UvA-DARE (Digital Academic Repository)

Beyond the case study dilemma in urban planning: using a meta-matrix to distil critical success factors in transit-oriented development

Thomas, R.; Bertolini, L.

Link to publication

Urban Policy and Research

Beyond the Case Study Dilemma in Urban Planning: Using a Meta-matrix to Distil Critical Success Factors in Transit-Oriented Development

Ren Thomas[a] & Luca Bertolini[a]

[a] Department of Geography, Planning and International
Development, University of Amsterdam, Amsterdam, the
Netherlands
Published online: 04 Mar 2014.

PLEASE SCROLL DOWN FOR ARTICLE

Routledge
Taylor & Francis Group

Beyond the Case Study Dilemma in Urban Planning: Using a Meta-matrix to Distil Critical Success Factors in Transit-Oriented Development

REN THOMAS & LUCA BERTOLINI

Department of Geography, Planning and International Development, University of Amsterdam, Amsterdam, the Netherlands

ABSTRACT   *Case study is well established as a learning tool and as a research methodology in the field of planning. However, there are a number of barriers to the use of single-case study results in planning practice and research. Meta-analysis is one approach to this case study 'dilemma'. This article details the use of a meta-matrix in the meta-analysis of 11 case studies of transit-oriented development (TOD) implementation. The meta-matrix has been essential in the identification of 16 critical success factors in TOD implementation. These critical success factors are useful for practising planners and provide a sound basis for further research.*

在规划这个行当中，个案研究早已成为学习手段和研究方法。但是在规划实践和研究中，单独案例的研究成果仍然难以得到应用。元分析或可解决这一难题。本文详细阐述了在 11 个 TOD 发展模式实施的个案研究中运用元矩阵进行元分析。元矩阵在确认 TOD 发展模式 16 个关键性成功因素的过程中至关重要。这些关键性成功因素给规划者提供了帮助，并为今后进一步研究奠定了坚实的基础。

KEY WORDS: Case study, meta-analysis, transportation, land use, policy, transit-oriented development

1. Introduction

Case study is well established as a learning tool and a research methodology in the discipline of planning. However, case studies are often done in isolation and do not learn from each other, instead "eternally reinventing the wheel" (Sandelowski *et al.*, 1997, p. 366). Synthesising the rich data generated by different case studies would be considered valuable in

Correspondence Address: Ren Thomas, Department of Geography, Planning and International Development, University of Amsterdam, Plantage Muidergracht 14, 1018TV Amsterdam, the Netherlands. Tel: + 31 20 525 3980. Email: r.thomas@uva.nl

this respect: the ability to distil essential concepts, issues and tools that could be applied in a broader demographic, and in different contexts, would be of interest to policymakers and in knowledge development. Meta-analysis is one approach to the case study 'dilemma': systematic comparison can enhance generalisability and define the specific conditions under which a finding will occur, while still doing justice to the richness of case study data.

This article details the use of a meta-matrix in a meta-analysis of 11 case studies of transit-oriented development (TOD) implementation. The goal was to identify critical success factors (e.g. Nijkamp *et al.*, 2002; Van Egmond *et al.*, 2003) in TOD implementation to determine the practices, policies and governance models that could work in the Netherlands. This research is Project 1 of a three-part study on overcoming barriers to TOD implementation funded by the Netherlands Organization for Scientific Research (Nederlandse Organisatie voor Wetenschappelijk Onderzoek in Dutch).

The article begins by detailing some of the problems in using case studies in practice and research, then describes case comparison, case synthesis and meta-analysis as possible solutions to these problems. In the third section, data and methods are presented. The fourth section presents the analysis and research findings, including the critical success factors for TOD implementation. Finally, the article concludes with implications for practising and academic planners.

2. Research Background

Case study is a common technique in both planning practice and research. In practice, planners regularly study the policies of other cities, regions and countries and adapt them to suit the local governance, policy and cultural context. The ability of case study to integrate different methods to answer complex questions also makes it a common research methodology in a multidisciplinary field such as planning.

2.1 Case Studies in Planning

Planners regularly study policies from other places, adapting them to suit local governance, policy and cultural contexts. Planners from municipalities and regional planning organisations host foreign planners and visit their counterparts in foreign countries to learn about specific policies or programmes. For example, the City of Vancouver, Canada, regularly hosts visiting planners who study its unique approach to urban development and regeneration: strong evidence of this appears in countries such as the United Arab Emirates. The City of Toronto was so strongly influenced by the design of 'pedestrian scrambles' in cities such as Tokyo and London that it installed its first such intersection in 2008. Tan (2011, p. 145) described the exchange of ideas between transportation planners in Perth, Australia and foreign academics and planners:

> Professional organizations are known to arrange at least one local and foreign study trip annually to learn from what they consider as good examples of land use and transport developments and interact with local experts.

Perth hosted a conference on TOD in 2005 where practitioners from all over the world shared cases of TOD implementation.

In planning research, case study has become a well-established research methodology. From Bent Flyvberg's critical examination of transportation planning in Aalborg, Denmark (*Rationality and Power: Democracy in Practice*, 1998), to Thomas Campanella's analysis of rapid urbanisation in China (*The Concrete Dragon*, 2008), in-depth case studies of planning processes allow researchers to understand the complex role of planners. Focusing on the intricacies of specific cities often results in rich data that tells a compelling story of conflicts and power dynamics. As Ragin (1987, p. 34) writes about case selection,

> It is their particularity—the fact that they are instances of significant events or phenomena—that attracts the attention of the investigator. Sometime, there is only one or two or a small handful of such instances.

2.2 Case Study as a Research Methodology

The ability of case study as a methodology to integrate multiple methods makes it particularly useful in planning, which is a multidisciplinary field integrating geography, sociology, public health, psychology and economics, among other disciplines. Many academic planners, having previously trained in other disciplines, integrate theories and methods from these fields. Planners are often interested in actors, processes and institutions, which are difficult to understand using a single research method. As Maxwell (2004, p. 248) puts it,

> Process theory ... deals with events and the processes that connect them; it is based on an analysis of the causal processes by which some events influence others. Process explanation, since it deals with specific events and processes, is less amenable to statistical approaches. It lends itself to the in-depth study of one or a few cases or a relatively small sample of individual and to textual forms of data that retain the chronological and contextual connections between events.

However, there are a number of criticisms of the case study approach, particularly single-case studies. Planning departments and government agencies are often interested in cases examining policy, process and tools, but single-case studies do not provide them with generalisable findings to allow them to take definitive action in policy development. Replication is considered a necessity in the verification of theories and generalisation of research findings. However, the time-consuming fieldwork used to gather data for case studies, which often includes a combination of interviews, participant observation, focus groups, surveys and policy analysis, means that few researchers would want to replicate a previous study (Schofield, 2002). In some cases, the inherent political, geographic or demographic context of a case study makes it difficult to apply its findings in a different city or country. In planning, contextual issues often act as a barrier to implementation of key policies or programmes in other jurisdictions. Planners have too often heard that a policy or project might work in Tokyo, but never in Los Angeles or Amsterdam.

The case study methodology is inconsistent with the requirements of statistical sampling procedures which are fundamental to generalisation (Yin, 1981; Schofield, 2002). However, both Yin (1994) and Flyvberg (2001) indicate the value of using atypical cases in analytic generalisation, the ability of a theory to be tested in a similar theoretical setting to further define its explanatory power. Schofield (2002) gives an example of generalising from an atypical case to a typical one. Prominent case study researchers also propose the multiple-case

study (e.g. Yin & Heald, 1975; Yin, 1994) as a way to develop and test theories, and comparison of cases for more generalised theory-building. For example, in their comparison of sustainable mobility in two cities, urban planning and development, Naess *et al.* (2011, p. 290) argued that:

> Copenhagen and Oslo could arguably be characterised as 'critical cases' of urban sustainability, understood to mean that any main shortcomings and barriers to sustainable urban dev't and sustainable mobility in these cities are also likely to be present among European cities with lower sustainability ambitions and achievements.

Case study comparison is also used to draw out similarities between cases. There have been a number of TOD case study compilations including Newman (2007), focusing on Australian cities, and Curtis *et al.* (2009), which incorporates cities from around the world. In both cases, the authors attempted to find common elements between the cases, with tables comparing land use and transport policies, processes, funding mechanisms and leadership across cases. The next step in developing more generalisable research findings could be research that synthesises completed case studies in an attempt to find common, concepts, issues or tools.

2.3 Synthesis of Case Studies through Meta-analysis

Meta-analysis aims to derive common elements from a series of completed case studies, often in order to identify transferable lessons in the form of conditional statements, which would specify the conditions under which the statements are valid. Nijkamp *et al.* (2002, p. 1873) wrote that "Meta-analysis aims to offer a statistical underpinning for the comparison of studies within the same broad research field." A major benefit of meta-analysis is that completed case studies can be used, decreasing the time-consuming fieldwork that is characteristic of case study research. Cases can then be compared, evaluated and ranked on the basis of well-defined criteria or performance measures, and key factors that are responsible for differing results across similar studies can be identified.

Considering the difficulties in translating case study findings into generalisable lessons, the ability to distil essential concepts, issues and tools that could be applied in a broader demographic, and in different contexts, may be of great interest to policymakers. Sandelowski *et al.* (1997, p. 370) wrote that projects that aim to synthesise the findings of case studies should be recognised as an important avenue in knowledge development. Baaijens and Nijkamp (2000, p. 822) observe that meta-analysis "is particularly suitable in cases where research outcomes are to be judged or compared (or even transferred to other situations), when there are no controlled conditions". Nijkamp *et al.* (2002, p. 1870) defended case synthesis as appropriate in their study of urban revitalisation projects:

> In the light of the complexity and the heterogenous nature of PPP projects, a thorough investigation into the critical success (or failure) factors of such projects is warranted, as it may generate important and transferable lessons for urban development planning.

Their study identified some critical success factors of public–private partnership (PPP) projects in urban revitalisation. In his comparison of European TOD cases, Bertolini (1998, p.

181) tried to go beyond the "best practices" approach to station area projects in the past, to learn what could be done in a context quite different from that of its example. Bertolini *et al.* (2012) found two key distinctions between TOD cases: cases where structuring new growth is the main problem, compared to those where restructuring old growth is the issue; and having land use characteristics relatively consistent with TOD, compared to those without this pattern. These two key differences led to different levels of public support for TOD, different strategic components and different implementation approaches.

One of the challenges of synthesising case studies is integrating different types of data: interviews, surveys, observations, policy analysis, etc. As Dixon-Woods *et al.* (2005) observe, researchers need robust ways of incorporating qualitative evidence into systematic reviews. The historical preference for quantitative methods and modelling prevalent in some planning sub-disciplines, particularly transportation planning, contributes to the problem of case comparison. Some meta-analysis techniques excel in the integration of qualitative and quantitative data. Dixon-Woods *et al.* (2005) discuss a number of techniques to synthesise evidence from primary case study reports, including narrative summary, thematic analysis, qualitative metasynthesis, content analysis and cross-case techniques. A number of these methods are able to reduce qualitative data significantly, albeit at a loss of the unique richness inherent in this type of data. Yet, Sandelowski *et al.* (1997, p. 367) argue that qualitative research "appears endangered by the failure to sum it up", and that the key to understanding several studies in relation to each other may lie in recognising how they all reprise familiar stories.

Cross-case techniques in particular offer an opportunity for researchers to mine the rich case study data for common elements. Miles and Huberman (1994) wrote that two major reasons to do cross-case analysis are to enhance generalisability and to deepen understanding and explanation, particularly defining the specific conditions under which a finding will occur. Khan and VanWynsberghe (2008) proposed cross-case techniques "as a mechanism for mining existing case studies so that knowledge from cases can be put into service for broader purposes", for example, gathering evidence to modify policy. Andersson *et al.* (2002) noted that only through systematic comparisons was it possible to say anything definitive about the characteristics and types of cases they studied. In Naess *et al.*'s (2011) comparison of Copenhagen and Oslo,

> The comparison across case cities has focused on common traits as well as differences and has attempted to explain both. These explanations were first made within each case. Explanations of similarities and differences were thus based on a study of generative mechanisms and cross-cases comparison of these mechanisms. . . . (p. 287)

Van Egmond *et al.* (2003) compared the public transport systems in 22 European cities, initially using case reports and relevant documents, and data gathered in a systematic way by local experts in each city. Walter and Scholz (2007) assessed collaborative urban transport projects in five cities using reports, relevant documents and interviews with local experts.

Andersson *et al.* (2002) found that cross-case analysis was useful in identifying common themes in case studies, but their ability to generalise results was limited by the fact that the nine cases were very different and reflected observations from extensive, but non-random, data. Choosing similar cases, Nijkamp *et al.* (2002) took their analysis a step further, first identifying within-case and cross-data patterns.

Among Miles and Huberman's (1994) cross-case techniques is the use of meta-matrices, which can be used in a meta-analysis to allow the researcher to approach data (both qualitative and quantitative) in a systematic, transparent way. The visual format allows the cases to be seen together, and the process of making the matrix and narrowing down the entries/categories helps in developing explanations for the patterns. Meta-matrices can be particularly useful at an early stage of analysis as a way of organising qualitative and quantitative data from the cases. While Miles and Huberman describe meta-matrices as ideal for tracing the flow and configuration of events in a process, Dixon-Woods *et al.* (2005) criticise it as a "stifling interpretive process". Meta-matrices can only be used with cases that are similar to each other. Ragin (1987) distinguished two types of case comparisons: case-oriented and variable-oriented analysis. Case-oriented analyses first determine the distinctive configuration and flow of events within each case, then compare these across cases: the central question is in what ways the cases are alike (Khan & VanWynsberghe, 2008). Variable-oriented analyses involve determining the mutual influence of a pre-specified set of variables disaggregated from cases, but as Khan and VanWynsberghe point out, there are often too many factors associated with social phenomena to isolate.

3. Data and Methods

In this study, the authors used a meta-matrix in the meta-analysis of 11 case studies of TOD implementation. City-regions, defined as the metropolitan area within which the majority of commuters travel, were chosen because transportation planning is often conducted at a regional level or requires the cooperation of many local actors across the region. The case city-regions were chosen from a long list of possible international cases using the following criteria:

- Ample information was available on the transportation and land use policies in the city-region in the form of case study reports, original policy documents and supporting academic literature.
- The city-region had been attempting to integrate transportation and land use policy through TOD implementation for at least 20 years.
- The authors were able to engage the help of three local experts in each case.

City-regions that met these criteria were: Tokyo, Perth, Melbourne, Montreal, Vancouver, Toronto, Naples, Copenhagen, Amsterdam, Rotterdam–Den Haag and Arnhem–Nijmegen.

The use of this type of case selection criteria can be seen in other instances of cross-case analysis. Andersson *et al.* (2002) selected cases for their study on the goals of family businesses based on personal contacts, whether businesses had direct involvement of family members and whether they were located in rural villages or small towns. The authors used cross-case analysis to study interview data from nine cases they had initiated two years earlier. Nijkamp *et al.* (2002) chose PPP projects that were completed, that had a sufficient database available, and that had a substantial financial and institutional scope. Van Egmond *et al.* (2003) selected cases with a range of urban sizes and organisational/regulatory frameworks, data availability and the willingness of cities to participate in the project. Walter and Scholz (2007) selected cases of urban transport projects that were completed or near completion, with at least five actors (at least one public and one private actor) and a multi-actor approach to planning.

The authors deliberately chose a range of 'successful' and 'unsuccessful' cases according to a definition of TOD developed from the literature. TOD can be described as land use and transportation planning that makes walking, cycling and transit use convenient and desirable, and that maximises the efficiency of existing transit services by focusing development around transit stations, stops and exchanges (TransLink, 2012). TOD can be seen as part of a broader smart growth approach to urban development including new urbanism, urban infill, urban growth boundaries, historic preservation, affordable housing and inclusionary zoning (Knowles, 2012). Bertolini *et al.* (2012, p. 31) write that the TOD implementation approach in European cities has been evolving, possibly towards full-fledged embrace of American–Australian style TOD by European cities, "an approach to station area projects which reaches further than single locations, and aims at the re-centering of entire urban regions around transport by rail and away from the car". Based on the existing literature, the researchers developed the definition below:

> TOD can be described as land use and transportation planning that makes walking, cycling, and transit use convenient and desirable, and that maximizes the efficiency of existing public transit services by focusing development around public transit stations, stops, and exchanges. Successful TOD can be defined as implementation of this type of development at a regional scale.

A case report was created for each city-region based on existing case studies, policy documents and academic literature. The text was coded according to five major themes identified in the reports and supporting documents for the 11 city-regions: policy consistency, actors and their roles, connections between land use and transportation, specific policies and instruments, barriers to TOD. The coded data was then entered into the meta-matrix. As the next section describes, this process allowed us to distil critical success factors (CSFs) from the meta-matrix.

4. Case Synthesis and Results

The use of the meta-matrix in case analysis proved to be very useful in understanding the case-specific and cross-case patterns. The creation of case reports, the process of coding the reports according to the themes and entering coded data into the matrix served as a systematic method in cross-case pattern recognition. Meta-analysis of existing cases also saved considerable time that would have been spent gathering data during fieldwork in a typical multiple-case study: the meta-analysis of 11 case studies was completed over a six-month period.

The end goal of this research was to identify the practices, policies and governance models that were essential in TOD implementation: the causal mechanisms or processes at work (Maxwell, 2004). To extract these from the rich case study data, a few rules were used to create codes to analyse the case reports. Codes had to:

- identify planning processes and timelines;
- apply to all cases to minimise the number of categories included in the meta-matrix;
- indicate the role of the various stakeholders in TOD planning and implementation, and the relationships between them;
- identify factors that encouraged or inhibited TOD, including characteristics and events of each case that might be generalisable;
- apply to quantitative and qualitative data.

To accomplish this, five broad code categories were developed (e.g. Fereday & Muir-Cochrane, 2006) in an iterative process, based on the goals of this study and the literature:

- policy consistency;
- actors and their roles;
- connections between land use and transportation;
- specific policies and instruments;
- barriers to TOD.

Virtually everything written about each case could be categorised using these five broad codes. They were also useful in identifying "discrepant evidence and negative cases" (Maxwell, 2004, p. 258), for example, 'policy consistency' could be used to code text indicating a high level of consistency in one case and a low level in another. They provided a way to organise the data systematically, as described below.

The case reports were coded using five distinct colours. The coded data was then entered into the meta-matrix under the theme headings. Data was re-ordered and configured according to timelines, for example in the case of policy creation or changing relationships between the various actors involved in TOD, the coded data was placed in a time sequence to understand the flow of events. In addition, for the second code, actors and their roles, data was organised by actor, for example the transportation authority. Each case had its own column in the matrix, and could easily be compared to the other cases within a simple spreadsheet format. Following Miles and Huberman (1994), this use of a meta-matrix would be considered a case-oriented analysis since the unique characteristics of each case were determined during the process of coding and entering the data, then compared to each successive case using the visual format of the meta-matrix. Contrary to a variable-based analysis, the researchers did not begin with a pre-determined list of variables to examine across cases, but began by finding within-case patterns.

At the bottom of each column of the matrix, possible barriers or keys to success were listed. These were a direct output of coding the data for practices, policies and governance models; they were drawn from the similarities and differences between cases (Khan & VanWynsberghe, 2008). When the meta-analysis was nearing completion, a list of all the possible CSFs was created. In an iterative process (see Figure 1), this list of CSFs was then updated as data from each case was added to the matrix. As the coded data from each case was entered into the matrix, the matrix column belonging to the case was printed and filed with the case report for that city-region. This created a unique file on each case for the
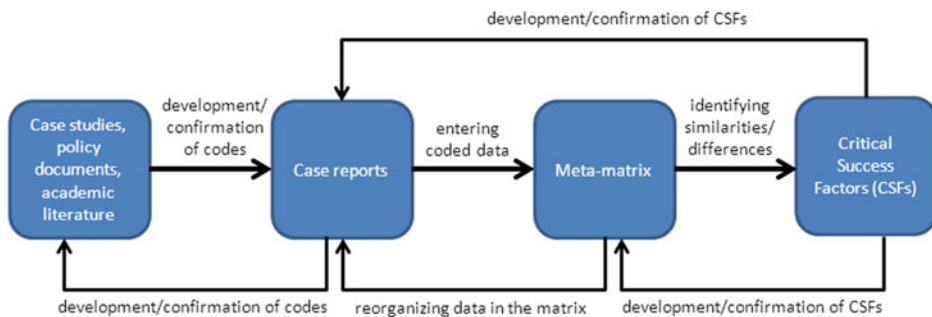

Figure 1. Research process

researchers' use, and was particularly useful in the determination of the final list of CSFs since the entire matrix was too large to view at once.

It became clear during the process of creating the meta-matrix that each city-region had its own strengths and weaknesses in the plans and policies, actors and implementation of TOD. The following section briefly describes these.

4.1 The 11 City-Regions: Patterns in Plans and Policies, Actors and Implementation

These case summaries, drawn from the meta-matrix, show the development of the CSFs (summarised in Table 1) in a case-oriented analysis. The summaries draw attention to the similarities and differences across cases that led to successful (or unsuccessful) TOD implementation across cases.

4.1.1 Tokyo. In Tokyo, land use and transportation planning policy supporting development around public transit infrastructure has been very consistent for several decades and there is a high level of national government support for TOD. However, master plans approved by the municipalities involve extensive cooperation from the private sector in the implementation stage (Chorus, 2012), mainly railway companies who have property development divisions. Planning guidelines are relatively flexible, particularly in the use of Floor Area Ratio (FAR) bonuses and transfers to achieve higher densities near targeted railway stations or in redevelopment districts.

4.1.2 Perth. In Perth, despite inconsistent land use policy and the absence of a vision for the city-region until very recently, key visionaries have advanced the idea of TOD (Curtis, 2008; Tan, 2011). Through increased collaboration among the actors involved in TOD, programmes to increase public participation and awareness such as Dialogue with the City and TravelSmart, and a high degree of willingness to experiment with new policies, Perth has implemented several TOD projects (Mouritz & Ainsworth, 2009). Transportation and land use planners have worked together through formal and informal institutional changes, although these collaborations have been unstable over the course of higher level political changes. Fragmentation of governance and different conceptions of TOD among transportation and land use planners are still major barriers to region-wide TOD efforts.

4.1.3 Melbourne. Melbourne has not yet developed a consistent vision for future growth and development: land use and transportation policy remain separate and distinct, and there is no regional land use planning authority. There is considerable fragmentation at the municipal and regional levels, with a low level of communication and coordination (Legacy *et al.*, 2012). However, there has been some informal collaboration among local government associations in the development of innovative strategies and plans. As seen in Perth, there is some willingness to experiment: in 2008 a forum was held on good governance for transport infrastructure, which brought together stakeholders to discuss and explore institutional integration and barriers to implementation. There has been some designation of transit-accessible activity centres, although many of these are in peripheral locations (Curtis & Scheurer, 2012). Public acceptance of public transit and higher densities seems to be increasing.

Table 1. Critical success factors

	CRITICAL SUCCESS FACTOR	INCREASES SUCCESS	DECREASES SUCCESS
		PLANS & POLICIES	
1	Policy Consistency	Very consistent over time in planning policy supporting TOD, e.g. specific station areas, transit corridors, and other transit-supportive and non-motorised-supportive land use planning	Very inconsistent planning policy supporting TOD, major changes over time
2	Vision Stability	Very stable vision, e.g. city-regional vision for land use–transport planning or urban sustainability	Very unstable vision, major changes over time
3	Government Support	Very good support of higher levels of government, e.g. provincial tax on gasoline to support public transit, national station location or regeneration policy, provincial funding for cycling infrastructure	No support of higher levels of government, no policies or funding
4	Political Stability (National)	Very stable national political agenda supporting TOD	Very unstable national political agenda supporting TOD, major changes over time
5	Political Stability (Local)	Very stable local (municipal or regional) political agenda supporting TOD	Very unstable local (municipal or regional) political agenda supporting TOD, major changes over time
		ACTORS	
6	Actor Relationships	Very good relationships between municipal actors at a regional scale, e.g. communication, overlap in goals and vision, roles	Poor or no relationships between municipal actors at a regional scale
7	Regional Land Use–Transportation Body	Presence of a regulatory regional land use–transport planning body	No regional land use–transport planning body (advisory or regulatory)
8	Inter-municipal Competition	No competition among municipalities for new developments/funding	Very intense competition among municipalities for new developments/funding

Table 1. *Continued*

	CRITICAL SUCCESS FACTOR	INCREASES SUCCESS	DECREASES SUCCESS
9	**Multidisciplinary Implementation Teams**	Widespread presence of multidisciplinary teams implementing TOD	Sector-specific teams (e.g. solely planners or engineers) implementing TOD
10	**Public Participation**	Very high public participation in land use–transport planning processes	No public participation, public not engaged or interested
11	**Public Acceptance**	Very high public acceptance of high densities and public transit	No public acceptance of high densities and public transit
12	**Key Visionaries**	Many influential key visionaries over time, e.g. elected, citizen or business leaders	No key visionaries over time
	IMPLEMENTATION		
13	**Site-Specific Planning Tools**	Widespread use of site-specific planning tools, e.g. FAR bonuses, leasing of air rights, density targets	No use of site-specific tools
14	**Regional Level TOD Planning**	Corridor-level planning, e.g. coordination of land use and transport in widespread transit corridors	No corridor-level or station area planning
15	**Certainty for Developers**	High degree of certainty for developers, e.g. plans and policies supporting higher densities, tools to enable mixed uses at station areas, designation of areas for development/transit corridors	Uncertainty; developers are unaware of policies, tools and sites encouraging TOD
16	**Willingness to Experiment**	Actors are very willing to experiment with new policies, practices and tools	Actors are unwilling to experiment with new policies, practices and tools

4.1.4 Montreal. Montreal has some consistent land use planning policy, particularly the use of density bonuses, long-term leases and FAR exceptions to concentrate growth around metro stations (El-Geneidy *et al.*, 2011). However, there is unstable national and provincial government support for transportation infrastructure development and governance in the metropolitan area is highly fragmented, with a large number of actors involved. Transportation and land use planning remain quite separate activities: plans and policies are developed with little collaboration between departments. There is growing public support for TOD and a number of TOD projects have been built (Adenot, 2007a, 2007b), but these are scattered across the region rather than connected in networks or developed as part of a regional strategy.

4.1.5 Vancouver. Vancouver has a very consistent and well-known regional vision, the Livable Region Strategic Plan, and high political stability at the local level. However, unstable national and provincial government support for TOD and significant inter-municipal competition for development projects and funding have limited TOD implementation (Raad & Kenworthy, 1998). The advisory regional land use planning authority works closely with the regional transportation authority in the creation of regional plans and guidelines and designation of transit corridors for both bus rapid transit (BRT) and light rapid transit (LRT) (e.g. TransLink, 2012). The use of site-specific tools, such as density bonuses and FAR transfers, is widespread and developers can easily understand the planning guidelines and tools when developing proposals for TOD projects. Public participation in planning processes is very high and support is growing for TOD (Tan *et al.*, 2012).

4.1.6 Toronto. Historically, planning in Toronto has supported higher densities around metro stations through the use of zoning incentives, however, there is no large-scale regional vision due to decades of inconsistent growth policies (Newman, 1991; Wheeler, 2010). Lack of federal and provincial government support, instability in local politics and strong inter-municipal competition for development projects have acted as barriers to TOD implementation. There is no regional land use–transportation authority, and there was no regional transportation plan or strategy until 2006. Public support for higher densities and TOD and public involvement in transportation processes are much lower than would be expected (Perl & Pucher, 1995; Grant, 2002). Although there are several notable high-density corridors with high access to public transportation and mixed-use centres even in the suburban areas of the city, TOD is limited across the region (Filion, 2001; Filion *et al.*, 2006).

4.1.7 Naples. Naples struggled for decades to approve and implement land use planning legislation (Allum, 2003). Political stability has been an ongoing problem at both the local and national levels (Gelli, 2001), there is intense competition between the municipalities and little collaboration among the various actors. However, in 1993 Naples saw the first of its key visionaries in Mayor Antonio Bassolino, who managed to close many of the city squares to traffic and garner higher level government support for key railway station developments through partnerships with the European Union (EU) (Bull, 2005). Beginning with small-scale improvements and extending to the entire region through the Regional Metro System Project of Naples and Campania (Cascetta & Pagliara, 2008; Pagliara & Papa, 2011), Naples now has widespread implementation of TOD projects,

improved collaboration between land use and transport planning, and a multidisciplinary approach to TOD implementation.

4.1.8 Copenhagen. Copenhagen's Finger Plan is an internationally known regional vision, however, poor adherence to the vision and to other TOD-supportive policies among the municipalities has resulted in much less implementation than might be expected (Hartoft-Nielsen, 2007; Naess *et al.*, 2011). A series of local government reforms in 2007 and a national directive on the Finger Plan are recent improvements supporting concentrated development around transit stations and in key areas such as Ørestad. There is strong inter-municipal competition for development, a lack of coordination among the various actors and municipalities do not have site-specific tools to adequately develop designated areas. There has been public support for inner city revitalisation projects and a growing acceptance of cycling within the inner city, but many residents still prefer to live in more suburban areas and to drive for most of their travel needs (Naess, 2005). Key visionaries supporting TOD include noted urbanist Jan Gehl.

4.1.9 Amsterdam–Utrecht. Like other Dutch polycentric city-regions, Amsterdam has seen some policy consistency and a high level of government support for TOD. Despite the position of Amsterdam and Utrecht as the North Wing of the Randstad region (the South Wing including Rotterdam and The Hague), it has seen remarkably little development of a regional vision. There is a long history of informal collaboration among the municipalities, but there is still a lack of coordination among the various actors. While TOD projects have struggled to get from planning to implementation stages (Bertolini, 1998; Tan, 2009), the region's cycling policies and programmes have a strong effect on modal shift away from the car (Schwanen *et al.*, 2004). Public participation in transportation planning processes is minimal, there have been no key visionaries advancing the concept of TOD and there is a low degree of willingness to experiment with policies or tools.

4.1.10 Rotterdam–The Hague. Rotterdam and The Hague have seen some level of policy consistency and a high level of government support for TOD over the past decades. Informal collaboration among the various municipalities and city-regions (*stadsregios* in Dutch) has become more formal through administrative platforms such as the Metropoolregio and South Wing Administrative Platform, where strategies and policies are discussed. The municipalities, city-regions and transport companies of Rotterdam and The Hague have been collaborating on regional projects such as Randstad Rail, which aims to connect the region's city centres and new housing districts through rail infrastructure, and Stedenbaan, a multi-jurisdictional agreement to coordinate land use and transportation planning in the region. A strong focus on required measures gives much more clarity to developers seeking to build near one of the Stedenbaan rail stations (Keurs *et al.*, 2012). This attempt to implement TOD at a regional scale is unique to the Netherlands and shows a high degree of willingness to experiment with governance and actor relationships (Duffhues, 2010; Meijers *et al.*, 2012).

4.1.11 Arnhem–Nijmegen. The Arnhem–Nijmegen region has seen some level of policy consistency and a high level of government support for TOD over the past decades. There is some informal collaboration among the municipalities and city-regions, particularly in the development of Stadsregiorail Arnhem–Nijmegen, which includes

frequent commuter train services between the two cities, and a BRT line. The advocacy of key visionaries, including a Member of Parliament, has been influential and images of the historical tram vision are often used in the development of a new vision for LRT. However, transportation planning remains a top-down activity because of the formal negotiation process between municipalities, regional and national authorities (Langendijk & Boertjes, 2012).

Clearly there are no 'perfectly successful' cases among these city-regions. The researchers were able to retain a lot of the richness of the case study data in the process of transferring code to case reports and to the meta-matrix. While each case has its unique contextual issues, the process of creating the case reports and the meta-matrix identified persistent cross-case patterns that exist regardless of geographic or political contexts. Other researchers have described these as CSFs (e.g. Nijkamp *et al.*, 2002; Van Egmond *et al.*, 2003), but they are just as indicative of barriers to TOD implementation.

4.2 Research Results: Critical Success Factors in TOD Implementation

As described in the case summaries, meta-analysis of the 11 cases has allowed the researchers to distil a number of CSFs that likely contribute to successful TOD implementation. These CSFs were drawn directly from the meta-matrix and are listed in Table 1. They can be further categorised into three groups: plans and policies, actors and implementation.

Many of the CSFs are well known to researchers in TOD, such as policy consistency (e.g. Stead *et al.*, 2008) and key visionaries. Indeed, many 'success stories' in TOD could be attributed in part to these two factors, Copenhagen and Vancouver being two of these. Other CSFs such as high inter-municipal competition and lack of certainty for developers are understood to be barriers to TOD implementation among municipal or regional planners, but are not discussed extensively in the TOD literature.

The meta-matrix was used to identify cross-case patterns specifically related to success, according to our definition (see Section 2). The CSFs tell us what conditions are likely to lead to successful implementation of TOD, but they also tell us about the barriers that prevent TOD from being implemented in a variety of cases. This is why Table 1 shows them as dualistic, for example, policy consistency refers to consistency or inconsistency over time in planning policy supporting TOD, with more successful cases having a higher level of consistency. Each CSF can be conceived as having a range of 'positive' and 'negative' aspects. Even in cases widely regarded as successful, low availability of site-specific planning tools, less formal regional-level TOD planning or low levels of government support for TOD were significant. It is not a situation of 'all or nothing': a case may have achieved significant TOD implementation even if it only displayed 'positive' aspects for half of the CSFs. The case summaries illustrate this.

This is somewhat liberating for policymakers: rather than a checklist of 16 items to do in order to achieve success, the CSFs offer a considerable range of options to choose from based on the opportunities and constraints presented by a specific context. Municipal/regional transportation authorities and land use departments could use this knowledge of CSFs to identify and overcome some of the barriers they face in TOD implementation. For example, they could choose to concentrate on some of the following policies and practices:

- Developing consistent policy and messaging about their land use and transportation policies.
- Developing a vision for future growth around TOD that has widespread support of the actors across the region and thus will in time become consistent.
- Developing better informal and formal relationships between municipal actors within the region with the aim of improving plans and policies.
- Creating informal land use–transportation networks where policy collaboration and knowledge exchange is supported. This may also lead to more multidisciplinary teams for TOD implementation, rather than sector-specific teams.
- Implementing widespread public engagement/dialogue on land use and transportation issues to help build interest and acceptance for TOD strategies.
- Piloting the use of key site-specific tools such as FAR bonuses or leasing of air rights.
- Developing clarification documents in collaboration with developers.
- Introducing a new policy or programme on a trial basis.

However, there are some CSFs that would require more intervention from higher levels of government, particularly government support for TOD. The political stability of governments seems to be more significant in countries such as Canada, where funding and policy support for issues such as public transit and high-density development vary widely depending on the political party in power. In countries like the Netherlands, the political stability of the country seems to have little to do with policy consistency or funding streams supporting TOD (the former being average in the Netherlands and the latter low). Countries within the EU have the benefit of an extra level of government whose policies support sustainable development and who are able to fund major infrastructure development that meets these policy goals, even if there is political instability at the local or national levels. This has been instrumental in certain cases, such as the rapid repair of disintegrating rail infrastructure, stations and station areas in Naples.

None of the case studies has positive aspects for all 16 CSFs; some combination of them worked for each of the 11 cases. Thus, in Tokyo it was possible to have widespread TOD implementation without much public participation, or in Rotterdam–The Hague regional scale TOD has developed because of strengthened actor relationships and willingness to experiment, even though the region did not have a stable vision over time. This understanding of the complexities of each case will be further developed as the meta-analysis continues with rough set analysis, a formal logic-based method (Nijkamp *et al.*, 2002; Van Egmond *et al.*, 2003; Walter & Scholz, 2007) that will help the researchers clarify which combinations of CSFs were critical to success in the 11 cases.

4.2.1 Reflections on the method.   The meta-matrices method provided a structured basis for the systematic analysis of case studies in TOD implementation. The creation of case reports based on completed research, the development and use of five codes, and the input of coded data into the meta-matrix provided two outputs that were essential in pattern detection and visually comprehensible to other researchers: the coded reports and the meta-matrix. The ability to use completed case studies in this meta-analysis enabled the comparison of 11 case studies in six months, a much shorter amount of time than would

have been required to systematically gather primary data for each case. The method also addressed a major barrier to case study synthesis: it had the ability to integrate a variety of quantitative (e.g. modal share, population, density) and qualitative data (interview quotes, policy details). Since case studies are so common in planning practice and research, there is no shortage of data that could be used in meta-analysis. Case synthesis is, as Sandelowski *et al.* (1997) argue, an important direction in knowledge development.

One potential disadvantage of the method was the inability to visualise the entire meta-matrix at one time because of the large number of columns and rows in the spreadsheet. However, the spreadsheet allowed easy on-screen comparison between cases since each case had its own column. The case report data was coded by one researcher, then discussed with the other researcher on the project. This allowed for consistency in the method, but did not provide multiple perspectives from people with different expertise. For those interested in using this method for another study in the future, several researchers could develop codes through discussion and agree upon a master code list to be used for the analysis of the reports. Alternatively, a variable-oriented analysis (Ragin, 1987) could be done, in which case the researchers would develop a list of variables based on literature or theory, then direct their meta-analysis towards these to find cross-case patterns. Another possible disadvantage is that meta-matrices are most useful at an early stage of analysis and can only be used with cases that are similar to each other (Sandelowski *et al.*, 1997), for example, similar in topic, methodological approach, data collection technique, disciplinary background or some other characteristic.

The meta-matrix was essential in revealing cross-case patterns and distilling the 16 CSFs, separating them from their geographical, social and political contexts. However, it is still unclear which of the CSFs might be more integral than others in achieving successful TOD implementation, or how they could be combined to achieve success. This will be clarified with the next phase of the meta-analysis which, as mentioned, will be carried out by means of a rough set analysis. Rough set analysis is a method that identifies deterministic rules supported by the categorically classified data available: in this case, using quantitative data from each case derived by the meta-matrix and input of local experts in each city-region. Rules take the form of 'if … then' statements ('decision rules') and reveal under which conditions a certain statement is valid. The CSFs on their own could be useful for municipalities, transportation authorities and other planning organisations in the determination of their own strengths and weaknesses. They could then choose to focus on developing the positive aspects of certain CSFs such as higher public acceptance or better relationships between land use and transportation planners.

5. Conclusions

This article began by presenting some of the problems in using case studies in practice and research, then describing case comparison, case synthesis and meta-analysis as possible solutions to these problems. Meta-analysis, including case selection and use of meta-matrices, was outlined. Finally, the case synthesis and 16 CSFs in TOD implementation were presented. The results potentially introduce new planning processes, institutional arrangements, policies and tools to planners in land use and transportation planning. It is unlikely that these CSFs in TOD implementation could have be found through analysis of a single-case study; the cross-case technique of meta-analysis showed that multiple cases reinforced each other.

This research has shown that despite the major differences in geographical, social and policy contexts, cross-case patterns in TOD implementation can be distilled in the form of CSFs. Testing the validity of these patterns will enhance the generalisability of the CSFs in other contexts outside the case city-regions. In the next phase of the research, the relationships between particular combinations of CSFs and particular TOD outcomes across the 11 cases will be further analysed by means of a rough set analysis. These CSFs have the potential to enhance planning practices among planning academics and practitioners: a later stage of this study will use workshops with Dutch land use and transportation planners to test which of the CSFs could be applied in the Dutch planning context. For example, the development of more formal collaboration between land use and transportation planners, or the use of site-specific tools to encourage private sector development in TOD, could be tested in workshops where the participants are given a scenario and asked to choose among a selection of tools, actor relationships or policies. Once the CSFs have been tested for their capability to support policy transfer and generation in the Dutch context, they could be used in similar workshops for practitioners in other cities and countries.

The use of meta-matrices in meta-analysis represents a significant step in systematic case comparison and generalisation of case study findings. This is one solution to the case study dilemma among practising and academic planners. With meta-matrices, planners now have a simple analytical tool that enables them to translate the extensive pool of existing single-case study findings into generalisable lessons.

Funding

References

Adenot, F. J. (2007a) Ville de Longueil: Place Charles-Le Moyne. Recherche URBATOD étude de cas, Département d'études urbaines et touristiques, Université de Québec à Montréal (UQAM).

Adenot, F. J. (2007b) Ville Mont-Royal: Les entreprises ferroviaires orientant le développement urbain. Recherche URBATOD étude de cas, Département d'études urbaines et touristiques, Université de Québec à Montréal (UQAM).

Allum, P. (2003) The politics of town planning in post-war Naples, *Journal of Modern Italian Studies*, 8(4), pp. 500–527.

Andersson, T., Carlsen, J. & Getz, D. (2002) Family business goals in the tourism and hospitality sector: case studies and cross-case analysis from Australia, Canada, and Sweden, *Family Business Review*, 15(2), pp. 89–106.

Baaijens, S. & Nijkamp, P. (2000) Meta-analytic methods for comparative and exploratory policy research: an application to the assessment of regional tourist multipliers, *Journal of Policy Modeling*, 22(7), pp. 821–858.

Bertolini, L. (1998) Station area redevelopment in five European countries: an international perspective on a complex planning challenge, *International Planning Studies*, 3(2), pp. 163–184.

Bertolini, L., Curtis, C. & Renne, J. (2012) Station area projects in Europe and beyond: towards transit oriented development? *Built Environment*, 38(1), pp. 31–50.

Bull, A.C. (2005) Democratic Renewal, Urban Planning and Civil Society: The Regeneration of Bagnoli, Naples. *South European Society and Politics,* 10(3), pp. 391–410.

Cascetta, E. & Pagliara, F. (2008) Integrated railways-based policies: the Regional Metro System (RMS) project of Naples and Campania, *Transport Policy*, 15(2), pp. 81–93.

Chorus, P. (2012) *Station Area Developments in Tokyo and What the Randstad can Learn from It* (Amsterdam: University of Amsterdam).

Curtis, C. (2008) Evolution of the transit-oriented development model for low-density cities: a case study of Perth's new railway corridor, *Planning, Practice and Research*, 23(3), pp. 285–302.

Curtis, C. & Scheurer, J. (2012) Benchmarking public transport accessibility in Australian cities, Paper presented at the Australasian Transport Research Forum.

Curtis, C., Renne, J. L. & Bertolini, L. (Eds) (2009) *Transit Oriented Development: Making It Happen* (USA: Ashgate Publishing, Ltd).

Dixon-Woods, M., Agarwal, S., Jones, D., Young, B. & Sutton, A. (2005) Synthesising qualitative and quantitative evidence: a review of possible methods, *Journal of Health Services Research & Policy*, 10(1), pp. 45–53.

Duffhues, J. (2010) Transportation as a means for densification—or the other way around?, Paper presented at Colloquium Vervoersplanologisch Speurwerk. Roermond, The Netherlands.

El-Geneidy, A., Kastelberger, L. & Abdelhamid, H. T. (2011) Montréal's roots: exploring the growth of Montréal's indoor city, *Journal of Transport and Land Use*, 4(2), pp. 33–46.

Fereday, J. and Muir-Cochrane, E. (2006) Demonstrating rigor using thematic analysis: A hybrid approach of inductive an deductive coding and theme development. *International Journal of Qualitative Methods*, 5(1), pp. 80–92.

Filion, P. (2001) Suburban mixed-use centres and urban dispersion: what difference do they make? *Environment and Planning A*, 33(1), pp. 141–160.

Filion, P., McSpurren, K. & Appleby, B. (2006) Wasted density? The impact of Toronto's residential-density-distribution policies on public-transit use and walking, *Environment and Planning A*, 38(7), pp. 1367–1392.

Flyvberg, B. (2001) *Making Social Science Matter: Why Social Inquiry Fails and How It Can Succeed Again* (Cambridge, UK: Cambridge University Press).

Gelli, F. (2001) Planning systems in Italy within the context of new processes of 'regionalization', *International Planning Studies*, 6(2), pp. 183–197.

Grant, J. (2002) Mixed use in theory and practice: Canadian experience with implementing a planning principle, *Journal of the American Planning Association*, 68(1), pp. 71–84.

Hartoft-Nielsen, P. (2007) Deconcentration of workplaces in greater Copenhagen—successes and failures of location strategies in regional planning, in: E. Razin, M. Dijst & C. Vaquez (Eds) *Employment Deconcentration in European Cities*, Springer GeoJournal Library 91, pp. 53–87. (Dordrecht, The Netherlands: Springer).

Keurs, K., Maat, K., Rietveld, P. & De Visser, G. (2012) Transit oriented development in the Randstad South Wing: goals, issues and research, Paper presented at the Building the Urban Future and Transit Oriented Development Conference. Paris.

Khan, S. & VanWynsberghe, R. (2008) Cultivating the under-mined: cross-case analysis as knowledge mobilization, *Forum: Qualitative Social Research*, 9 1. Article 34. Available at http://www.qualitative-research.net/index.php/fqs/article/view/334/729

Knowles, R. D. (2012) Transit oriented development in Copenhagen, Denmark: from the finger plan to Ørestad, *Journal of Transport Geography*, 22, pp. 251–261.

Langendijk, A. and Boertjes, S.(2012) Light Rail: All change please! A post-structural perspective on the global mushrooming of a transport concept. *Planning Theory*, 12(3), pp.290–310.

Legacy, C., Curtis, C. & Sturup, S. (2012) Is there a good governance model for the delivery of contemporary transport policy and practice? An examination of Melbourne and Perth, *Transport Policy*, 19(1), pp. 8–16.

Maxwell, J. A. (2004) Using qualitative methods for causal explanation, *Field Methods*, 16(3), pp. 243–264.

Meijers, E., Hollander, K. & Hoogerbrugge, M. (2012) *Case Study Metropolitan Region: Rotterdam-The Hague*, European Metropolitan Network Institute: European Regional Development Fund (The Hague, The Netherlands: European Metropolitan Network Institute).

Miles, M. B. & Huberman, A. M. (1994) *Qualitative Data Analysis: An Expanded Sourcebook* (Thousand Oaks, CA: Sage Publications).

Mouritz, M. & Ainsworth, L. (2009) Successful delivery mechanisms: coordinating plans, players and action, in: C. Curtis, J. L. Renne & L. Bertolini (Eds) *Transit Oriented Development: Making It Happen* (USA: Ashgate Publishing, Ltd), pp. 171–183.

Naess, P. (2005) Residential location affects travel behavior—but how and why? The case of Copenhagen metropolitan area, *Progress in Planning*, 63(2), pp. 167–257.

Naess, P., Strand, A., Naess, T. & Nicolaisen, M. (2011) On their road to sustainability?: *The challenge of sustainable mobility in urban planning and development in two Scandinavian capital regions*, *Town Planning Review*, 82(3), pp. 285–316.

Newman, P. (1991) *Toronto and Vancouver Land Use - Transit Success Stories. Case Studies Index* (Melbourne, Australia: Murdoch University).

Newman, P. (2007) Planning for Transit-Orientated Development in Australian Cities, *BEDP Environment Design Guide 2*, pp. 1–11.

Nijkamp, P., van der Burch, M. & Vindigni, G. (2002) A comparative institutional evaluation of public-private partnerships in Dutch urban land-use and revitalisation projects, *Urban Studies*, 39(10), pp. 1865–1880.

Pagliara, F. & Papa, E. (2011) Urban rail systems investments: an analysis of the impacts on property values and residents' location, *Journal of Transport Geography*, 19(2), pp. 200–211.

Perl, A. & Pucher, J. (1995) Transit in trouble? The policy challenge posed by Canada's changing urban mobility', *Canadian Public Policy*, 21(3), pp. 261–283.

Raad, T. & Kenworthy, J. (1998) The US and us, *Alternatives Journal*, 24(1), pp. 14–22.

Ragin, C. C. (1987) *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies* (Berkeley: University of California Press).

Sandelowski, M., Docherty, S. & Emden, C. (1997) Qualitative metasynthesis: issues and techniques, *Research in Nursing and Health*, 20(4), pp. 365–371.

Schofield, J. W. (2002) Increasing the generalizability of qualitative research, in: A. M. Huberman & M. B. Miles (Eds) *The Qualitative Researcher's Companion* (Thousand Oaks, CA: Sage Publications), pp. 171–204.

Schwanen, T., Dijst, M. & Dieleman, F. M. (2004) Policies for urban form and their impact on travel: The Netherlands experience, *Urban Studies*, 41(3), pp. 579–603.

Stead, D., De jong, M. & Reinholde, I. (2008) Urban transport policy transfer in Central and Eastern Europe, *Disp: The Planning Review*, 44(172), pp. 62–73.

Tan, W. (2011) NICIS KEI Case Study #1: Perth, Western Australia.

Tan, W. G. Z. (2009) Policy context of key transit-oriented projects for station locations within the Netherlands, Paper presented at TU Berlin, Centre for Metropolitan Studies.

Tan, W., Bertolini, L. & Janssen-Jansen, L. (2012) The role of implementation barriers and institutional incentives in transit-oriented development: the cases of Perth, Portland and Vancouver, Paper presented at the AESOP 26th Annual Congress. Ankara, Turkey.

TransLink (2012) *Transit-Oriented Communities Guidelines. Creating More Livable Places Around Transit in Metro Vancouver* (Vancouver: TransLink).

Van Egmond, P., Nijkamp, P. & Vindigni, G. (2003) A comparative analysis of the performance of urban public transport systems in Europe, *International Social Science Journal*, 55(176), pp. 235–247.

Walter, A. I. & Scholz, R. W. (2007) Critical success conditions of collaborative methods: a comparative evaluation of transport planning projects, *Transportation*, 34(2), pp. 195–212.

Wheeler, S. M. (2010) The evolution of urban form in Portland and Toronto: implications for sustainability planning, *Local Environment: The International Journal of Justice and Sustainability*, 8(3), pp. 317–336.

Yin, R. K. (1981) The case study crisis: some answers, *Administrative Science Quarterly*, 26(1), pp. 58–68.

Yin, R.K. (1994) *Case Study Research: Design and Methods*, 2nd Ed. (Thousand Oaks, CA: Sage Inc.).

Yin, R. K. & Heald, K. A. (1975) Using the case survey method to analyze policy studies, *Administrative Science Quarterly*, 20(3), pp. 371–381.