behaviour as those using the services of pay day lenders. Even interventions that focus on improving consumers information need to be subject to considered cost benefit analysis, randomised trials and effectiveness reviews.

Conclusion

Social marketing involves activities aimed at changing or maintaining people's behaviour for the benefit of individuals and society as a whole. These activities

can occur across various media platforms including radio, television and social media. They can be undertaken by government (including regulators) or private sector parties.

The world of smart phone and tablet 'apps' is an especially fertile field in social marketing. Information about transit schedules and traffic conditions are already mainstreamed. But technology is going well beyond this. An app has been developed targeting young male drivers to record their driving behaviour, and give them real time-feedback intended to encourage safer driving. An example of an initiative exploring social marketing is the UK government 'nudge' unit established in 2010 that was specifically designed to design policies in such a way as to account for known human decision-making tendencies, which include a preference for the status quo, a "present bias" and aversion to loss.

The problematic issue (for social marketing, as for conventional regulation) is changing behaviour in ways which may not be aligned with their self-interest. The broader issue is the appropriate role of government in influencing people's behaviour through nudging, social marketing, or conventional regulation. The use of social marketing should be subjected to the same tests as traditional regulation. Social marketing even simple interventions that focus on improving consumers information needs to be subject to considered cost benefit analysis, randomised trials and effectiveness reviews. The kinds of questions that need to be asked include whether the Government better at social marketing than the private sector, and to what extent Government sponsored social marketing may drive out private sector social marketing?

7.3 New Technologies

- a) How is new technology being used in regulation and
- b) what new technologies are emerging which could add to the regulatory toolbox including enforcement?

Big data and big data analytics are the big opportunities

The rise of 'big data' and 'big data analytics' is obviously front and centre for transport system regulation and management and widespread digitisation has obviously made possible real-time accumulation of very finely grained and precise micro-data. Most transport systems are by their nature composed of many individual transactions that are now amenable to direct physical measurement and can typically be monetised as well. This is probably the major technology available to regulators.

New pricing technologies and data analytics

Perhaps one of the greatest opportunities presented by new ICT technologies may be the opportunity to price better and in real time on transport networks. In the old days to collect a price for a road service drivers had to stop to drop money into a "drop-box". This was and remains a costly means of collection, because of the time lost and congestion it causes. While the New Zealand petrol tax is related to use, and was a better mechanism for funding road

development than drop-boxes, or more blunt taxes like PAYE or GST, and New Zealand is a world leader in the use of a petrol tax, it is still a blunt instrument. The petrol tax paid and collected does not vary sufficiently according to congestion. No doubt large commercial transport companies use the amount of petrol they can save for planning routes and monitoring performance. But the tax on top of the petrol price is a blunt signal even to them. Moreover advances in fuel efficiency, means the tax paid may fall though road development and use costs are rising.

There has for some time been the means to electronically price transport use, and collect tolls or charges for use, but it is not widespread in New Zealand. The reason or cause for its low use relative to other countries is clearly a regulatory decision not to use such pricing. Tax funded transport will however increasingly fail on a number of fronts compared to a more explicit pricing system that is now becoming possible with new information and communications technology, including location based GPS and time of use pricing. By comparison pricing of transport services using new information and communications technology (ICT) would

- better incentivize efficient use, with peak period pricing
- send more efficient signals for new investment
- provide better incentives for investment
- better enable ease of competitive entry, by better enabling new investment of private capital in private infrastructure projects
- better enable inter-modal competition by better revealing relative prices
- increase the ability to 'unbundle' and 'rebundle' individual services to optimise both user outcomes, administrative economy, and fiscal efficiency

More deeply the “big” opportunity is to exploit combined developments across utility or network industries, not just transport modes, but also telecommunications, electricity, gas water etc. The opportunity here is at least twofold – better co-ordinated investment and better management. The essential asset of a transport service, or other utility typically is the right of way it uses. Many utilities share these rights of way, but this could be done better to lower investment and management costs. On management, the use of ICT on transport platforms to make them “smarter” offers considerable potential over the next 10 years for better outcomes. Already the necessary systems and the data they collect are available. Some of it in private hands, with outsourcing and privatisation likely to continue. Public access to, and use of the data, including use of the data in enforcement are major issues to be grappled with. As discussed further below, privacy of information issues need to be addressed “ahead of the curve”.

New technology has clearly expanded the scope for better transport pricing, enhanced competition, and increased transport privatisations, both within and across modes, and one can readily point to early adopters of regulatory approaches permitting better pricing, more competition, and greater private sector involvement, including early expansion of private providers in transit (e.g. Hong Kong), in roads (e.g. Spain), and in airports (e.g. Australia). In each case increased competition and private involvement has resulted in and

driven improvements in project delivery and oversight, price setting and collection, and identification and harvesting of new revenue streams that benefit user, private company and the general public alike. For example, toll and fare collection systems have become increasingly efficient, in the case of transit especially allowing for faster and faster loading and unloading of passengers and hence speedier system flows. The ability to sell and harvest data and put it under a brand has made some of these services not just self-funding, but revenue centres for government entities in some case. The simple privilege of data collection is worth money to a private company. An analogy can be made with Amazon.com, which uses its vast database of transactions to present users with 'you may like' options that cross-market other goods and services, sometimes from third parties. Facebook's core asset is the private information of its users it has access to.

Technology also allows for more creative design of pricing methods. London's Congestion Zone, a so-called Cordon Price that wraps around the Central Business District (CBD) would not be possible without advanced technologies in camera tag recognition, automated billing and collection and a vast informatics network to process everything. Compared to simple flat rate tolls, or charges, more sophisticated pricing methods¹⁹ including vehicle kilometres travelled (VKT) and weight/distance charging are technologically intensive, requiring careful choices about technical means and ends often not easily reversible, and which need to interact with a rapidly changing transport service delivery environment. Private network operators who own their network, do active yield management of their capacity. So too do some public operators, especially in rail. How this plays out with distributive networks such as Uber is not easy to predict.

Government generally needs to do more with sophisticated pricing as a way of internalising externally imposed costs of private use of a collective network, including through distance and weight charges. Government does have some experience, though still limited, in considering nuanced ways of making sure network goods are managed in a decentralised way using price signals. One of the problems preventing such transitions in the past however may be that current collective choice mechanisms based on broad based tax funding of transport networks, in effect redistributes wealth across users, and other groups, subsidising some at the expense of others. The resulting outcome may thus be difficult to change politically, even though inefficient. It may be politically entrenched to the extent the outcome benefits a politically strong special interest group or the median voter at the expense of the wider society. Technological change however that enables more sophisticated pricing, and more efficient transport networks may also enable politically feasible transitions from current less efficient transport market equilibrium to better ones.

There are some obvious concerns, of course with attempts to support more efficient use and investment in transport networks by using new technology to

¹⁹ New Zealand has a road user charge system for heavy vehicles it can build on

enable greater competition and private sector involvement in such networks (road, rail, sea and air). Public Private Partnerships and privatisations have not been without glitches, such as poorly designed pricing or political fallout from users disliking prices applied to previously 'free' goods or paying higher tolls. Technology is also not necessarily inexpensive. London's Cordon Price, for example, consumes forty percent of its revenue in administration and standard e-tolled roads average between ten and twenty percent of total revenues consumed in collection costs in the US. Privacy is also major concern both in the unintended use of information (e.g. through hacking or technical faults) or intended misuse (e.g. licensing of private information to a third party without prior consent). However there is a large knowledge base to draw upon to minimise known problems and design of contracts between users, providers and government can be optimised to ensure that, when problems do occur, there is ready and flexible and efficient recourse and resolution.

Privacy issues need to be addressed

Privacy of personal information stands out as a major user concern affecting the use of big data and smart transport networks with automated vehicles. Personal information is information about the characteristics of individuals and their behaviour. Individuals will be concerned with who can monitor their movements and what might be done with such information in smart automated transport systems. This is not easy to address adequately, either in terms of types of data collected or inadvertent release of information (as with compromised digital security), not to mention outright abuse of data either by a malevolent agency or a rogue operator within.

The failure to regulate perhaps “ahead of the curve” to protect privacy, or rights to personal information on the internet has had significant adverse effects on trust and the value of services available online. The design of a regime for privacy, or enforceable rights to personal information on transport networks will be critical to their future technological development. Information about personal characteristics and behaviour “on-line” is valuable to the individuals and to others. In the first instance, the bearer of the information is the person on whom the information is about. Such information is something however that can be transferred to others voluntarily – it is therefore something that can be sold. A legal framework on rights to personal information on transport networks might thus in the first instance allocate enforceable rights to personal information to individuals, but enable these rights to be tradable, so the information may be legally transferred, subject to conditions, and for reward, under contracts with transport service providers, in a more competitive market.

Conclusion

The rise of ‘big data’ and ‘big data analytics’ is key to transport regulation and management. Most transport systems comprise many individual transactions that are now amenable to direct physical measurement and can typically be monetised as well. Widespread digitisation has made possible real-time accumulation of very finely grained and precise micro data.

New technology has expanded the scope for better transport pricing, enhanced competition, and increased transport privatisations within and across modes. Examples include expansion of private providers in transit (e.g. Hong Kong) in roads (e.g. Spain) and in airports (e.g. Australia). In each case, increased competition and private involvement has resulted in and driven improvements in project delivery and oversight.

Privacy of personal information stands out as a major concern affecting the use of big data and smart transport networks with automated vehicles. Individuals will be concerned with who can monitor their movements and what might be done with such information. These privacy issues are not easy to address adequately either in terms of types of data collected or inadvertent release or misuse of information.

7.4 Social media

- a) In what ways is **social media** being used in regulation now?
- b) In what circumstances could it be used to deal with problems of information asymmetry previously dealt with using regulation?

Social media are defined here to cover forms of electronic communication (such as Web sites and other online applications) through which users create and share information in online communities, or participate in social networking. There are a large number of social networking websites²⁰ the top ten are said to include Facebook, Twitter, LinkedIn, Pinterest, Google Plus, Tumblr, Instagram, VK, Flickr, and Vine.²¹ Social media can thus be used as a platform for social marketing discussed earlier.

Information delivery and acquisition

Social media, as far as we are aware, are mainly being used by regulators as an information delivery device to affected parties and other users, and possibly as a means of listening to their communities. It certainly is effective in that. As a replacement for regulation, its use is probably somewhat limited, except perhaps for coordination of activity across networks. Indeed decentralised information, payment and scheduling is a natural replacement for more top-down management of many freight and passenger infrastructure systems. That is, of course, no small thing. But cultural changes within the bureaucracy (which tends to be organised for central command and control) and unintended consequences are important challenges. The use of pilots to learn-by-doing is probably recommended. This is exactly what is happening with VMT and other distance based charging schemes currently.

The major way social media are being used otherwise is to gather opinions and information from citizens and users in major and minor project initiatives and to automate various public communication and feedback mechanisms. In a transport setting Google Transit is a major private initiative that has been

²⁰ see https://en.wikipedia.org/wiki/List_of_social_networking_websites#F

²¹ <http://www.ebizmba.com/articles/social-networking-websites>

around for close to ten years now that is in standard public data formats, i.e. open-source, that lets anyone access route, schedule, and location data and design outputs as they wish. This has been a big input into both entrepreneurial development of apps and government trip planning web and phone-based programs. Activists and NGOs often use such data for assessing impacts of transport programs on various types of users or communities and often use social media to get transport agency attention. In a non-transport setting there is an Italian example of the Kublai initiative, an online community that enables young people to participate in economic development project design, an example of 'co-creation' of services.²²

Government is not necessarily a laggard in the use of social media in program delivery and design. Its use in public health promotion and campaigns is fairly long standing. New Zealand is one of a number of countries known for innovative and interactive public health campaigns (<http://www.hpa.org.nz/>) and an experience base has been built up on the proper use of social media accounts and content within agencies that has been codified by the New Zealand Controller and Auditor General (<http://www.oag.govt.nz/2013/social-media/part4.htm>).

Addressing information asymmetry

Public transit agencies are perhaps one of the more active government users of social media. The Transportation Research Board (TRB) Transit Cooperative Research Program (TCRP) issued a 2012 report on transit agency use of social media in the US and found five major types of engagement:

- “Timely updates—Social media enable agencies to share real-time service information and advisories with their riders.
- Public information—Many transit organizations use social media to provide the public with information about services, fares, and long-range planning projects.
- Citizen engagement—Transportation organizations are taking advantage of the inter-active aspects of social media to connect with their customers in an informal way.
- Employee recognition—Social networking can be an effective tool for recognizing current workers and recruiting new employees.
- Entertainment—Lastly, social media can be fun. Agencies often use social media to display a personal touch and to entertain their riders through songs, videos, and contests.”²³

However most social media use is still oriented towards shaping behaviour (e.g. getting people to use transit or quit smoking) rather than overseeing regulated people and entities and making sure they comply or, perhaps better,

²² Bianchi, T.; Cottica, A. Harnessing the unexpected: A public administration interacts with creatives on the web. Eur. J. ePractice 2010, 9, 82–90

²³ TRB TCRP (2012) Uses of social media in public transportation (2012), p. 1. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_99.pdf

collaborating with them to design efficient regulations. The general approach is still generally focused on issuance of regulation and codes of conduct etc that is then 'pushed' out, to use marketing terminology, rather than interacting with those being regulated to help co-design policy. In five case studies considered in the TCRP report (Chapter 5), some of the large US agencies considered did not regularly track responses to their social media posts and none of them did systematic analysis of responses, things private companies and even individual users do as a matter of course. And the New Zealand Controller and Auditor-General report conducted a survey of agencies and found that a majority of staff were not even aware of relevant internal policies governing the use of social media (<http://www.oag.govt.nz/2013/social-media/part4.htm>)

There is clearly more scale and scope for more innovative and interactive use of social media in transport regulation and to some degree this is happening of its own accord as open-source platforms in particular allow almost anyone with a little technical savvy to become a transport activist, program designer, or information provider. Public health professionals and agencies are the most cutting edge here since they must interact with target populations to assess cause and effect and design suitable and effective policies that those affected must willingly accept and sometimes actively take up, e.g. vaccination.²⁴ In transport regulation and service delivery, governments still have tended to be more reactors rather than actors here but there is a growing body of 'best practice' from which to draw upon .

7.5 Models to pay for the costs of regulation?

- a) What are the alternative **models to pay for the costs of regulation**?
- b) Are there new models emerging?
- c) How do these models balance *competing objectives* (such as
 - i) efficiency,
 - ii) natural justice and
 - iii) equity?

The appropriate method for financing regulation requires one to be clearer about

1. first the nature of the regulation, and the degree to which it involves purely private, or significant social or public benefits, and
2. second the nature of the costs of regulation being referred to.

In what follows we present a high level discussion of these two points, and then proceed to review examples of specific models being used to pay for the costs of regulation

3. first under the common law and then
4. second under other sector specific regulatory authorities, including transport.

Private versus public good regulation

Different methods of financing the costs of regulation appear appropriate to different types of regulation depending on the degree of private versus public good, or private versus social benefits associated with the regulation. Where the benefits of a good or service are purely private or limited to a closed class, it is generally recognized as efficient to charge the costs associated with the activity to the private or closed group. This provides the group incentives to efficiently use and invest in the good or service.

Transport regulation when properly conceived may in fact generate strictly private benefits. This is true to the extent it is technically possible for an owner of a transport asset like a road for example to exclude people from road use. Given the benefits of road regulation accrue mainly to road users, the benefits of road regulation then may technically be a purely private good. Road rules designed and implemented by road owners governing road use generate *private benefits for road users*. To the extent then road regulation, for example of safety, enhances the value of the road asset to users, and therefore user willingness to pay for road use, the owner of a road is likely to have incentives to regulate safety on the road to the benefit of road users in a manner that optimizes the assets value. This will occur at the point where the net benefit to road users of the regulation equals the risk-adjusted opportunity cost to the road owner providing such regulation. To the extent then those who do not pay for the costs of road use including the costs of regulation can be excluded, the costs of design and administration of road safety rules for example can be, and typically one might expect would be recovered from road users by a private road owner. If the owner charges more or less than their risk adjusted opportunity cost of providing the services for such benefits, they will risk forgoing a profit-maximizing outcome.

The state in New Zealand has of course acquired significant ownership interests in underlying transport assets, either through the nationalization of existing assets, or investment in new assets to support state production of transport services. But this does not change the above underlying analysis. If the state as owner chooses not to exclude and charge users, and instead taxes or charges non-users, for transport services (including regulatory services) which benefit only transport users, it will cause a distortion from efficient outcomes in relation to use and investment in transport assets. So too if the state charges road users more than the risk adjusted opportunity cost of providing the services, perhaps in order to subsidise others, it will cause a distortion from efficient outcomes.

It is thus important to draw a distinction between

- i) private good transport “regulation” which can be optimally implemented by the owner of a transport asset, as the benefits of such regulation accrue solely to the users of that transport asset:
versus
- ii) *public good legal regulation* which is applicable to every citizen (i.e. non-excludable), and available to every citizen (i.e. non-rival) in all contexts (not just transport) and is generally designed or intended to promote efficient and equitable social outcomes, involving rule of law, or the constitutional or legitimate use of the coercive powers of the state under the constitution, (including Acts of Parliament, Order in Council, Judicial decisions).

The first form of regulation should not be confused with the second. The first involves private good regulation, in that it only applies to users of a specific transport asset. The second involves classic public good regulation, which is applicable to every citizen and available to every citizen in all contexts, not just transport. The models or principles for financing the second form of public good regulation tend to differ from the first.

Where public good legal regulation is applied to the transport sector it can be understood as a particular manifestation of rule of law. Such legal regulation may of course be applicable to transport assets, but it will tend to exhibit significant positive externalities, or public good benefits over and above the private benefits to transport users. A user of a road may cause pollution that affects more than just road users, thus in order to internalize these effects requires public good regulation. A driver on a road is also liable however to other road users under general law rules like tort law rules, in the same way as an employer is liable to a worker under such tort law rules, or one cinema goer is liable to other cinema goers, or any service provider is to any user.

Given public good regulation or law is applicable to every citizen (i.e. non-excludable), and available to every citizen (i.e. non-rival) in all contexts (not just transport) it is a public good. The goal with public good legal regulation is to ensure a socially optimal, as compared to a privately optimal outcome. There are then several principles suggested as providing a possible basis for funding such regulation. Two potentially relevant ones worth mentioning are:

- a) The benefit principle. The benefit principle approach to funding public good legal regulation suggests that from an efficiency point of view the direct cost of regulation should still be allocated according to how individuals benefit from the regulation. Although individuals cannot be excluded from benefiting from public good regulation they may benefit differently. The benefit principle approach suggests the costs of public good regulation should be paid by individuals in accordance with their share of the benefit from the regulation. The benefit principle was initially developed by Knut Wicksell (1896) and Erik Lindahl (1919) and was premised on a just income distribution.

- b) The ability to pay principle. This principle suggests that the way in which the costs of public good regulation are financed should reflect an individual's ability to pay, and may seek to address a perceived unjust income distribution. The concern is that simply charging users of transport assets how much they benefit may exclude poor people from transport use. Instead the rich should pay more than the poor. This entails a redistribution of wealth. It may be possible however conceptually to separate distributional concerns from allocational, through the use of a negative income tax (NIT)²⁵ overlaid on the benefit principle for taxation.

The costs of regulation

One needs to distinguish between the direct costs of regulation and indirect costs. The direct costs are the money spent or budget costs of any regulatory decision making body (agency, court or tribunal) and those who may participate in the regulatory process. The direct costs of regulation are only the tip of the iceberg; broader costs are much larger. Indirect costs to society occur where people change their behavior in response to incentives created by regulation. Major indirect costs include value lost when people cut back purchases in response to regulation-induced price increases, reductions in quality or convenience caused by regulation, and risk related tradeoffs.

Clearly a major concern is how the rules governing the allocation of the direct costs of regulation may impact the optimality of regulation. In what follows we analyse how alternative rules appear to be affecting outcomes in two major relevant systems discussed so far – first under the common law system, and second under sector specific regulators created by statute.

The Common Law models for allocating costs of regulation

The common law provides a relatively neglected and rapidly developing model for the recovery of the costs of regulation. Common law litigation over harm caused is important when considering transport regulation as the common law can be understood as a substitute for ex ante regulation by sector specific regulators including for example transport regulators. Recent developments to legalise or facilitate class actions and provide litigants with greater access to capital markets for litigation funding may thus offer an alternative to transport regulators and justify less funding of independent sector regulators generally and greater reliance on the common law.

This is particularly true given one of the theories or the rationales for sector specific regulators is that they serve to establish and enforce an efficient long term relational contract between consumers (who are many) and suppliers

²⁵ An NIT would raise the revenue required for redistribution by a progressive tax, which taxed high income earners a greater percentage of their income, and those on lower income less, until ultimately at some low income point tax paid would be zero and people below that level would be paid a benefit (negative tax) thereby transferring the income raised by the NIT to poorer people.

(who are few) which markets and the common law may have failed to offer. The argument is that in many sectors like transport, consumers become locked into long term relational contracts in which competitive forces provide consumers with weak protection from inefficient behaviour by suppliers. The costs of litigating in common law courts to enforce an efficient contract has also seen to be costly and subject to the free rider problem, where the litigator bears all the costs of litigating, but does not reap all the benefits which accrue to all consumers. This implies under provision of common law remedies and supervision. The sector specific regulator then acts like an agent for consumers, and enforces an efficient implicit contract over time to compensate in part for free riding and weaknesses in the common law system. This argument however is weakened to the extent class actions are legalised and consumers can now take group actions against suppliers, and share the costs of litigation, and even further weaker where consumers more recently have gained greater access to capital market for litigation funding as outlined further below.

As noted public good regulation seeks to regulate and thereby optimally prevent and compensate for the harm caused by market failures. Common law rules governing the allocation of the costs of litigation therefore offer insights on how a key form of regulation is financed. As we shall see the common law tends to adopt a mixed approach, with courts funded in part out of general taxation, and partly out of court fees charged to litigants, including awards for costs. This reflects in turn the benefit principle and the mixed public good, and private good elements of litigation. In what follows we present some analysis on the possible effects of common law financing rules and how these have evolved over recent years.

There have in particular been changes to funding, this includes costs and fees rules applying to litigation. Variation and changes in these rules over time and through jurisdictions is increasing the ability to evaluate their effects. The rule for cost allocation in England, NZ, and Australia for example is that the loser pays both sides costs. In the US by comparison the rule tends to be that each party bears their own costs. Further in England, NZ, and Australia unlike the US, a lawyer cannot typically be compensated through contingency fees, or a share of the judgment. Only conditional fees are available or an uplift or premium if the case is won, a premium which is not calculated by reference, to the adjudicated amount.

The effects of variation and changes in these compensation rules have been the focus of some investigation. It is clear that a litigant's ability to bear risk and finance the costs of litigation is more important under loser pay rules applying in NZ. New models for financing common law litigation²⁶ have however been emerging over the past 20 years involving third parties in litigation funding, such as lawyers, insurance companies and Litigation

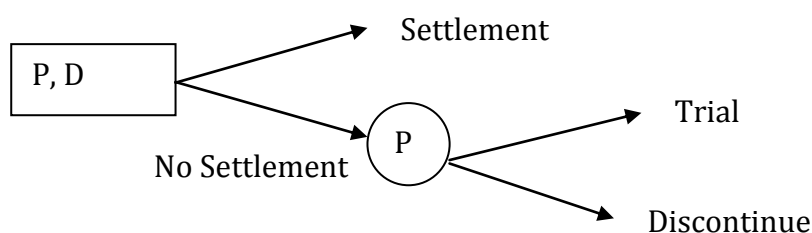
²⁶ Funding another person's litigation for profit ('champerty') and improperly encouraging litigation ('maintenance') were formerly torts and crimes in all common law jurisdictions including New Zealand.

Funding Companies (LFCs)²⁷ For a long time third party litigation funding was assumed to be illegal - but recently this view has changed. The Australian High Court for example endorsed such litigation funding in *Fostif*.²⁸ This raises the question as to the effect of the legal rules surrounding litigation funding. In particular their impacts on the incentive to litigate, and therefore the nature, extent and effectiveness of common law regulation, which may in turn affect the nature of demand for transport regulators. LFCs however have been a relatively new development, and there has to date therefore been very limited scope for analysis of their role.

A particular issue of relevance to transport regulation is the role of litigation funding in class actions. The majority of the cases funded by Australia's main litigation funder for example involve class actions or group proceedings which as noted can serve as a direct substitute for sector specific regulation in transport. Clearly running a class action lawsuit is likely to be expensive to the extent it involves complex legal issues, and numerous plaintiffs. There has been an upsurge in theoretical or empirical research on the role of law firms, insurance companies and LFCs in litigation funding and the effect of relevant legal rules. One can for example use event analysis and game theory to model the basic decision of whether to settle or litigate and how it is affected by the availability of class actions and associated rules on litigation funding.

The basic event tree for the model of class action law suits with litigation funding is summarised in Figure 1 below. It shows the typical choices of the parties involved in a simplified lawsuit being the Plaintiff (P), the Defendant (D). Two events only are modelled here being the decision to settle or litigate, and then whether to drop the case or proceed to trial. The individuals are assumed to make decisions based on their expected payoffs.

Figure 1:



The above model assumes individual decision making and the absence of class formation, e.g. because the law prevents it. If it is permitted by the law the main benefits from joining the class are the economies of scale in production or consumption of a non-rival good. The assumption is that a legal decision may be non-rival in that it may help to settle or determine other cases where there is a common interest and grievance. In addition through class

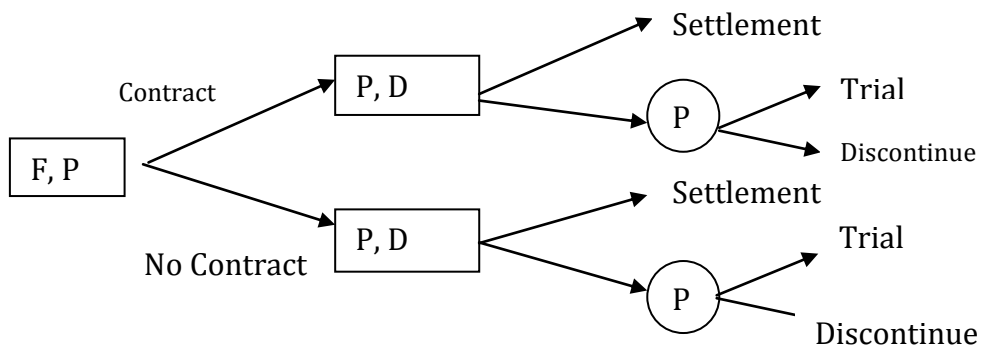
²⁷ LFCs are commercial entities that contract with one or more potential litigants to pay their legal costs and accept the risk of paying the other party's costs for a share of the proceeds if successful. There are now five "for profit" LFCs in Australia.

²⁸ *Campbells Cash & Carry Pty Ltd v Fostif Pty Ltd* (2006) 229 ALR 58

actions individuals may be able to share production costs and perhaps non-rival inputs to litigation including information that may be shared at low cost.

In Figure 2 below we highlight how therefore a prior decision may be made by litigants to contract with a law firm to form a class²⁹ and/or with a litigation funder for funding, depending on the legal rules. Using this event analysis and its payoffs, it is possible to analyse the parties' behaviour under varying conditions in terms of expected legal costs, expected recovery and plaintiff and defendant expectations of trial success. On this basis one can formulate the conditions under which a case may involve the formation of a class and/or litigation funding agreement, and go to trial or settle. Interestingly at this stage it appears that fewer class action cases should go to trial with litigation insurance or funding contracts in place. This basic model can be extended to analyse behaviour incorporating additional considerations of class size, costs of class formation and unrecoverable costs.

Figure 2: Class Action Litigation and/or Funding Contracts



As noted one of the variables influencing these outcomes is the role of litigation funding rules and contracts. Thus there is a growing body of literature by economists which supports the proposition that lawyers, and the outcomes of litigation, are influenced by the financial incentives implicit in funding contracts. In Table 1 below we try to summarise what the various economic models predict about the relationship between key policy variables and case outcomes. As Table 1 shows, legal expenses insurance and litigation funding together are predicted to raise the settlement amount and shorten the duration of the case.

Table 1: Hypotheses	Case Outcome (effects relative to Private Finance)	
	Settlement Amount	Duration To Settlement
Legal expenses insurance	+	-

²⁹ Our proposed modelling of the decision to join a class and the operation of the class will draw on the economic theory of clubs.

Litigation Funding	+	-
Trade union finance	+	-

The important implication of recent developments in class actions and litigation funding then is that, to the extent they increase the efficiency of common law regulation, they may as a result justify a commensurate reduction in the role for sector specific statutory regulators. Statutory transport regulators for example may now only duplicate, crowd out or complicate such private regulation. There however remain concerns about the principal-agent problems in class actions and litigation funding that give cause for caution. These principal-agent problems arise between class members themselves (e.g. free riding), and in the class members relationships with lawyers (e.g. the incentives of entrepreneurial lawyers promoting weak cases) and in the class members relationships litigation funders. (E.g. LFC capital adequacy and solvency)

Models of financing sector specific statutory regulators and their effects

There has been a tendency recently for the costs of sector specific statutory regulators to be financed increasingly by the industry they regulate rather than out of general taxation. Assuming optimal regulation by the regulator, and that most of the benefits to regulation accrue to the industry this move tends to reflect the underlying benefit principle outlined above and looks like the analogue of the polluter pays principle. This therefore may be a good outcome, to the extent the direct costs of regulation get engrossed in the final cost of the service being regulated, they are presumably then financed out of the benefits made possible by the regulation.

A recent example of the benefit principle apparently being used to the allocate direct costs of a regulator to the industry is UK Financial Conduct Authority (FCA) established in 2013 which regulates the conduct of both retail and wholesale financial services firms and is financed by charging fees to members of the financial services industry. It is too early to refer to studies of the effects of this on the operation of the regulatory process. In the transport arena however an example of the benefit principle being used to allocate costs of a regulator to the industry which has been studied is the US Transport Security Administration (TSA). The TSA budget for screening airline passengers was \$4.3 billion in 2005. These TSA costs were in turn funded with an explicit fee on airline passengers. It is clear however the indirect costs far exceeded this amount. For example recouping the fee from airline tickets increased ticket prices. As a result fewer people flew in 2005, forgoing the trip altogether, or choosing a less convenient way to travel, which was estimated to cause lost value at around at \$2.35 billion - half as much again as the TSA budget. A further indirect cost that has been estimated is the cost of increased waiting time, which was estimated to be slightly higher at \$2.76 billion. The biggest indirect cost however was due to the increased risk of dying from travel accidents, including increased highway deaths, costing \$3.2 billion annually, with people substituting auto travel for air travel on short trips, and auto travel being riskier than air travel.

Monetising of service streams also seems to be the major alternative financing model, something that often comes about organically when functions are privatised or contracted out. This certainly could continue in any number of forms, ranging from small transaction charges collected by operators (similar to a securities excise tax idea where a very small flip tax, e.g. 0.001%, is collected by government), to unbundling of services into separate charges (perhaps with basic access offered for free and additional services offered as desired at extra cost, a simple example being HOT lanes that charge different prices at different times of day for uncongested travel while offering free travel on variably congested lanes all day long). Subsidiary streams that cost users nothing are another possibility (e.g. the Madrid Metro selling naming rights to line 2 and the Plaza de Sol stop to Vodafone). The drawback here is twofold: that the public regulator loses sight of the public interest and becomes more motivated by revenue collection and, related to this, that the revenue tail drives the policy dog, e.g. perverse incentives to create activity that earns money and drive it away from activity that does not even if the latter is better for society as a whole. Equity is also very important. It is quite possible to disenfranchise or disadvantage low income people and pricing models need to be designed to avoid this outcome. Finally, there is a social and reputational dimension to be considered: how 'public' is branded space felt to be? An interesting aspect of technology is the blurring of 'public' and 'private', something that has real implications for Public Private Partnership (PPP) delivery and design models. Right now traditional PPPs are between large public and private entities, generally. But now there is real potential for broad decentralised partnership with wide networks, individuals and small entities which may be more real-time demand responsive, and yet also efficient to manage through electronic platforms.

8.0 Conclusions

This paper covers a broad spectrum of the law and economics of transport regulation.

It is difficult to land on a set of conclusions which apply to all the issues covered, so we focus here on the highlights from the discussion of regulation, technology, and social change, and within that the five specific topics.

- The evolution of information and communication technology (ICT) is a key influence on transport and other sectors and the way they are regulated.
- New technology has expanded the scope for better transport pricing, enhanced competition, and increased transport privatisations within and across modes.
- The question *for a regulator* confronted by new technology or social change is whether new regulations needs to be introduced or whether current regulation can be adapted. This is part of decisions about regulating 'ahead of the curve'.

- Uncertainty about regulation is a key problem *for investors* in new technology. This is especially so when there are multiple regulators.
- Social marketing is increasingly being used in transport e.g. road safety campaigns, as well as in many other areas of government such as public health. The problematic issue (for social marketing, as for conventional regulation) is changing behaviour in ways which may not be aligned with their self-interest.
- Models or principles for funding regulation depend on the nature of the regulation. For example, 'user pays' might be efficient and equitable in the case of private good transport regulation. Taxpayer funding, or partial taxpayer funding, may be more appropriate for public good legal regulation.