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Using Strategic Niche Management to evaluate and implement urban transport policy instruments

P. Ieromonachou, S. Potter & M. P. Enoch
Centre for Technology Strategy
The Open University, United Kingdom.

Abstract

Strategic Niche Management (SNM) is rooted in organisational innovation diffusion theory and provides a structure to evaluate and manage the introduction of new transport technologies. In brief, SNM involves:

- Formation of a 'technological niche'.
- Identification and introduction of appropriate protection measures that support the new technology.
- Analysing the technological regime of the 'experiment' (demonstration project). -Promotion and examination (by actors/partners) of 'second order' learning processes within the protected experimental space.
- Management of experiment to encourage innovation diffusion.

An existing transport case study is presented to demonstrate how Strategic Niche Management could be used in the development of new and innovative transport technologies. These were conducted as part of a research project for the CEC DG XII *Strategic Niche Management as a Tool for Transition to a Sustainable Transport System*.

This paper briefly introduces Strategic Niche Management and focuses on the new research by Petros Ieromonachou that is seeking to use SNM to evaluate and manage radical local transport policy package measures. The possibility of producing an implementation guidance tool based on this concept is discussed.

Implementing new policies in old ways

Transport systems in the UK are facing severe problems of congestion, fuel consumption and pollution. The dramatic increase of road traffic has put pressure on the government to change its way of policy development. Despite the emergence of several promising concepts, their introduction has been slow. Demand management strategies such as road and parking pricing, car sharing, traffic calming and teleworking are gradually becoming established. The success of these strategies depends mostly on policy research and their implementation process. Factors that affect implementation include institutional, technical, political, social and behavioural as well as fiscal sensitivities.

The move from a demand responsive 'predict and provide' approach to transport policy to that of 'predict and prevent' transport demand management has resulted in the use of urban transport instruments that involve a complicated set of institutions, processes, people and procedures. Transport policy instruments of the old demand responsive regime, basically enlarging road capacity, involved a relatively simple system of actors and processes around which expertise, knowledge, and skills had built up over several decades. Demand management policies involve a larger and more complex system. The result of this is particularly evident for more radical demand management measures (such as congestion charging, work parking fees and high occupancy vehicle lanes), which so often get bogged down amidst controversy, disagreements, unanticipated problems, and a whole host of delaying factors. If they ever get implemented, they tend to be watered-down and consequently rarely effective.

It has long been realised, for example in Potter [1], that there are problems of using the information systems and professional skills base of the old transport policy regime (predict and provide) to develop transport instruments for the new demand management regime. But it is not only new information and skills that are needed for modern urban transport policy instruments. Also needed are ways to manage their development and implementation. This paper explores the use of one such management technique, Strategic Niche Management.

Strategic Niche Management

Strategic Niche Management (SNM) has not emerged from transport policy studies, but is rooted in organisational innovation diffusion theory that explores the processes and actors needed in shaping, and the application of, new technologies [2][3]. Dissatisfied with existing approaches to technology diffusion such as 'technology push' and 'market pull' strategies, Schot and Rip [4] explored another type of model that they called Constructive Technology Assessment (CTA). This attempts to shift the focus away from forecasting the impacts of new technologies towards broadening the design processes themselves to include new social actors and factors with the aim to anticipate and accommodate social impacts within technology development.

Schot and Rip [4] suggested using Strategic Niche Management as a CTA strategy which encourages the idea of creating a protected space for the

alternative technology, termed the 'technological niche'. The concept of a 'protected space' in SNM is more than technological 'pump priming' to support a desired technology. It is difficult to introduce new technologies that do not fit in with the existing system (e.g. electric vehicles into an internal-combustion engine transport regime). The new technologies may require complementary technologies that are probably expensive or difficult to acquire at the initial stages and there are vital cultural and psychological factors.

Because it is impossible to design a first-time-perfect technology SNM accepts the need for protection to experiment and learn, rather than pump-prime. The experimental introduction of these new technologies is with the intention to learn and diffuse this learning.

Overall, an SNM approach to project development involves setting up experimental demonstration projects (the sum of which comprise the 'technological niche') in which actors learn about a technology's design, user needs, cultural and political acceptability, environmental impact and other aspects [3][4]. SNM provides a framework for all parties (including producers, users and policy-makers) to be involved in the development and diffusion process. Schot and Rip developed the concept of SNM to describe a process of learning, constructive assessments and reassessments of the various actors involved, to ensure the development of a viable technology [5]. Indeed SNM has been defined as: "the creation, development and controlled break down of test beds (experiments, demonstration projects) for promising new technologies with the aim of learning about the desirability (for example in terms of sustainability) and enhancing the rate of diffusion of the new technology" [6].

A crucial factor about SNM for technology shaping is that the focus is upon learning by all those involved and providing a framework within which all actors can explore a new technology and come to a view as to its role. Central to this learning is an acknowledgement and discussion of the 'expectations' held by different actors. This process occurs within the protected space of the experiments within the dominant technological regime. The whole process of SNM can be viewed as a laboratory experiment where the niche is developed under special protected settings and diffused step-by-step into real-world market conditions. If successful, SNM manages the transition from technological niche to market niche.

The application of SNM requires the design and introduction of appropriate levels of niche protection. Too little protection and the learning process is precluded, too much increases the risk of creating an expensive failure. This is because the new technological options can only become competitive through exposure to increasingly demanding economic and regulatory environments. The goal is to successfully introduce the new concept and, after a period of niche protection (which usually includes financial and organisational support), expose it to real-world conditions where it should be able to survive. It is important to note that, once the protected space has performed its function, SNM demands the dismantling of the technological niche in order that the new technology can be tested by real world conditions. If successful, a market niche will be formed.

An evolving technological niche is defined by a series and/or set of similar experiments over time. To be complete, this definition includes a description of the protection measures used and the regulatory framework within which the experiment is situated. Indeed, the concept of a technological niche was initially employed to analyse industrial innovation and influence technology policy [7]. Similarly, not only can Strategic Niche Management be used to analyse the introduction of new technologies, it also is effective as a policy design tool. Its use for policy analysis as well as for technology development is a theme of this paper.

To date SNM has been largely used as a tool to analyse the key components, relationships and designs involved in developing new transport technologies. This has been a development process to refine SNM itself, so that it can then be used as a project and programme management tool. The following two cases illustrate the use of Strategic Niche Management to evaluate transport technology policy projects.

Table 1: Strategic issues within the experiment, technological niche and regime

Level	Strategic Issues	Analytical Issues
Experiment	Experiment Expectations Specific Learning Experiment Design Experiment Support Experiment Evaluation	The organisations (and key individuals) involved. Who is excluded and why? The relation between the network in the experiment and the networks that existed before it. Motivations for participation in the experiment and resources brought into the experiment Is the adequate representation of outsider perspectives? Are potential users represented? The strength of ties between actors. How are tensions and controversies identified? Who leads and what is the project leader's vision on the role of the experiment? Articulation of experiment goals? Are the goals the same for each participant? What do they expect of the experiment and technology development as a whole? What problems are encountered and solved during the experiment? Are problems expected or unexpected? How are these problems defined, and by whom? How are problems solved? Who comes up with the solutions: the supplier, users, others? Does second order learning occur? Are all actors included in learning process? What are the effects of learning process? Are lessons incorporated into technology diffusion?

<p style="text-align: center;">Technological Niche</p>	<p>Niche Protection</p> <p>Evolution of Expectations</p> <p>Generic Learning</p> <p>Niche Development</p> <p>Niche Competition</p>	<p>What niche protection measures are employed?</p> <p>How does the network underlying the experiment provide protection for the technology?</p> <p>What selection pressures are temporarily eliminated or reduced by the protection?</p> <p>How is the experiment embedded in the actor's organisation(s)?</p> <p>What were the initial expectations of the technological niche?</p> <p>How do these change over time?</p> <p>Who were the opinion formers and where are expectations articulated and discussed?</p> <p>How does the technological niche develop over time?</p> <p>Do expectations become shared by more actors (robustness) and/or become more specific?</p> <p>Does the niche learning lead to support from users, investors and other actors?</p> <p>Are the lessons learned by the participants communicated in the field?</p> <p>Does the niche development become irreversible?</p> <p>Is there a key threshold where the attractiveness for the technology increases?</p> <p>What other niches are developing in parallel with this technological niche?</p> <p>What interactions are there between parallel niches?</p> <p>Competition or reinforcement (clustering)?</p>
<p style="text-align: center;">Existing Regime</p>	<p>Market Barriers</p> <p>Market Acceptance</p> <p>Market Niche Development</p> <p>Policy and Regulation</p> <p>Effect on Existing Regime</p>	<p>What are the main barriers to market share and market acceptance?</p> <p>Are these barriers real or perceived? What attempts are made to overcome these barriers?</p> <p>What are the relevant socio-technical trends, which affect the uptake of new technology?</p> <p>Do experiments within the niche include measures to stimulate diffusion?</p> <p>What evidence is there for the emergence of a market niche?</p> <p>Market: for whom is the technology produced? What are the consumers' needs and requirements?</p> <p>What kinds of marketing channels are used?</p> <p>What is the regulatory environment for the emerging technology?</p> <p>Is the technology affected by regulatory pressures/barriers?</p> <p>Is the technology affected by competition pressures among manufacturers/others?</p> <p>What levels of cooperation/networking exists between key actors?</p> <p>How is technology affected by R&D programmes? Are they supportive or not?</p> <p>How is the existing regime likely to develop?</p> <p>Is the regime under external pressure to change? If so, from what?</p> <p>What are the chances that the new technology develops into a dominant technology?</p> <p>Is this likely to constitute part of a new regime?</p>

An example of a Strategic Niche Management Approach

The use of Strategic Niche Management to assist the development of innovative transport technologies was developed through a research project for the CEC DG XII *Strategic Niche Management as a Tool for Transition to a Sustainable Transport System*. The project (detailed in [3]) analysed 16 experiments that provided insight into the potential use of SNM for innovative transport technologies. Some also show the potential to use SNM for the development of local transport policy measures. It should be emphasised that these cases did not use SNM to design and manage the projects, but SNM was used to analyse them and develop the SNM project management tool. The study analysed new technologies at three levels; experiment, technological niche and existing regime; using three defining dimensions; technology, application and actor network. Table 1 shows the strategic issues as defined by Lane [8] and the analytical issues as used by the CEC study.

Case Study: the Coventry Electric Vehicle Project

The Coventry Electric Vehicle Project (CEVP) [9] intended to stimulate the UK market for Battery Electric Vehicles (BEVs) by simply demonstrating existing vehicles marketed elsewhere in Europe. Within the CEVP, no development of the *technology* was intended, as many years of vehicle testing had already been carried out in France during the 1980s and 1990s.

In 1997-98 fleet of 14 Peugeot 106E Electric cars and vans were introduced to replace existing petrol and diesel vehicles for five organisations in the West Midlands. The project was made possible through part funding from the Energy Saving Trust. It was one several alternative fuel projects under the *Powershift* programme which provided part funding for alternative vehicles in the UK to explore their potential. The Involved Network was of six partners, the Energy Saving Trust, Peugeot Motor Company PLC, Coventry City Council, East Midlands Electricity PLC, Royal Mail Midlands and PowerGen PLC. Figure 1 shows the network of partners and their responsibilities. Monitoring was set up on 4 of the 14 vehicles, which were in service as planned, providing information that was used to confirm the environmental impact of the 106E and evaluate its economic viability within a UK market. Lessons learned from the project were disseminated by the project partners and through the Powershift programme.

The CEVP experiment successfully confirmed the main project goal, which covered the (hardware) technological aspects of the 106E and its recharging infrastructure. This was not surprising, as PSA Peugeot-Citroen had previously developed the vehicle over many years. With the insignificant modification of having to produce a right-hand drive version, the technology was already as demonstrated in France. The CEVP also dramatically raised the profile of battery powered electric vehicles in the United Kingdom, attracting media interest and the enthusiasm of local authorities that were keen to use this technology. A great amount of interest was generated both within the Coventry area and among the

national network of local authorities; the latter assisted by the involvement of a city council as one of the key project partners.

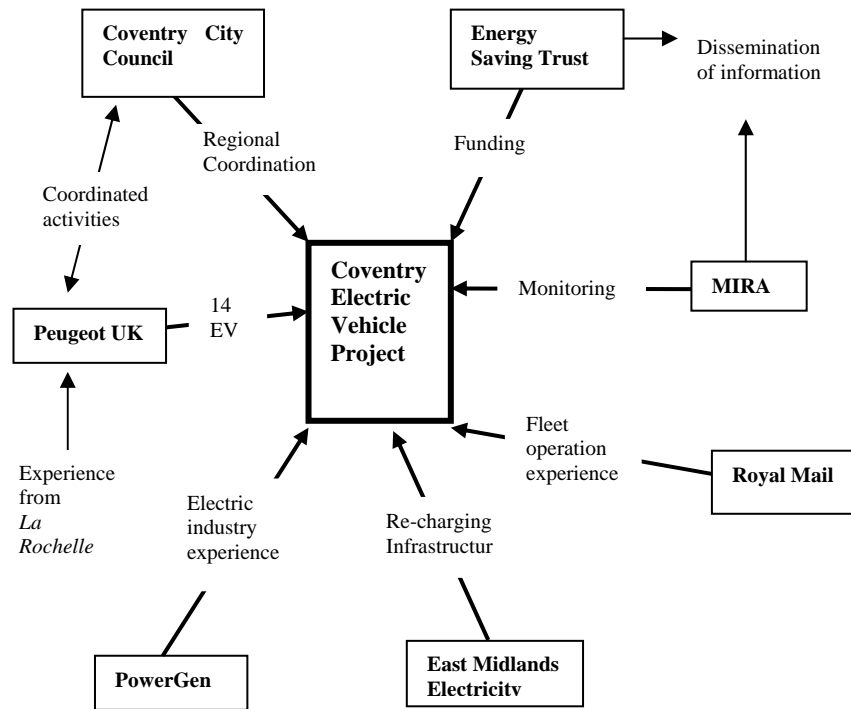


Figure 1: Network of Actors – Coventry Electric Vehicle Project

SNM analysis showed that prior to the project, expectations of an electric vehicle were low and fleet operators were largely ignorant of the relative merits of alternative fuel vehicles. Through its use in the CEVP, the 106E had a very positive response, both as a zero-emission and as a high performance real car that sufficiently satisfied users' expectations. The CEVP allowed the partners to widen their experience of BEVs, and many of the partners decided to purchase electric vehicles to use as part of their fleets in addition to the vehicles used within the CEVP. Therefore, the SNM analysis provided evidence that the initial (low) expectations had been successfully challenged reducing the discrepancy between the actual and perceived viability of the light-duty BEV. Evidence also showed that the users were highly engaged with the project. Feedback from the Royal Mail was partly responsible for the decision to commercialise the electric Partner Van. The project provided a valuable lesson regarding market preference.

However, in spite of the partners' high expectations for the technology and its successful demonstration, the CEVP and related projects have not resulted in the successful diffusion of BEVs within Europe. This was not a failure of

(battery) electric vehicle technology, but can be explained by competing technologies in the existing regime. Indeed, this was highlighted early on by the SNM analysis that noted in 1998 that: "It may turn out that hybrids (and subsequently fuel cells) may be the only threats to the success of BEVs" [9]. This has turned out to subsequently be the case with monthly global sales of the Toyota Prius (hybrid) outstripping annual sales for BEVs. There has also been the emergence of other cleaner vehicle technologies such as liquefied petroleum gas, as well as from cleaner petrol and diesel technologies. SNM therefore provides a very useful analytical tool with which to explain the poor uptake of BEVs in spite of the niche's proven technological capability.

SNM and Urban Transport Instruments

Strategic Niche Management has been developed in the context of transport technology projects. However, behind these specific technologies has been some form of policy initiative. In their book, Hoogma *et al* [3] note the need for more research "*on the relationship between SNM and state policies, and the relationship between SNM and planning. In general, SNM may be used to inform planning (both transport planning and town planning) while planning may be used to foster niche development processes.*"

Many of the project management aspects in the structured SNM framework relate to processes that apply to the developing urban policy instruments. Factors such as enabling learning, support measures; the motivation of key actors, the evolution of expectations, barriers, acceptance and relationship to the existing regime can all be applied to policies as well as technologies. Could also innovative policy instruments be viewed in the same way as technologies, such that there is a 'policy niche' in the same way as SNM has a 'technology niche'? For example, road pricing could be viewed as having developed in a number of protected niche environments around the world.

It appears that there is potential to analyse more radical policies that have proved to be difficult to implement, such as Urban Congestion Charging, Travel Plans and Workplace Charging mechanisms. This could include identifying critical information, processes and actors in the planning, introduction and implementation of the policy projects, the barriers that planners face during implementation (social, political, institutional, financial), and the different information needs for each step in the process. Consideration should be given to whether policies require more protection than already provided from the regulatory framework.

Experiments with new urban transport policy instruments policies do occur, but they are not regularly used to systematically learn about possible new linkages between technology, information needs and issues of social and political acceptability. They also do not provide feedback to the implementing agencies and network actors in order to develop a generic tool. A tool based on Strategic Niche Management that incorporates such knowledge could well ease the implementation process by identifying these issues of concern and barriers that inhibit this.

How to use SNM to analyse and manage the development of more radical urban policy instruments is being explored via a PhD project (part sponsored by the transport consultants Atkins) undertaken by Petros Ieromonachou at the Open University. A SNM urban transport instrument analysis map is to be developed structured around the ‘strategic issues’ in the grid in Table 1. In order to use the concept of SNM in policy implementation some adaptation to the structure for technology implementation will be needed, but the main idea of supporting niches within the existing regime in order to create a shift towards a more sustainable system remains the same.

Financial incentives and other actors’ goals should be considered but at the same time social and environmental benefits must be incorporated in the early stages of the project. Participating network actors should be judged by their overall project enthusiasm and not just the quest for their own objectives. On the other hand, each partner should derive some benefit from the scheme. In the case of designing long-term policy strategies using SNM, development of sustainability-oriented niches will not only depend on actors but will also require a strong public role in leading the transition process. According to Hoogma et al [10], numerous studies of product innovation and failure have shown that involvement of users is an important factor for successful market introduction, while a lack of user involvement is a major cause of failure.

Creating a niche with one or more interrelated demand management policies will facilitate the process of societal embedding as well as overcoming several other barriers including institutional arrangements or regulatory frameworks in favour of the established regime. At the same time, barriers have to be overcome in order to find partners willing to support the new concepts and provide alternatives that will encourage their acceptance. For example convincing public transport operators to reduce their fares in the implementation of road pricing would provide a ‘value’ alternative to the users in order to dispose of car dependency as well as ensuring more future passengers.

Moving towards sustainability requires a regime shift, combining radically new solutions with a change in practices and organisational settings. Therefore, major elements in the project would be the extension of the theoretical and conceptual approaches of SNM and regime shifts in application to the field of transport policy. The use of SNM for policy development, as in the case of technology development, would not guarantee success (but what can?), but it would ensure that key factors are not excluded and that inconsistent and ‘no hope’ instruments would be readily identified.

Conclusions

We are becoming aware that only radical policy measures can effectively tackle issues of transport’s environmental impacts and congestion, and that these need to be delivered rapidly – yet the introduction of such instruments is fraught with difficulty and liable to delay. Transport planning has a crisis of managing policy development and implementation. The new policy agenda requires a more complex and integrated process than has hitherto been adopted.

From outside of transport policy has emerged a technique, Strategic Niche Management (SNM), which has started to be related to transport technology developments. The use of SNM for urban transport instruments looks promising, however it would also be useful to see if there are other project and programme planning techniques that could also be of relevance.

References

- [1] Potter, S. *Vital Travel Statistics*, Landor Publishing, London, 1997.
- [2] Weber, Matthias, Hoogma, Remco, Lane, Ben and Schot, Johan (1999) *Experimenting with Sustainable Transport Innovations: a workbook for Strategic Niche Management*, CEC Joint Research Centre, Seville.
- [3] Hoogma, R., Kemp, R., Schot, J., and Truffer, B. *Experimenting for Sustainable Transport: the Approach of Strategic Niche Management*. Spon Press, London, 2002.
- [4] Schot, J. and Rip, A. The Past and Future of Constructive Technology Assessment, *Technological Forecasting and Social Change* **54**, pp.251-268, 1996.
- [5] Schot, J., Hoogma R., and Elzen, B. Strategies for Shifting Technological Systems: The case of the Automobile System, *Futures* **26**, pp.1060-1076, 1994.
- [6] Kemp, R., Schot, J., and Hoogma, R., Regime shifts through processes of niche formation, *Technology Analysis and Strategic Management* **10(2)**, pp.175-195, 1998.
- [7] Van den Belt, H., & Rip, A. The Nelson-Winter/Dosi Model and synthetic dye chemistry 1987, in Hoogma, R., *Exploiting Technological Niches*, Twente University Press, Twente, 2000.
- [8] Lane, B. *Optimising Implementation Strategies for Fuel Cell Powered Road Transport Systems in the United Kingdom*, PhD Thesis, The Open University, Milton Keynes, 2002.
- [9] Lane, B. *Promoting Electric Vehicles in the United Kingdom – a study of the Coventry Electric Vehicle Project*, The Open University, Milton Keynes, 1998.
- [10] Hoogma, R., Weber, M., and Elzen, B. Integrated long-term strategies to induce regime shifts to sustainability: The approach of Strategic Niche Management, Proc. of *Towards Environmental Innovation Systems*, 27-29 September, Eibsee, Germany, 2001.