The Role of Expertise in Policy Development: Towards a de-carbonized British Road Transport Infrastructure

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Abstract: Boundedly rational policy specialists simultaneously interact, learn and adapt their behaviour and the rules that guide them. Collective structures and norms incrementally change along the way. The research presented in this paper further investigates the possibility of a reciprocal causal relationship between the emergence of policy specialists' generic understanding of a decision situation and the development of collective structures from a realist perspective. Of particular interest is how expertise on techno-scientific and ecological issues enters into and influences this process. The Advocacy Coalition Framework (ACF) guides the investigation. The ACF describes the ways in which fundamental policy core beliefs concerning strategies to deliver ontological axioms could lead to conflict, coordination and collective action. Furthermore the ACF explains how perturbations external to the system, and learning processes within the system, might change how individuals with an interest in the policy area perceive a decision situation and possibly alter the relations between them. The empirical work in this investigation develops on Dudley and Richardson's ACF-based study of British road transport policy. Their study described the links between policy-oriented learning and change towards a more sustainable approach to road transport in the 1990s. This investigation is a longitudinal, record-based, micro-level study into how policy specialists, who share a common interest in the case, exchanged, utilized and readjusted their expertise over the period between January 1988 and December 2011. Social network analysis was used to identify case relevant specialists and the relational structure between them. The method to transcribe their policy core beliefs from archival records follows Axelrod (1976). Citations made verbally during policy development were recorded, to map and closely examine cases in which one individual evidently influenced the expertise of another.

1. Introduction

The car is the bedrock of our society. This remains the case despite the introduction of several land-use and transport-engineering measures intended to reduce the need for travel and promote sustainable modes of transport. Nowadays, policymakers across Europe face a complex challenge. On the one hand policymakers are expected to deliver economic growth and facilitate the growing demand for road space, yet at the same time they are expected to find ways to meet emission reduction targets at minimal cost to the taxpayers and energy consumers.

The case of British road transport policy reveals the complexity of the policy problem at hand: those involved in delivering the required policies do not know how to judge the likelihood of various outcomes in the context of an economic recession, nor do they know how society and markets will respond to new policy measures. Policymakers seem to be divided over the issue of what constitutes the policy problem, consequently there is little agreement over the most suitable solutions to the problem. One group of organisations appears to believe that low carbon surface transport needs to be facilitated to tackle climate change. However, other groups call for traffic regulation and modal integration as the preferred means by which to reduce congestion on the UK's roads as well as the carbon footprint of surface transport. Both groups seem to have access to evidence that supports their claims.

Furthermore, the situation appears to be in a continuous state of change: all actors involved seem to simultaneously interact, develop their knowledge and skills (referred to in this paper also as 'expertise') and adapt their behaviour and the rules that guide them; while collective structures and norms change incrementally along the way.

There is not yet sufficient empirical evidence to verify any single scientific argument that attempts to describe and explain individual decision making processes in complex decision situations (such as the one described above).

This paper summarizes some findings from a doctoral thesis that synthesizes widely recognised theories of the mind as well as complex human systems and investigates how these apply to British road transport policy. In particular the following questions are central to this discussion:

> *How do policy specialists involved in British road transport policy understand the decision situation?*
>
> *What are the factors that could potentially influence the development of this knowledge?*
>
> *How could new knowledge impact the policy process?*

2. Theory and the Problem of Complex Adaptive Systems

Based on the available evidence, neuroscientists and cognitive psychologists have constructed a preliminary portrait of the mind, which describes the ability to reason rationally as necessarily bounded by the limits of the neural architecture (cf. Gilovich 1991: 9-49, Kahnemann 2011); detailing Barnard's observation that individuals often do not make deliberate choices, but rely on intuitive responses (Barnard 1938: 302-305).

Simon (1957, 1983) drew two important conclusions from this, and these have informed most policy analysis research and practice that exists today. Firstly, he recognises the limits of human intellectual capacities (memory, attention, processing) and highlights that mental structures evolve in context of social and cultural changes and thus can enable but also constrain our ability to reason rationally. Secondly, Simon highlights contextual factors that influence the availability of information with potential to further develop the expertise that would be required to fully understand a given situation. Both of these factors are said to constrain rational reasoning, and therefore the ability to produce the best possible outcome (cf. Simon 1983: 23-29, Simon 1985: 19, Simon 1987: 301). In recent history, there has been an accumulation of experimental research around this issue, and this has provided evidence that specifies causes and possible consequences of these limitations (cf. Kahneman 2011, Goldstein & Gigerenzer 2002).

Theorists have also started to recognise that when a set of boundedly rational individuals simultaneously interact, learn and adapt their behaviour and the rules that guide them, collective structures and norms change incrementally (cf. Lindblom 1959: 79-88, Olson 1965: 53-65, Axelrod 1979: 44-68). The concept of

'emergence' has formed the intellectual core of the more recent literature describing complex adaptive systems. It suggests that overall behaviour cannot be obtained by simply aggregating the behaviour of individuals in a static and isolated setting (cf. Holland 1998: 225-231, Mayntz 2011: 156-186). The discussion has provoked a greater awareness amongst policy analysts of the complex inter-relationship between an individual's understanding of a given decision situation and the attributes of the situation itself.

So far there have only been a few attempts made by policy analysts to explain and establish the existence of this reciprocal relationship in the context of policy making. Schlager's recent review of existing policy process theories found the Advocacy Coalition Framework (ACF) and the Institutional Analysis Development framework (IAD) to be the most comprehensive (cf. Schlager 2007: 293-317). The key difference between the ACF and the IAD frameworks are the assumptions they make about which factors constrain or enable learning and coordinating behaviour (e.g. exchange of knowledge) in the context of influencing governmental policy and the achievement of common goals. In the context where we assume a situation is too complex for individuals' cognitive capacity; the IAD framework simplifies the analysis of individual choice by focusing on fixed preferences, and assuming that policy specialists use each others' expertise instrumentally (logically-rational opposed to value-rational), whereas the ACF does not. Compared with the IAD, the ACF recognises the emergent nature of knowledge. Where the IAD framework would predict non-cooperative behaviour unless new institutional or structural norms emerge, the ACF predicts cooperation based on shared experience (manifested in a person's mind as a three layer belief system), but also mediated by existing structures and external parameters. The ACF best explains preference changes in complex conflict situations that stretch over a decade or more, whilst the IAD framework model of reasoning works well in more comprehensible situations with stable values (since it has not been designed to explain such changes). In this sense, neither the IAD nor the ACF can be regarded as the one universal explanatory framework that is suitable for every circumstance.

The ACF was selected to guide the research that is presented her, since this framework is best suited to describe uncertain decision situations like the case of British trunk road policy.

3. ACF Research Programme and the Problem of Revisions

The ACF research programme is associated with Paul Sabatier, Hank Jenkins-Smith and more recently Christopher Weible. In contrast to the IAD framework, it assigns more explanatory weight to the effects of inherited beliefs when explaining how people interact, learn and adapt their behaviour. It builds on the literature on policy implementation (Sabatier & Mazmanian 1983, Pressman & Wildavsky 1973) and the role of knowledge in public policy (Weiss 1977). Furthermore it draws on Heclo's work (1974), a synthesis of Putnam's (1976) review of the normative and cognitive orientations of political elites, Axelrod's (1976) work on intuitive judgments, an adaptation of Lakatos' (1971) distinction

between 'core' and other elements of scientific belief systems, and Converse's (1964) contention that abstract political beliefs are more resistant to change than specific ones (Sabatier 1988: 144). Sabatier and Jenkins-Smith (1993) adapt Simon's bounded rationality model, but do not focus primarily on the structure of the situation.

The ACF explains the ways in which shared policy beliefs can lead to conflict, or coordination and collective action. Furthermore it explains how perturbations external to the system and policy oriented learning within the system might change beliefs and as such subsystem structure: The 1993 revision of the framework basically assumes that most policy making occurs amongst specialists within a policy subsystem. It rejects the rational choice individual, but assumes actors within a subsystem are affected by systemic rules as well as the desire to improve the current status. Specialists within such a subsystem can be aggregated to advocacy coalitions each connected or separated from another on the basis of common beliefs, especially policy beliefs (normative). Ontological (deep core beliefs) and instrumental (secondary aspects of belief systems) are also identified as relevant in explaining stability or change. Policy beliefs are seen to be most relevant. Here the framework draws on Putnam's work from 1976 (Putnam 1976: 81-89).

The following factors are said to influence a belief system structure and therefore influence policy decisions: policy-oriented learning, stable exogenous factors that rarely change (e.g. fundamental socio-cultural values) and dynamic external factors (e.g. changes in socio-economic conditions): "...learning comprises, however, only one of the forces affecting policy change over time. In addition to this cognitive activity, there is a real world that changes (...) Changes in relevant socio-economic conditions and system-wide governing coalitions ... can dramatically alter the composition and the resources of various advocacy coalitions and thus the policy decisions at the collective choice and operational levels." (Sabatier & Jenkins-Smith 1993: 19) It was only recently, in the 2007 revision of the framework, that ACF theorists added 'political opportunity structure' to the list of contextual variables that was initially drawn from Hofferbert (1974). The revision now considers the degree of consensus needed for major policy change and the openness of the political system. (Sabatier & Weible 2007: 199-201) It's generally claimed that understanding the process of change requires a perspective time period of a decade or more.

2.1. Prospect for Development

Since the framework was first published, Sabatier and other proponents of the ACF have addressed its theoretical shortcomings; in particular issues around the model of the individual. Schlager observes that "much of the elaboration of the theory of the individual in the ACF" in recent years has been the result of her "explicit comparisons of the IAD and the ACF" (Schlager 2007: 330).

Indeed, her theoretical elaborations and the empirical work that followed appear to go hand in hand, since academics working in a range of fields decided to focus their investigation on how structural aspects influence the behaviour of the

individual. These accounts often challenge the concept of the ACF actor from an institutional analysis perspective. This perspective does not acknowledge the emergent nature of an individual actor's knowledge of a decision situation, instead studies that adopt this perspective seem to accept individualistic notions that over-emphasise an actor's contextual constraints when considering limits of rational reasoning. This discrepancy presents a potential risk to the maintenance of the framework's theoretical coherence over time (a decade or more).

The intention of this discussion is not to claim existing research findings cannot inform ACF revisions, but rather that the researchers risk moving the framework away from the systemic notion that acknowledges the co-evolution of a person's mind and its context.

4. Structure, beliefs and the utilisation of expertise: Three Hypothesizes

The question that deserves more attention is to what extent does structure influence the decision to utilize the other's expertise and how does it compare to the influence the actors' attributes have? None of the reviewed ACF studies seem to have looked at this question in further detail; although it may provide new insights about how expertise enters and consequently influences the policy process.

Three propositions emerged from the discussion; these may be used to further investigate the extent to which in particular relational proximity and shared policy core beliefs influence the use of expertise in policy development, in the absence of clearly evident external drivers that could distort research findings (for example a crisis event like the 9/11 attacks in the United States or the Chernobyl disaster in the former Soviet Union) :

(1) *An individual's decision to use the expertise of another depends on whether or not these two individuals share policy core beliefs.* This relates to the ACF's core assumption that the decision to utilise information is influenced primarily by policy beliefs.

(2) *An individual's decision to use the expertise of another depends on the relational structure between these two individuals.* By definition, a sub-system consists of a set of policy specialists and the relationships between them; for instance, friendship and trust relationships or connections used to exchange knowledge. This investigation is particularly interested in the latter type of relationship. The rationale for this proposition is derived from the recent discussion concerning the role of strong coordination (joint activities) that recognises relational proximity as a factor that influences what information is directly or indirectly available to policy specialists.

(3) *Shared policy core beliefs and relational structure jointly influence an individuals' decision to use the expertise of another.* From the research utilisation literature (cf. Weiss 1979), that informed the development of the ACF, three premises emerge which are central to the discussion:

Political Use: Political use of expertise is expected to inform cognitive and structural stability. In this instance experience of someone who shares the same policy core beliefs is likely to be considered, whereas evidence that contradicts a policy specialist's cause-effect understanding of an ambiguous situation isn't. The ACF proposes that knowledge exchange between two specialists with divergent policy core beliefs (cross-coalition learning) and learning is least likely to occur where discussions focus on the policy core level or when the level of conflict between coalitions is high. In such situations learning between specialists with convergent beliefs (within coalition learning) is more likely, resulting in policy stability.

Instrumental Use: Instrumental use of another's expertise is only expected to occur when a directly connected pair that shares a strong knowledge transfer relationship (e.g. individuals met) has reached a compatible understanding of the situation. This logical-rational use of information is more associated with cognitive changes and changing structures for it has the potential to trigger perceptual and thus behavioural changes. The ACF proposes that cross-coalition learning is more likely to occur when there is an incentive to negotiate seriously (i.e. a "hurting stalemate"), the level of conflict is low, or the issue at hand is narrow in scope and traceable. Here, specialists that have been accepted in the role of neutral brokers are expected to be in the position to facilitate a logical-rational debate between members with opposing policy core beliefs. Cross-coalition knowledge exchange could inform perceptual changes and consequently policy change.

Enlightenment: Any direct effects are assumed to be rare. More likely is the indirect and unintended impact of distorted evidence (e.g. individuals monitor the debate (weak knowledge transfer) and learn from the observed unintentionally). The ACF proposes that divergent information could alter the perception of few policy brokers who have the potential to facilitate learning in the long-run. Where this results in stability, the use of each other's expertise is probably political. Enlightenment and change is assumed to follow from exposure to divergent expertise concerning policy core beliefs.

Table 1. Micro-level transfer and use of expertise in policy development

POLICY SPECIALIST	POLICY SUBSYSTEM (Knowledge transfer relations)	
	Strong KT-Relations	*Weak KT-Relations*
Convergent Policy Core Belief	Political	
Divergent Policy Core Belief	Instrumental	Enlightenment

5. British Trunk Road Policy

The remainder of this discussion will look for empirical evidence of these hypothesises in an empirical study of actors in the policy subsystem concerned with recent British trunk road policy. Studies of the case have so far implied that in the period after 1988 trunk road policy in Britain was highly contested with individuals utilizing confirmative expertise to add weight to their arguments and attract support. The researchers suggest the existence of two advocacy coalitions; the one groups consists of actors who advocate traffic regulation (the "environmental lobby" advocating "new realism"), and the other group consists of actors who support traffic facilitation (the "road lobby" advocating "predict and provide"). While the "road lobby" was found to have essentially dominated transport policy since the 1950s, the situation shifted slowly in favour of the "environmental lobby" in the 1990s.

Table 2. A comparison of two advocacy coalitions in British road transport policy 1988 - 2000

Particulars	Advocacy Coalition identified by prior research	
	Road Lobby	*Environmental Lobby*
Membership	For instance, representatives of British Road Foundation, Automobile Association, Royal Automobile Club, Freight Transport Association etc.	For instance, representatives of Friends of the Earth, Transport 2000, Alarm UK, Campaign for the Protection of Rural England etc.
Policy Core Beliefs	Predict and Provide	New Realism
Objectives	The so called 'predict and provide' attitude is regarded as a concept that 'encapsulated a distinct approach to transport policy which prioritised the use of the private car and signalled a predisposition to provide additional road capacity in preference to alternative transport options.	The notion of 'new realism' was coined by Goodwin, Hallett and Kenny (1991) in their report *´Transport: The New Realism´*. This area of the discussion focuses on traffic management through a variety of measures, including an increase of alternative travel options, rather than the facilitation of traffic growth.

It seems the gradual decline in support for 'predict and provide' ideas in policy making and the rise of a 'new realism' era in British trunk road policy can be observed in four stages: The '*Roads for Prosperity*' White paper and the asymmetric support for 'predict and provide' ideas between 1988 and 1992 constitute the first phase. The second phase is characterised by an increasing symmetry of support between 'predict and provide' and 'new realism' following the publication of the RECP and SACTRA research reports and a slowing down of the economy. This phase started in 1993 and may be said to have ended around the time when Labour took office in 1997 (Dudley & Richardson 2000). The publication of the '*New Deal for Transport*' White paper in 1998 marked the start of a new phase, in which support was asymmetrically distributed in favour of 'new realism'. Theorists argue that this phase ended in 2004 with the '*Transport for the Future*' White Paper that is partially seen as a response to the 2000 fuel protests; indicating that society at large did not fully support 'new realism' and was willing to oppose the government on controversial issues, such as road user charging (Parkhurst & Dudley 2008, Dudley & Chatterjee 2012); this resulted in an increase in ambivalent statements on both sites, although support for "new realism" still dominated the policy discourse.

None of the studies mentioned above systematically investigates perceptual change on a micro level or empirically describes the properties of the relationships (e.g. knowledge transfer) between individual actors involved in British trunk road policy: While Dudley and Richardson rely on a combined approach (policy documents and stakeholder interviews) to identify ideas that are said to have influenced the policy process (Dudley & Richardson 2000), the latter studies rely solely on the analysis of policy documents to describe how these specific ideas have been translated into practice.

The purpose of the empirical study of British trunk road policy presented here is to identify and examine cases in which individual policy specialists transferred and used another's expertise in the absence of external pressure. The study covers the period between January 1988 and December 2011. In this investigation "use of expertise" is the dependent variable and "relational structure" and "shared beliefs" are the independent variables. The unit of observation is the individual and not the organisation with which the individual is affiliated; the policy subsystem constitutes the unit of analysis, which is defined as a set of individuals who regularly seek to influence British trunk road policy.

The first independent variable, relational structure, measures not only who is a member of the subsystem, but also how each member is connected to the other. Here, the researcher differentiates in particular between strong and weak knowledge transfer relations. 'Weak relations' describe situations in which individuals express an interest in British road transport policy and are thus expected to monitor each other's behaviour. 'Strong relations' describe connections between two individuals who evidently interacted face-to-face. Although weak relationships are central to the theoretical consistency of the ACF (Zafonte & Sabatier 1998: 479-480), recent theoretical developments have highlighted the need to understand the role of strong patterns of coordination in policy making (for example, when policymakers directly engage with consultants and adjust their strategy according to the evidence given).

The second independent variable, shared beliefs, investigates subsystem members' policy core beliefs; defined as "fundamental policy positions concerning the basic strategies for achieving normative axioms of deep core, and specifically apply to the policy area of interest" (Sabatier 1988: 145, Sabatier & Jenkins-Smith 1999: 133).

Compared to the two independent variables, the dependent variable (use of expertise) has not been clearly defined in the ACF literature. Considering the limited knowledge of the reasoning process, this work does not attempt to describe the actual use of information. Instead, the aim of the investigation is to capture empirically observable indications that members have utilized another's expertise. This expertise may be used to directly confirm ("political use") or readjust ("instrumental use") their understanding of cause and effect, or it could be to adopt divergent knowledge over a long period of time ("enlightenment"). Therefore, the empirical investigation of the variable will measure cases in which one subsystem member (citer) cites another member (cited).

5.1. Database

Data collection focused on the meetings of the Commons Transport Select Committee (CTSC), during the period between 1988 and 2011. The meetings considered in this study must have addressed at least one of the following topics: national road finance & expenditure, national road review & programme appraisal techniques (i.e. traffic forecast, economic impact assessment, environmental impact assessment), traffic management in general (i.e. modal integration, taxation, planning), technological advances (i.e. low carbon cars, road user charge), public opinion (i.e. road protests); since activities in these areas immediately relate to changes in the subsystem environment (e.g. socio-economic or climate change).

The data presented here was derived from the records of oral evidence given to the CTSC between January 1988 and December 2011. Appendix A outlines the coding rules used to extract the data from these records.

The study used social network analysis to identify and map case relevant specialists and the knowledge transfer relationships between them.

In order to define the policy core positions for each pair that shares either strong or weak relations, the content of all statements taking place at these occasions was analyzed. The method to transcribe core assertions from archival records follows Axelrod (1976). Social network analysis was then used to identify and map pairs of individuals, who shared a policy core belief related to a cause-effect understanding. Data for each individual in the network was collected for five policy core belief categories: unconditional and conditional 'new realism', 'diplomatic middle' (brokerage) and unconditional and conditional 'predict and provide', but inter-coder reliability tests suggests that data analysis should be based on the three main categories 'new realism', 'diplomatic middle' and 'predict and provide'.

Citations made verbally during CTSC discussions were recorded for each divergent and convergent pair in the sample, to identify cases in which one evidently utilized the expertise of another; duplications were ignored when stated by the same individual at the same moment in time. For each citation data was collected for three categories of attribute data: personal observation, narrative and research. The first denotes all cases in which the citer is the primary source of information; the latter includes cases in which the citer cites an external source.

For each individual in the dataset the researcher also collected attribute data, in particular his or her functional role at the meetings. For example they may be witnesses (whose role would be to deliver information), or they may be members of the committee (in which case their role may be that of an inquirer or chairman). Social network analysis was then used to identify and map pairs of witnesses, pairs of committee members and mixed pairs.

5.2. Sample

The research identified 371 individuals who in 570 cases stated a reference clearly and in which the researcher was able to also measure a) whether the pair shared concurrent or divergent beliefs at the time when one cited the other as well as b) determine the strength of the relationship the pair had maintained during the case study period up to the point when one utilized the expertise of the other. The majority of individuals in the sample are witnesses (54%), the remaining 46% were committee members (inquirers (43%) and chairmen (3%)).

5.3. Analysis & Findings

Relational structure and shared beliefs are the independent variables and the number of citations made is the dependent variable; all three are categorical variables. The categorical nature of the data suggests common Frequency and Chi-Square test are employed to establish whether there is a significant difference between the presence or absence of either strong ties and citation; whether such difference can be established between concurrent or divergent pairs (citer-citer pair sharing or not sharing policy core beliefs); and whether there is a relationship between belief concurrence or divergence and strong or weak knowledge transfer relationships. The difference is considered significant only if the probability that there is a difference is higher than 95%.

The research outputs presented here were disseminated amongst academics, journalists and civil servants who have closely monitored the case since 1988. Four ninety-minute sessions (one session per person) have taken place in spring/ summer 2012. The feedback confirmed the validity of the methodological approach as well as the findings.

Number of citer-cited pairs connected through strong KT relationships

The research findings suggests that on average, citers tended to reference individuals whom they had met prior to when the citation was made; while only a handful of individuals cite sources for which no strong connection was evident.

More precisely, in only 2.3% (n= 13) of the cases in the sample was there no record that the citer and the cited had met prior to when a citation was made; however there was reason to believe that both had engaged in weak sub-system interactions (for example monitoring the other's press releases) up to this point (including the meeting at which the citation was made) due to their shared interest in the case at the time. This sample includes twenty-one witnesses and nine committee members who made a reference in the past ten years and primarily cited research-based evidence.

In contrast, a total of 557 cases (94.7%) could be identified in which citer and cited had been observed to maintain a strong connection (in the sense that both attended the same CTSC session): Of the citers, 316 were witnesses compared to 224 committee members.

Of course, 526 of these cases involved self-references; for the purpose of this research, the act of consulting one's own memory is rated as a situation in which the person maintained a strong and directed link to the knowledge source. A citer referred to someone they met at these sessions in only thirty-one cases. Compared to the thirteen cases in which the citer and the cited had not met prior to citation, in these thirty-one cases individuals primarily referred to narrative based evidence (n= 21); research-based evidence (n= 8) was least popular among the citers in this sample. Throughout the case study period a greater number of witnesses than committee members cited a reference or were cited as a reference; this tendency can probably be attributed to the code of conduct that requires witnesses to give evidence and committee members to receive evidence.

The data suggests that there is possibly a significant difference between strong and weak knowledge transfer relationships and citations, and that the null hypothesis may be rejected for the first proposition with regards to the sample population.

Number of citer-cited pairs sharing policy core beliefs

The results also suggest that on average, citers tend to reference individuals that had expressed concurrent policy core beliefs shortly before a reference was made; while only a handful of individuals cited sources with divergent positions:

The analysis identified twenty-four cases (4.2%) in which individuals utilized the expertise of someone who had, up to ten years prior, primarily advocated policy core assertions that challenged the position advocated by the citer, at the meeting when the citation was made. The longitudinal analysis of this data shows that these cases are located on either end of the time scale, although the majority of cases were observed in the past ten years; at the time when the media in UK covered research addressing cause and effect of climate change (e.g. Stern report).

In the majority of these cases (n= 12) the citer was recorded to have advocated 'new realism'; equally referring to narrative and research-based evidence. In only eight cases had the citer expressed ambivalent policy core beliefs and displayed a moderate bias towards citing narrative-based evidence. The remaining four individuals advocated 'predict and provide' principles; and primarily referred to research-based evidence.

In 546 cases (95.8%), the citer and the cited were observed to share concurrent policy core beliefs; compared to divergent pairs, the number of convergent citations was more equally distributed across the time scale. As before, self-references (n= 526) are included in the analysis, since they are evidence that the citer relied on confirmative information. Strongly represented within the sample of individuals that state personal observations are advocates of 'new realism' (n=226), followed by those with ambivalent policy core positions (n=159) and those supporting 'predict and provide' principles (n= 141).

In only twenty cases were the citer and the cited not the same person. Here, a moderate bias towards narrative-based evidence (n= 12) was observed; in the majority of cases cited by advocates of either "new realism" or ambivalent positions.

The results support the claim that there is possibly a significant difference between concurrent and divergent policy core beliefs, and that the null hypothesis may be rejected for the second proposition with regards to the sample population.

Association between Shared Beliefs x Relational Proximity

A Pearson Correlation test for these two categorical variables reveals that there is in fact a weak (Phi = 0.57) but significant ($p < 0.01$) association between a pairs' belief concurrence and whether one cites a person whom they had met before.

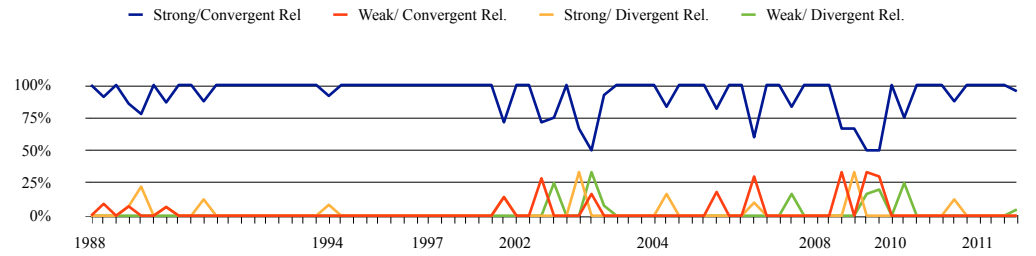
The combined effect of both independent variables on the decision to utilize expertise is considerably higher than the single effect of either relational proximity or shared beliefs: Individuals who have met at least once were most likely to also have concurrent policy core beliefs (adj. res. = 13.2); while individuals who have not met before were more likely to have divergent policy core beliefs (adj. res- = 13.2).

In approximately 95.3% of cases in which citer and cited had met at least once before making the citation, they also shared policy core beliefs; compared to 1.8% of cases, in which individuals utilized the expertise of other subsystem members whom they had not met before and with whom they did not share policy core beliefs. Approximately 0.5% of cases involved individuals who did not meet but shared the policy core beliefs of the individual they cited; compared to 2.5% of cases in which individuals had met but did not share policy core beliefs with the individual they cited.

Table 3. Cross-tabulation of independent variables associated with citation

			Knowledge Transfer Relationships		Total
			Weak	*Strong*	
Policy Core Beliefs	*Concurrent*	Count	3	543	546
		% within row	.5%	99.5%	100.0%
		% within column	23.1%	97.5%	95.8%
		% of Total	.5%	95.3%	95.8%
		Adjusted Residual	-13.2	13.2	
	Divergent	Count	10	14	24
		% within row	41.7%	58.3%	100.0%
		% within column	76.9%	2.5%	4.2%
		% of Total	1.8%	2.5%	4.2%
		Adjusted Residual	13.2	-13.2	
Total		Count	13	557	570
		% within row	2.3%	97.7%	100.0%
		% within column	100.0%	100.0%	100.0%
		% of Total	2.3%	97.7%	100.0%

Figure 1. Proportion of citer-cited relationship broken down by CTSC session



Thus, for the sample population one can conclude that strong knowledge transfer relationships and shared beliefs influenced a policy specialist's decision to utilize expertise more than weak relationships and divergent beliefs.

Further tests suggest that no significant association ($p > 0.05$) is likely between a citer's policy core position and the type of use of expertise. Also, the observed effect seems to apply to committee members and witnesses alike; since no significant relationship ($p > 0.05$) was observed between a citer's functional role and the type of use of expertise.

Discussion

The research presented here implies the existence of two advocacy coalitions in British road transport policy (January 1988 to December 2011): One supporting "new realism" and another that advocates "predict & provide" ideas. This confirms prior observations of the case, which highlight that policy specialists within the policy subsystem do not share a common understanding of the decision situation (Dudley & Richardson 2000).

Outputs of the micro-level analysis confirm the simultaneous existence of all three types of use of expertise throughout the case study period; indicating a reciprocal but not consistent causal relationship between citation, shared beliefs and relational structure: The results highlight a significant tendency towards informed stability within the sample population (n= 371), which also confirms outputs from case related research that Dudley and Richardson conducted in the 1990s. In addition, this research found that regardless of their policy core belief, policy specialists, witnesses and committee members were alike in the sense that they were most likely to cite their own experiences, and/or confirmative expertise that were generally available in the public realm. However, they were least likely to cite others who did not share their understanding of the decision situation; especially when no strong knowledge transfer relationship was evident. This observed reliance on confirmative information suggests that individuals in the observed population tended towards the political use of information; behaviour that is expected to result in cognitive stability as well as structural stability and consequently policy stability.

Thus the data confirms the temporal dimension of knowledge (individuals interpret what they hear, see or read by comparing it to past experiences), but also the possibility that policy oriented learning may be biased towards information that is readily available and can easily be matched to past experiences. In deed, according to Kahneman and Tversky, the observed behaviour is particularly likely in uncertain situations. These are situations in which individuals do not have complete information about what constitutes the cause of a given policy problem or the best solution to that problem, nor they have the time to deliberate carefully about the best possible response. The researchers identified several judgmental errors that may arise in such situations; the ease with which individuals can recall information (availability heuristic) is one of them. Kahneman and Tversky also highlighted 'memorability' and 'frequency' as two factors that influence what information is available, since frequently occurring events and dramatic events are both more easily recalled.

The findings reported here point to possible associations between perceptual stability and environmental factors in the case study. An analysis of the content of personal observations quoted highlights in particular, a) an increase of confirmative information available through various multimedia sources; and b) convenient and frequent access to information about local road networks. Hence it is possible that policy specialists in the sample encountered a greater diversity of views via the media, which may have increased the probability that individuals encountered convergent views with increased frequency. Such a scenario would probably limit the potential for perceptual change. In addition, the data highlights the fact that relatively stable aspects of the external subsystem environment may have also limited subsystem members' ability to accept divergent information, since these environmental aspects may have contributed to core belief stability. For instance, policy specialists representing a rural constituency often felt inclined to support road building, since they, their family and neighbours, as well as their constituents, would not be able to travel every day to work without access to a private car.

ACF-based research that investigated the link between contextual changes and policy-oriented learning focused on the positive association between change in the external subsystem environment and policy change. Having said that, the literature distinguishes between more frequently occurring changes (such as changes in socio-economic conditions, change in public opinion or political opportunity structure (i.e. the number of seats above a majority that the government hold in the House of Commons), the influence of other policy subsystems) and changes in relatively stable parameters (e.g. relatively stable resources, values and rules). The literature shows that although the latter rarely ever gives an impetus for behavioural or policy change, it nevertheless influences subsystem members, since these factors constitute "the resources and constraints within which subsystem actors must operate" (Weible & Sabatier 2007: 192-193). Theorists have not, as yet, highlighted a person's living and working environment as an aspect of the subsystem context, but it seems to integrate well with the current understanding of stable parameters and their constraining impact on endogenous subsystem dynamics.

Compared to stable parameters, external events have been acknowledged to substantially influence the endogenous policy process. For example, Nohrstedt (2005) recognised that media coverage of the Chernobyl created concern and panic amongst members of the public whose reaction then became the story itself. This created a vicious cycle that, when exploited by the minority coalition, could eventually force the majority coalition to distort their priorities (Nohrstedt 2005: 1049-1050). In 2010, Nohrstedt and Weible joined forces and addressed in depth, the association between attributes of the crisis (i.e. policy and geographical proximity) and the properties of the policy subsystem (i.e. patterns of interaction between subsystem members) and its members (i.e. policy strategies, beliefs and how these have changed). The theorists recognised that in times of uncertainty beliefs influence how advocacy coalition members perceive a crisis event and that individuals with divergent beliefs are likely to "compete with each other over the prevalent interpretation concerning causes and implications" of a given event. Subsystem properties as well as the attributes of its members were said to be plausible intervening mechanisms, with the potential to influence subsystem members' ability to exploit external changes to their advantage (in the sense that they successfully change endogenous patterns of interactions either in favour of the majority coalition or to the advantage of the minority coalition, Nohrstedt & Weible 2010).

It is tempting to assume that from this discussion one could also derive assumptions about the association between contextual stability, intervening mechanisms and perceptual stability. However, this association is yet to be tested. For now it seems fair to conclude that availability of convergent information possibly reduces the impetus for cognitive and behavioural change.

The tendency towards stability that was observed in the sample population does not explain why British road transport policy changed in 1998, but it may help us to understand why change came about slowly and not suddenly.

6. Conclusion

In addition to developing on the insightful work of other ACF theorists, as well as the work of researchers associated with the heuristics and biases programme, this contribution to the discussion also hopes to support to the development of a more rigorous theory, linking an individual's understanding of a given decision situation to aspects of that situation and visa versa. The findings not only stress the importance of an individual's cognitive disposition and behaviour, but also the role of the social, institutional, cultural and environmental contexts within which he or she operates, as well as the significance of feedback-loops.

Further research is needed to validate case study outputs and to establish whether the findings are simply characteristic of the observed population, or whether policy specialists engaged in other select committee discussions display similar beliefs and coordination behaviour.

If further research observes similar citation behaviour for other populations, theorists may also wish to investigate whether there is a difference between the verbal exchange of information and written communication, since written correspondence and verbal dialogue seem to constitute two different situations. For example, individuals engaged in written correspondence have more time to consider various perspectives in private before formulating a response, whereas those who engage in verbal discourse may encounter evolutionary conditions that require human beings to fall back on intuitive responses, such as fleeing from a possible hazard (for example, this may occur when the individual in question is not used to speaking in front of a critical audience).

Furthermore, in order to develop on Nohrstedt's and Weible's efforts to give a comprehensive explanation of the association between external change, intervening mechanisms and policy oriented learning, future research should also address the following questions: How does a stable exogenous environment affect how subsystem members understand a given decision situation, and what possible causes may be involved in this?

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Appendix A

Box 1. Coding rules for extracting knowledge transfer relationships from CTSC minutes

The following coding rules were followed, which were defined prior to the coding process:

- Identify case relevant inquiries by searching the list of CTSC inquiries manually
- Extract meeting records only for CTSC sessions on a pre-defined list of case relevant inquiries
- Extract data from CTSC minutes of oral evidence only
- Extract names from the attendance list for each session, not from the body of the text
- When new name cannot be clearly matched to a name on the index, create a new a-node
- When uncertain whether it is the same person, compare academic title and organisational affiliation; when still uncertain create a new a-node
- Extract attribute data for each a-node from text body; starting with attendee's introduction

Box 2. Coding rules for extracting convergence data from CTSC minutes

The following coding rules were followed, which were defined prior to coding process:

- If a statement cannot be matched to an edge, do not code it
- Where statements only concerned an urban area, do not code it
- Where statements only concerned a local area, do not code it
- Document reference and paragraph must be recorded each time formal statements could be matched to a policy core belief category, and edge $e_{ap} \in E_{AP}$. For example, HC432 (Document Reference), §6 (Numbered Paragraph)
- Relate statements to category "Predict & Provide" should these include as a cause variable some means to facilitate demand/flow, followed by a positive linkage to the effect variable,
  - Code "UP" when a viewpoint was unconditionally advocated
  - Code "CP" when a viewpoint was conditionally advocated, for example road widening schemes would be acceptable for rural areas only
- Relate statements to category "Realism" should these include as a cause variable some means to facilitate traffic demand/flow, followed by a negative linkage to the effect variable
  - Code "UR" when a viewpoint was unconditionally advocated
  - Code "CR" when a viewpoint was conditionally advocated, for example charging road users would be acceptable only in urban areas
- Relate statements to category "DM" (Brokerage) should these include as a cause variable some means to facilitate traffic demand/flow, followed by an ambivalent linkage to the effect variable; or should overall contribution to specific discourse include an equal number of statements with a positive linkage on one side and statements with a negative linkage on the other
  - Code "DM" when several viewpoints are advocated with equal frequency

Box 3. Coding rules for extracting citation data from CTSC minutes

The following coding rules were followed, which were defined prior to coding process:

- If a cited name cannot be matched to an existing a-node, create and code a new a-node
- Create for each new a-node, a new m-node and label it REFERENCE
- Document reference and paragraph must be recorded for each citation; see example Box 5.3.
- Citations with a positive weight (3) should clearly have the purpose to support a policy core statement.
- Citations with a negate weight (-3) should clearly have the purpose to challenge a policy core statement.
- Citations with the attribute code (OBS) should include cases in which the citer is the primary source for the cited information, including research projects where the citer was directly involved in data collection or dissemination; specific cue words are "I", "We", randomly matched with visual or audio sensual verbs (e.g. "see", "observed", "heard")
- Citations with the attribute codes (NAR, RES) should include cases in which the citer is not the primary source for the cited information, including specifically the cue word "They", randomly matched with visual or audio sensual verbs (e.g. "see", "observed", "heard")
  - (NAR) denotes oral or written narrations from an external source, e.g. anecdotal evidence, news reports, conference papers & presentations etc (cue words, such as article, news, morning show, interview, radio, TV, letter, talk, presentation, show)
  - (RES) denotes written evince from an external source (specific cue words "report", "research", "research report", "data", "statistics")
- Citations with the attribute code (UNC) should include cases when no information is given about the type of reference
- Cases in which speaker makes no citations should be coded (MIS)