

“Ethical Challenges and Professional Responses of Travel Demand Forecasters” - Review

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1. Introduction

P. Anthony Brinkman, a PhD candidate at the University of California, Berkeley, produced a very interesting dissertation on this issue in late 2003. The complete document can be downloaded from the UC archives at www.uctc.net/papers/diss106.pdf .

It is a fairly dense dissertation of nearly 200 pages, with much discussion and survey/interview data. Its density and length should not be allowed to detract from its interest as a good reminder of the pressure that can be placed on the people who make forecasts and the ethics that they must maintain. The following short review may make the findings more generally accessible.

In this review, the findings and views summarised are those of Anthony Brinkman and (except where clearly noted as comments) not of Kilsby Australia.

Brinkman's final paragraph includes the following observation:

If the forecasters assembled for this research are representative of the profession at large, the problem of biased forecasting has little to do with venality and ambition. Rather, it relates to unmet expectations and hidden opportunities to work constructively in alternate decision-making environments.

2. Bias in Travel Demand Forecasting

An extensive literature review looks at the writings of others on forecasting bias.

Brinkman makes the point that, apart from bias towards particular modal alternatives, even mode comparisons that over-predict travel demand equally across alternatives not only introduce bias, but increase the potential financial consequences for making the wrong choice.

By combining data from different studies, Brinkman produced Tables 1 and 2 comparing the outcomes of 229 individual projects. His definition of “high” (forecasts overstated demand significantly), “similar”, and “low” (forecasts understated demand significantly) are deliberately qualitative rather than quantitative. Note that in the evaluation procedures in the US, over-prediction of demand will favour more capital-intensive alternatives such as rail lines. Both rail

and highway projects are well represented in data from the US, while the much more copious European data relates mostly to highway projects (as in Table 3).

Table 1: Forecast Travel Demand to Demonstrated Demand by Mode

Source: Brinkman P24

Forecasts	Rail	Highway	ALL
High	26	61	87
Similar	6	86	92
Low	4	46	50
ALL	36	193	229

Table 2: Forecast Travel Demand to Demonstrated Demand by Location

Source: Brinkman P24

Forecasts	N America	Europe	Elsewhere	ALL
High	25	54	8	87
Similar	3	87	2	92
Low	5	45	0	50
ALL	33	186	10	229

Table 3: Project-Specific Travel Demand Forecast Evaluations

(Rail/Highway only)

Source: Brinkman p 41

	N America	Europe	Elsewhere	TOTAL
Rail	19	7	10	36
Highway	14	179	0	193
TOTAL	33	186	10	229

There appears to be little research on the accuracy of forecasts.

3. The Ethical Dimensions of Travel Demand Forecasting

A critical starting point for the study was the assumption that bias systematically pervades travel forecasts.

The notion that choices comprise no more than practical, purely logical or analytical acts uninfluenced by considerations of right and good, or that science or methodological sophistication can provide understanding from a universally valid and unbiased point of view, is dismissed as a “convenient fiction”.

After lengthy discussion of these issues Brinkman comments:

It is curious that the convenient fiction [of value-neutral expertise] persists even in fields such as planning where postmodern sensibilities have long prevailed. On the other hand, when one considers the fiction's capacity for maintaining power relations and providing a sense of control to both

professionals and laypersons, the question no longer seems difficult. Regardless of the answer, the convenient fiction serves to blind professionals, including modellers, to the ethical decisions they make everyday.

Further, the ethical cast of the decisions of modellers was emphasised because they affect the interests and well-being of individuals who depend on their expert advice – hence the modellers' power also implies duties and obligations owed to others.

Brinkman reminds us that:

... In essence, forecasters must not only resist pressures within their own agency or firm to accept a dated conception of practice, but also work against a social inertia, which at its most benign denies them the encouragement that can perhaps make the difference when the resolve to act ethically is lacking.

4. Theoretical Considerations

The objective of the research was to understand why, and to a lesser degree how, modellers (a) generate biased travel demand forecasts and (b) tolerate the misuse of their work. A secondary goal was to collect the data necessary to suggest practicable steps to reform.

Since corruption – deliberate and dishonest exploitation of power for personal gain – was a commonly offered explanation of biased forecasting, it was adopted as the null hypothesis (despite much experience and anecdotal evidence suggesting its rarity). It was compared to alternative working hypotheses, assuming modellers were *not* corrupt, of:

- *self-deception* – the process of holding two conflicting self-referential beliefs, with the more negative belief being less within awareness
- *role-singularity* – the tendency among modellers to accept the role of dispassionate technician to the exclusion of others, regardless of context
- *role-shizophrenia* – the covert acceptance of two conflicting role models: at some times dispassionate technician, at other times advocate for action.

In relation to role singularity, Brinkman is critical of professional education and of particular interest to engineers will be his comment that:

The training of modellers is deeply rooted in the tradition of positivism and, by most accounts, forecasters schooled as engineers are likely to graduate without ever being exposed to alternative concepts of knowledge and truth.

The three working hypotheses all maintain that bad decisions by honest modellers, and not technical deficiencies, are responsible for poor forecasting.

Comment: The null hypothesis is very unusual and suggests that Brinkman has something of an agenda. In formal statistical testing the null hypothesis is that there is no difference between two groups, that everything is standard etc. A better null hypothesis would be that there is no bias, with corruption one of the alternatives. Brinkman's null hypothesis is that modellers are corrupt - guilty until proven innocent!

5. Methodology

The researcher conducted a series of in-depth qualitative interviews with 29 professionals, following an initial mail survey of North American travel demand forecasters which produced nearly 1200 responses.

Comment: The findings of the latter should be treated with caution in Australia as the American responses were dominated by engineering and planning graduates (50% of the mail survey, and 60% of the interviewees had postgraduate degrees in engineering or planning). The pool of modellers in Australia is more limited and may have a different professional make-up. Many modelling practitioners were trained overseas. Anecdotally many modellers in Australia have a mathematical background, but only 2% of North American modellers had first degrees in mathematics.

6. Findings

The findings relate to the qualitative interviews with individuals rather than the mail survey, which was only used to give a profile of the profession and provide a sampling frame for the interviews.

Critical reflection about practice seemed generally to be lacking. Brinkman comments that most commonly, modellers seemed either not to recognise the concept of a public interest or responsibility to it, by repeatedly failing to include citizens in discourses with the interviewer about cliental matters (but it may be that this issue carries different importance in a North American cultural context than an Australian one).

Brinkman develops a typology for his interviewees, depending on two factors: the degree of professional satisfaction they derive from their work, and the extent to which they think anyone takes any notice of them. Brinkman classified his interviewees as either engaged, complacent or disillusioned, according to Table 4.

Table 4: Typology of Modellers' Practice Based on Individual Appraisal

Source: Brinkman P122

Professional Satisfaction	Impact on public decision making	
	High	Low
High	Engaged (5)	Complacent (9)
Low	-	Disillusioned (15)

Four of the five “engaged” modellers worked for public agencies, and the fifth was the principal of a relatively small firm with a prior history of public service. There were indications that “engaged” forecasters were more critical and thoughtful than others.

The largest group were classified as “disillusioned”. For them, reality failed to match their expectation that forecasts should form a rational model of decision making. In the broadest sense, the disillusioned were seeking what the engaged enjoy – relevance (4), impact (7) or both (4). Brinkman considered that a small group (4) seeking relevance were not even minimally qualified for the work they were doing.

The complacent modellers believed, like the disillusioned, that their work had little significant impact on policy making, but what sets this group apart is a collective lack of concern with this.

7. Analysis

Modellers may generate biased travel demand forecasts and tolerate the misuse of their work for a variety of reasons, on which the interviews shed some light. These reasons include:

- applying political spin
- off-model considerations, eg giving the “benefit of the doubt” to forecasts to help projects develop
- lack of sufficient resources (*“It is plausible that methodological shortcuts borne of expediency reflect personal prejudices and the data collected with scarce resources may be that which is least likely to invalidate favoured projects”*)
- silence when recognising bias and/or inferior forecasting by others
- circumscription of professional role inviting misuse of forecasts by others
- overselling the capacity of mathematical models to produce accurate and precise forecasts

Two external threats to ethical behaviour by modellers are political pressure, and indifference.

Some of the modellers reported receiving at least some political pressure from management, clients or decision makers to provide forecasts that supported

favoured projects, and “it doesn’t take much imagination to see how this dynamic threatens ethical work”.

Indifference, or potential indifference, influences modellers in various ways:

- It encourages analysts to hide, or at least not acknowledge, the uncertainty of their forecasts
- The threat of indifference may persuade modellers to remain silent when they encounter poor forecasting or would prefer a different use of their own numbers.

Two internal threats, potentially more intractable, are mode bias and positivism.

Mode bias usually affects transit, which is sometimes given the benefit of favourable assumptions or even uncritically promoted over other modes. Bias to highways was not evident. In the literature review several commentators had noted an implicit bias in favour of transit systems: *“This is not to say that transit is an effective way of serving all these objectives [six of which were cited], but simply that it was widely believed to be so”*.

A positivist orientation – sometimes referred to in the US as “black-boxing” - will discount the role of professional judgement in forecasting and exclude qualitative considerations, which may have the same (or more) explanatory power as those that are gauged numerically.

For the archetypes emerging from the survey, Brinkman comments that:

- Engagement makes it easier for modellers to do the good and right thing because it removes the greatest disincentive for acting ethically – diminished credibility.
- For disillusioned modellers, influence-seeking forecasters (unlike relevance-seeking ones) experienced varying degrees of political pressure to bias the results of their analyses. The greatest threat to ethical forecasting by the disillusioned was seen as the various mechanisms they adopt to cope with their disillusionment to preserve self-esteem. This picture requires some sort of measured response.
- The complacent modellers are more of a problem because, in neither claiming nor seeking influence on policy, they are free to practice without concern for issues of right or good. Their main motivation for continuing could be material reward or technical inspiration.

There is much to recommend role-singularity and self-deception as explanations for forecasting bias. The hypotheses of role-shizophrenia and corruption (the null hypothesis) have little to support them and can probably be safely abandoned.

Comment: This is a North American verdict on the North American situation.

8. Summary and Recommendations

Extracts from Brinkman's summary encapsulate the findings:

Engaged forecasters are unique for their demonstrated belief that what they do has an important impact on policy decisions ... Organisational leadership and long-term reputation are key for establishing and maintaining engagement as the centrepiece of practice in some agencies and firms.

By far the largest group of modellers are .. disillusioned ... a few fight, some take flight and the rest find ways to cope ... In essence, they [coping disillusioned modellers] "cave" to reduce the pressure of politics and the weight of indifference, albeit only temporarily.

Like the disillusioned, complacent modellers too believe that their work has little significant impact on policy making ... Put most simply, the disillusioned wish not to see that they do not matter and the complacent that they do. ... What is most troubling about the complacent modellers is not their detachment. Rather, it is their lack of disillusion that is so disconcerting.

...The data provide very little to suggest that modellers as a group are corrupt.

Brinkman makes two principal recommendations:

There should be a concerted effort to develop and require design professionals to complete a rigorous curriculum on professional ethics.

Institutions of practice need to be created to promote and sustain inspired leadership in both the public and private realms of transportation planning.

He raises two issues in particular that he considers to merit further consideration.

Relying on the methodologies of psychology, it may be possible to achieve a more complete understanding of how self-esteem dictates professional behaviour.

What explains individual responses to disillusionment? ... A labour-union-type role for professional organisations might be more attractive to modellers [than other ways of encouraging the fight response] and more effective for ameliorating the dysfunctions of practice.

9. Commentary

The preceding account has been a summary of Brinkman's dissertation. We conclude with some comments of our own.

The thesis assumes that the reasons for bias are not technical, and it does not address technical aspects of forecasting. Its perspective is that forecasts are consistently biased, and therefore the people who produce them are deliberately distorting the truth.

Technical limitations of modelling are still a matter of public and professional debate in Australia, and most practitioners believe that the quality of their forecasts will increase over time as continuing technical deficiencies are remedied. Brinkman might dismiss this as an "excuse" but it may be a better explanation for any bias than that the modellers are crooks or do not know what they are doing.

The dissertation was based on a survey of and interviews with North American, mainly US, practitioners. A similar exercise in Australia might not produce the same findings, because of:

- our different cultural background
- our different institutional structures
- our different transport policies
- lower resources devoted to planning in general and modelling in particular, requiring more ingenuity and innovation than in US
- the different composition of our modelling pool
- the relatively strong influence in Australia of British rather than American modelling practice

The basis of transport modelling was developed in the United States in the 1960's, and models conforming to the basic "four-step" modelling structure have been developed and applied all over the world. This is not to say that they are all the same.

Mode shares to public transport are much higher in Britain than they are in North America. British modelling practice displays much more experience and interest in estimating demand levels for public transport both in isolation and in a multi-modal context.

Australian cities are less car-dependent than North American ones, though more so than British/European cities. Thanks partly to the influence of this British experience, and also to the absence of federal largesse as a prize for the most optimistic forecasts, Britain/Europe tends to produce more realistic forecasts for transport projects than those reviewed by Brinkman for North America.

Significantly, Table 2 showed a greater proportion of "similar to observed" forecasts for Europe (47%) than for North America (9%).

The habit of both public and private sector clients of requiring modellers to sign legally enforceable confidentiality agreements before modelling commences might inhibit investigation here.

A strong message that emerges from Brinkman's work is that the more engaged modellers there are, the better off society is.

As in North America, modelling in Australia is little understood beyond the circles of the initiated and the results are usually viewed by decision-makers with some suspicion.

The difficulty of assessment of the quality of demand forecasts has long been recognized as a barrier to credibility in Australia. The UK in particular is more advanced in this respect than we are.

There is a lack of "Practice Manuals" or "standard guidelines" for modellers in Australia. (In contrast, the UK has quite extensive practice manuals already). Without such professionally endorsed standards and practices, quality assurance for modelling forecasts becomes impossible. Hence the establishment of both standards for practice and reporting/checking procedures are essential precursors to adequate quality assurance.

Another issue is the lack of range (confidence intervals) often attached to forecasts, with a resultant obsession with comparing single forecast numbers. Remedying this could be incorporated in any "practice guidelines" developed as above.

Brinkman noted "There appears to be little research on the accuracy of forecasts". This is true in Australia also. One inquiry (the Advisory Committee on the relocation of the Hume Freeway between Craigieburn and the Metropolitan Ring Road) said in 1999:

A common feature of many environmental assessments is the doubt which submitters seek to cast on the reliability and accuracy of traffic forecasts. In the light of the importance placed on traffic volumes by VicRoads ... the Committee finds it surprising that so little attention is apparently paid by VicRoads to monitoring the outcomes of its traffic predictions.

(VicRoads is the state road planning agency in this case, but the point is a general one). An *ex-post* investigation into the accuracy of forecasts made in Australia 10-20 years ago would be a significant addition to our understanding of forecasting bias, if any.

There seems to be a *prima facie* case in Australia for an independent professional organisation to take up the issues of training and general credibility of modellers that Brinkman raises, and quality assurance for modelling. This would improve both professional standards and the potential policy impact of modelling, the two factors whose poor state Brinkman identified as leading to disillusionment and complacency in North America.

References

Brinkman, P Anthony, 2003, *The Ethical Challenges and Professional Responses of Travel Demand Forecasters*, Dissertation submitted in partial satisfaction of the requirements for the degree of Doctor of Philosophy from the University of California, Berkeley.

Advisory Committee on the relocation of the Hume Freeway between Craigieburn and the Metropolitan Ring Road, 1999, *Report*