

A Transdisciplinary Perspective on Ergonomics Research and Policy Implementation: An Example of the History of Transport in Japan

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ABSTRACT

Human factors applied to transportation has a long history of scholarship dating back to the early days of traffic engineering in the USA, and these contributions to national policy are important to document. More generally, there is a need for case studies that describe how ergonomics research is translated in government policies or organisational reform. The aim of this paper is to suggest a suitable transdisciplinary methodology using a case study of highway policy in Japan as an example of the approach. The paper introduces the methodology of the literature review and a simple conceptual model of the interactions between civic and civil society and summarises the results of an extensive case study of the history of transport in Japan.

Keywords: Ergonomics research; Transdisciplinary methodology; Transportation; Policy; Traffic engineering

INTRODUCTION

Transport researchers should “engage with substantive questions of governance which pay greater attention to context, politics, power, resources and legitimacy” whether this should also apply in the field of ergonomics is a matter for domain specialists to determine. This is an important question because applied research that addresses issues in society must ultimately be addressed to policy makers in government or private sector organisations for implementation. As issues become increasingly complex and multi-faceted, it can be argued that transdisciplinary approaches to framing research designs are needed [1-4]. Research that engages with governance and its objectives implies some form of institutional analysis, of which the New Institutional Economics (NIE) provides one suitable conceptual framework.

The new institutional economics-a social science perspective that focuses on institutions and organisations that underlie markets and economic activity imposes questions about who is charged with policy development, who are the key actors and what contextual problems they face, how do they obtain their advice, and how do the policy outcomes intended, or otherwise impact on society [5]. The highway sector is chosen in this article to narrow the focus on policy because it is a basic servant to all economies, both developed and developing. A common

historical characteristic in the socio-politico-technological development of all nations is associated with the overland movement of people and goods, where parallel developments have taken place in vehicle technology and propulsion systems that have impacts on society, the economy, and the environment.

MATERIALS AND METHODS

The term “institution” extends from a nation’s constitution to other governing organisations that have a less secure constitutional basis, such as provincial and local government, the bureaucracy, political parties, trade unions and lobby groups. English language is sometimes ambiguous because the term “organisation” tends to supplant the word “institution” as the context moves further away from constitutional structures. The New Institutional Economics (NIE) is one suitable framework to examine specific case studies (for example, the translation of ergonomic research into institutional or organisational practice).

Analyses conducted under the framework of the NIE include the role of people as key agents: It is people in institutions and organisations who make decisions about what to do when confronted with internal or external pressures for policy change and who rely on the circulation of ideas on technologies, policies, services, and finance to inform their “worldview”. The central propositions include: The interplay between economic

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and political markets holds the key to the dynamics of institutional change; transformation occurs over long periods of time, where social theory considers the dynamics of change in phases; people in institutions and organisations (embracing both civic and civil society) who make decisions about what to do when confronted with internal or external pressures for change; and people are informed by the circulation of ideas on technologies, policies, services and finance. The research gaps in the Japanese scholarship are clear: The NIE has not been applied to the highway sector.

There is a vast literature in English on the political institutions and economic history of Japan from archaic times to the present day. The book by Ishii, although now dated, is the standard work in English on the history of Japanese institutions from a legal perspective. *Japan: An illustrated encyclopedia*, written by leading Japanologists, is a valuable reference source. Within this body of literature, and noting the largely ceremonial role of the emperor, is the role of institutions and organisations outside of the government. Until 1868, the Japanese population was divided rigidly into three hierarchical classes: Ruling elites (court nobles, war lords, and clergy); farmers and artisans; and merchants. In ancient times, the imperial court made decisions, but power was later usurped by the regional warlords, but two successive military governments (Kamakura and Muromachi) failed to unite the country that is until 1600 and the Tokugawa military dictatorship. Although despised by the noble and military elites, merchants grew in economic importance from the middle ages onwards, handling finance (on behalf of the warlords), trade, transport, and rice transactions (the monetary basis of the economy). After the restoration of the emperor (Meiji), in 1868, merchants formed the great business houses, such as Mitsui and Sumitomo and, later, provided the powerhouses of Japanese industrialisation in "Society 4.0".

"Society 5.0" is the label attached to a vision of a whole of government, business and academia plan to integrate new technological systems, including Artificial Intelligence (AI), across various fields to the benefit of society. Although Holroyd has explored the conceptual background, rationale, policies and programmes that Japan has enacted in pursuit of its visions for "society 5.0", there are no publications in English or Japanese that analyses "society 5.0" from the vantage point of highway governance [6-10].

On the history of highway administration in Japan, the authoritative source is by Takebe written in Japanese, although there are summary outlines of highway history in English [11-14]. More specifically, on the topic of highway provision, highway policy, resources for implementation and impacts on society, there are two excellent research monographs written in English but their historical scope is limited to the Tokugawa period [15].

The proposed methodology for a transdisciplinary perspective to frame a research program into governance and policy formulation that may be applied to any case study of time and geographical space is distilled into the following basic steps.

- Define a case study-any territorial unit that has a government structure (national state local); select any economic sector or

specific policy area to investigate; identify the temporal scope of the investigation (contemporary, recent period, long history).

- For any historical slice of time and territorial unit, undertake a static descriptive relationship analysis of the ultimate source of power in the selected case study jurisdiction, the form of government, and the key actors involved in civic and civil society.
- The next step is to elaborate on these relationships in terms of the issues that are relevant to case study. These include: the key people involved, the governance of sector or policy under investigation, the policy responses, including cultural transfer, and some form of critical analysis, or judgement, of the impacts of programs and policies on society.
- The next step is to introduce the dynamics of institutional and organisational change, along with its key agents and what was achieved with the reforms. A different landscape will be formed (a variant on step 2).
- The final step is to repeat point 3 above with different institutions and organisations, and key players, with the outcomes being subject to some form of interpretative judgement.

RESULTS

The historical development of the highway sector, and associated policies in Japan, were selected as a case study and full details are described by Black, Nakanishi, and Kobayashi. The territorial area has a population as of May 2022, in a land area of 364,546.41 km², is 125.05 million, according to the statistical bureau of Japan. Japan was chosen as a suitable case study of the long term changes in governance and policy because the present government of Japan has clearly divided the historical evolution of its society into five qualitatively different epochs, which is convenient for a structure to interpret the data. This elapsed time period for the case study stretches from the earliest migration of people into the Japanese archipelago to the present day. Historical and contemporary data are available from primary and secondary literature in both English and Japanese.

The descriptive interpretation covers the following different forms of government (absolute monarchy, aristocratic, colonial, democratic, military dictatorship, socialist, theocratic and totalitarian); its approach to highway provision; the key actors involved (and their legitimacy and power relationships); and the sources of funds needed to implement initiatives. The significance of this approach is that by historicising highway provision and policy, the research contextualizes and presents possible shifts and changes in governance in a historically grounded analysis that transcends contemporary arguments. It is important to note here of the need to explain briefly the evolution of the territorial units in the first three societies because Japan was only unified in 1600.

The state formation of Wa-the oldest attested name of Japan from Chinese sources) can be traced to the late 2nd century, but it was a relatively small area (Yamato) to the West And Southwest of lake Biwa. The ancient period saw the expansion of territory away from this heartland in central Honshu in the 6th and 7th centuries, involving long and frequently bloody internal

wars, that fashioned the archipelago's first recognisable state. The country then fragmented then into numerous self-governing provinces in the medieval period until the early years of the 17th Century, when the territorial extent of Japan as it exists today was forged by its third military government. When the emperor was restored to power in 1868, Japan rapidly modernised following Western models of governance, and, following its defeat in world war two, and the imposition by Western allies of a new constitution, became an economic powerhouse.

DISCUSSION

The details of the interpretation of the evolution of highway policies under all five systems of government are explained elsewhere, but for brevity only one example is given here because it resonates with a global trend in policy formulation, known as policy transfer. The new institutional economics identifies that it is the people in government, and those responsible for highway administration, who are informed by the circulation of ideas on technologies, policies, services and finance (policy transfer). Japanese historical data strongly support this

proposition both in terms of reforms to government and to policies in the highway sector. Table 1 summarises some of the major cultural and policy transfers from societies external to Japan. Initially, policies were transferred from China such as highway design and the spacing of post stations. Horses were imported from the Korean peninsula for transport purposes around the 5th century (the indigenous, wild horses in the Kiso valley of Japan were too frail to act as beasts of burden). With the Meiji restoration, the Japanese leaders search for best practice in government administration in Europe and the USA. The allied occupation of Japan from 1945 forced a new constitution on the country and various US policy reforms. American technical approaches to highway planning, design and economic evaluation are further examples of policy transfer. With globalization, many nations were exposed to international trends and the privatization of infrastructure, and its financing in Japan, based on the UK private financing initiatives are other examples of policy transfer.

Table 1: Examples of policy transfer government reform and the road sector.

Description of government reform/policy/technology	Source of reform/policy/technology
Road design and location of post stations.	Chin Dynasty, China
Introduction of domesticated horses for transport of people and goods.	Korea
Taiho reforms introduced national administration (Ritsuryo system).	T'ang Dynasty, China
Neo-confucian philosophy of Tokugawa military government.	China
Meiji restoration and modernisation of government and bureaucracy.	European powers and USA
Formation of ministry of public works.	European powers and USA
Toyota's first production model-a sedan that borrowed heavily from Detroit automotive technology following Eji Toyoda's overseas visit.	USA
New constitution imposed after Japan's defeat in Pacific war.	USA and Great Britain
Expressway design using US bureau of public roads manual.	USA
Highway administration heavily influence by Watkins report.	USA
Privatisation of highway corporation.	USA
Private Finance Initiatives (PFI).	UK

CONCLUSIONS

The government of Japan has divided the history of its society in terms of five, distinctive epochs commencing with the hunter gather society and finishing with the information technology and a digitised society. This provides both the territorial unit and the temporal scope of the case study. A simple conceptual model was proposed to analyse the interactions between civic and civil society. Data on systems of government and policies in the highway sector of the economy over time Japan have been interrogated through the lens of the New Institutional

Economics (NIE). In this article, only one example of the several propositions from the NIE has been included for brevity. These key propositions that could be applied to any case study in ergonomics are:

- The interplay between economic and political markets holds the key to the dynamics of institutional change.
- Transformation occurs over long periods of time, with the dynamics of change in phases.
- It is people in institutions and organisations who make decisions about what to do when confronted with internal or external pressures for change.

- It is people who are informed by the circulation of ideas on technologies, policies, services and finance (policy transfer).
- Judgement on which values govern the decision and in what way do they impact on society.

The framework provided by New Institutional Economics (NIE), and its central propositions, is a useful starting point for designing qualitative policy research case studies in any spatial unit or in any time period. International studies with common protocols could assess the policies and outcomes with evidence based measures for designated countries, regions, or cities. The framework is suitable to apply when there is a regime change, or a change in political party and a different policy agenda is proposed. More specifically, in the application of the NIE framework to research in Japan a bibliography provide a suitable springboard for case studies of specific eras and geographical locations.

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CONFLICT OF INTEREST

None to report.

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