



An Analysis of Social Infrastructure and City Competitiveness – Synthesis and Key Findings

***Final Report for the City of Ottawa/
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Executive Summary

This research initiative set out to answer a fundamental research question:

Can you measure the outcomes of individual infrastructure investments for productivity and competitiveness at the level of a city or urban region and if so, how? And to what extent do municipal governments already do so? Or, alternatively, have cities engaged in investments that were specifically meant to develop the competitiveness of the local economy and that have been or could be measured against their stated goals?

By way of a wide-ranging survey of theoretical and empirical literature, it became clear that these issues had not often been addressed from the perspective of a city or urban area, and had certainly not been satisfactorily answered. Nor was there enough quantitative background research to allow the direct specification of statistical models as a research strategy. Econometric studies have yielded a number of insights as to the impact of infrastructure on local factor productivity, but have said little on measuring attainment of “competitiveness” or identifying the channels by which productivity gains are so achieved.

Nevertheless, there appeared to be enough of an emerging consensus in the literature for this effort to identify a qualitative model of the impacts of infrastructure investments on urban competitiveness and to base a research methodology on that structure.

The literature yielded, first, a series of observations that allowed a characterization of infrastructure, “social infrastructure,” and the nature of its potential role in the economic competitiveness of an urban region or city.

Second, the mainly qualitative literature yielded a reasonable but restricted number of indicators covering: urban competitiveness and competitiveness itself; “drivers” or necessary conditions for competitiveness; and productivity and the underlying quality of life and quality of infrastructure and municipal services.

The literature pointed to a framework within which to assess three general types of investments, with respect to their relationship to the geographical area and their function in supporting competitiveness: “*external network infrastructure*”; “*local network Infrastructure*”; “*in-place infrastructure*.”

It was further determined that investments may be characterized as to their orientation to the external trading sector, or local economy. In following linkages between investments and outcomes, it is noted that a particular investment may have either direct or indirect impacts: specifically and directly supporting the sectors of the local economy that is engaged in trade with external economies; or indirectly supporting the trading sector via impacts on the local economy.

These insights allowed the development of a theoretical model and research methodology suitable to the questions at hand, via adaptation of several existing models of factors and relationships affecting urban competitiveness that represented a reasonable consensus view from the literature.

This synthesis of the literature and consequent development of a model represents an advance in the theoretical understanding of urban competitiveness, which can be used in the future to help guide decision-making and performance measurement.

The model and methodology allowed the researchers to specify a set of questions. The answers to these questions were pursued by in-depth case studies, involving documentation of the investments by the participating municipalities, what other data was available from other sources, and by expert interviews, mainly with senior city staff. The questions, in summary form, were:

- Did the case studies identify specific strategies and investment plans directly linked to the larger strategy or economic development plans?
- Were the specific investments intended to relate to competitiveness?
- Irrespective of intentions, did the case study investments have potential or observable competitive effects?
- Did the investments have direct effects on competitiveness?
 - Did they affect fundamentals/drivers, with probable or future effects on competitiveness?
 - What about the extent to which you could connect, observably or otherwise, strengthening of the local economy to competitiveness?

And finally:

- Were the intended outcomes of the investments defined and measured? Specifically, what measures and data, relevant to the particular investment, as suggested by our theoretical and empirical review, exist in current municipal studies or could be obtained from local-level data obtainable from the municipality or elsewhere?

Key Findings of the Case Studies

Several of the study's key findings relate to matters of governance and decision-making structures.

In general, the case studies show that the cities studied have recently moved from a relatively reactive model of planning to more strategically-oriented planning over time and now explicitly include, and in fact emphasize, economic competitiveness and its link to infrastructure and other investments in their planning documents. Evidence suggests that this theme is beginning to permeate across city corporations and greater consideration is starting to be given to how certain investments might or might not contribute. However, and as might be expected, the state of strategic planning varies in terms of how well coordinated other municipal decision-making processes are both integrated into and support the strategic planning process.

Competitiveness is not the only, or even the primary, driver of investment decisions. Also, the degree to which each city has taken steps to direct key infrastructure investments towards fulfilling that agenda varies, although in all cases this shift is still relatively new.

A key contribution of this research is the recognition of how governance processes influence decision-making and how this may in future relate to the successful pursuit of urban competitiveness.

In particular, the municipal capital budgeting process seems to be fundamental to the successful implementation of a city's competitiveness strategy. The extent to which corporate strategic objectives are explicitly considered in formulating the budget determines the potential of major investments to purposefully support a city's competitiveness agenda. This follows from the direct observation that initiatives designed with competitiveness effects as the goal are likely to have the most directly observable impacts.

Related to this is the critical influence of federal and provincial policies and practices. Municipal infrastructure investment decisions are often driven by federal and provincial funding conditions. Cities are embracing the concept of strategic planning towards defined objectives including improved competitiveness. Certainly, it is important that where local governments have clearly defined strategic plans for decision-making, that those plans be respected and, better yet, that there be improved coordination of multi-government planning and decision-making regarding infrastructure.

A third key finding on governance is the general lack of data to support analysis of both decision-making and post-investment performance assessment, particularly in terms of whether a particular investment demonstrated the intended support for strategic objectives. Particularly surprising was that in general there were no apparent expectations for post-investment assessment by any of the funders. This is a potentially significant obstacle to implementation of effective strategic investment practices.

This research has identified a qualitative and strategic model that can be adapted to guide decision-making on infrastructure investments where a goal is economic competitiveness. The same model, therefore, could logically guide the collection of data and analysis in assessing, *ex post*, the performance of the investment. However, just as more effective investments would follow from increased coordination of funding and planning across levels of government, more effective assessment of results could follow if the funding partners could agree on common data collection agendas, agencies and approaches.

A number of findings as to the relative effectiveness, in terms of enhancing city competitiveness, of differing types of investment may provide assistance to policy-makers and planners.

First of all, and fundamentally, the research found that most of the investments reviewed had their connection to economic development via increasing the value of human capital as it relates to production. This argues for the general irrelevance, from an analytical and policy perspective, of the old labels or "hard" versus "social" infrastructure and highlights the importance of viewing infrastructure investments, where competitiveness is the goal, in terms of their precise functional impacts on the efficiency and supply of human capital.

Second, if improved competitiveness is the goal, it is important to define how investments will support this goal as part of a deliberate strategy and aimed at specific targets and sectors. The theoretical model developed in this research study will be of use to such planning processes because it explicitly links how decisions are made to the intended outcomes.

Third, similarly well-targeted strategies may be required to manage the pressures of growth that may accompany competitive success. This will be particularly important where high growth rates impact on the affordability of housing, the environment, and the general quality of life for all residents. Because competitiveness is clearly and intimately linked to urban quality of life, both as an expected outcome as well as a determining factor of attractiveness to support increased competitiveness, attention to the social and environmental aspects of growth should logically be seen as part of a competitiveness strategy.

The importance of system-wide approaches to infrastructure and the relative unimportance of scale, for discrete investments, were highlighted in the case studies. In general, for large-scale infrastructure such as transit or housing, attention to complete systems of infrastructure, oriented in function and location toward support of planned city/business growth, is important as opposed to unconnected, discrete and/or unfocused investments. At the same time, the Ottawa Broadband initiative showed that relatively small-scale investments can have significant impacts on competitiveness when aligned to improving the overall system of competitive infrastructure. The relatively large-scale Sheppard subway line did not have similar effects mainly because it was not well-positioned to support an overall transit strategy.

The research also highlighted what appears to be an importance of physical proximity or connection of infrastructure to the locations at which the externally competitive production takes place. This is particularly important when new economic development occurs in deliberate or de facto industrial and research clusters. As it stands, there appears to be little linkage between the needs of identifiable externally competitive industries and the *overall* pattern of transit, housing and other large-scale infrastructure.

Finally, the research found that most of the investments reviewed had their connection to economic development via increasing the value of human capital as it relates to production. This argues for the general irrelevance, from an analytical and policy perspective, of the old labels or “hard” versus “social” infrastructure and highlights the importance of viewing infrastructure investments, where competitiveness is the goal, in terms of their precise functional impacts on the efficiency and supply of human capital.

An Analysis of Social Infrastructure and City Competitiveness – Synthesis and Key Findings

1. Introduction

This summary report represents the culmination of a research program conceived in 2005. This research program is one of a number funded under the Infrastructure Canada Knowledge-building, Outreach and Awareness (KOA) research program.

In calling for proposals, Infrastructure Canada (INFC) identified three research priorities: communities, cities and public Infrastructure; the economic, social, cultural and environmental impacts of public infrastructure; and governance issues related to public infrastructure.

In particular, the research proposal addressed an interest in how infrastructure investment decisions are made, from the perspective of how municipalities choose to make one investment over another. In part, this interest was based on questioning how investments in social infrastructure such as housing and community facilities can compete with the need to continue to invest in traditional “hard” infrastructure such as roads and sewers.

The research team had a long involvement in the area of housing and urban systems. Reflecting these interests and responding to the INFC priorities, the research proposal was framed around the notion of examining various types of infrastructure investment, with a focus on social infrastructure, and attempting to relate this to emerging interest in the competitive positioning of cities as drivers of economic growth in a post-industrial global economy.

The proposed research agenda was planned to:

- increase awareness and understanding of a broader definition of infrastructure;
- build and expand an understanding of the nature and impact of investment in social infrastructure such as housing;
- identify key indicators that will facilitate measurement of these impacts and help to support improved and informed decision-making about infrastructure investment;
- test a measurement model developed across a range of Canadian cities;
- identify the public policy implications of the research findings, including governance issues, to help improve future investment decisions and the ongoing management of infrastructure; and
- disseminate findings to municipal employees and elected officials.

The research and outreach activities were planned with three phases, commencing in the summer of 2005:

Phase 1. Identifying the current state of knowledge – with particular reference to how infrastructure investment is conceived and defined. This focused on recent work that has framed this definition in the broader terms being suggested here, that is, encompassing social infrastructure.

Phase 2. Developing a model to measure the impacts of infrastructure. This first explored the existing literature of the concept of how cities compete and the role of infrastructure investment in facilitating competitiveness. This model was subsequently used to identify the key drivers and fundamentals that influence city competitiveness, with a particular focus on the role of infrastructure investment.

Phase 3. Broadening understanding of how infrastructure benefits cities. It was intended that, consistent with the objectives of INFC and the KOA program, the research insights would be shared with senior city elected officials across a variety of cities and with provincial and federal officials with a view to enhancing understanding among these decision-makers about the value of all forms of public infrastructure.

1.1 Why Focus on Competitiveness

In developing the original research proposal, the research team identified an increasing awareness and interest in the role of cities as engines of economic growth. This was identified both in the academic literature (e.g. Krugman, 1994; Kresl and Singh, 1999; Kresl, 2002; Parkinson, 2002; Begg, 2002; and summarized in Maclennan, 2006) as well as in more populist debates.

The last 20 years have seen new notions of labour (as human capital) and capital (as a catalyst for innovation) pervade economic thinking. There has been much less attention to “land” related factors such as planning, land use, housing and infrastructure. These are serious omissions because it is often such policy areas, much influenced by local and provincial governments, that shape the local response to the global competitive challenge. Governments have come to recognize that these sectors can have key impacts on growth and productivity, not just for subsets of places within a city but for the metropolitan region and the nation as a whole.¹

Certainly, leaders of Canada’s major cities have articulated increasing concerns about their capacity to manage growth and infrastructure renewal:

Successful economies are measured on their ability to generate wealth through innovation and to attract the labour and capital required to support the knowledge economy. Canada’s ability to be competitive, innovative and productive is increasingly being linked to its cities. Cities contribute to the economy in several ways, in addition to the assets they house and quality of place they provide; they also attract businesses and skilled workers.²

¹ City of Ottawa KOA Research Proposal, January 2005.

² Federation of Canadian Municipalities. 2006. *Our City’s, Our Future: Addressing the Fiscal Imbalance in Canada’s Cities Today. Big City Mayors’ Caucus, June 2006.* Although published after the start of the project, this quote captures the dialogue that was already evident at the time of the project formation.

Thus, while there was much rhetoric on the role of cities and more particularly the need for federal funding to preserve and enhance the competitive role of cities, there was a lack of empirical research to support these assertions. Nor is there much analysis on the economic consequences of infrastructure investment in general, and specific types of infrastructure investment in particular. The planned research sought to contribute to closing this knowledge gap.

2. Research on the Nature of “Social Infrastructure”

2.1 Defining the Issues

An initial set of research papers summarized an extensive review of existing literature:

1. *Social Infrastructure for Competitive Cities* – an examination of how infrastructure is defined and how this definition is evolving.
2. *Cities, Competition and Economic Success* – reviewing the basis for city competitiveness and how this contributes to successful cities.
3. *Connecting Infrastructure, Cities and Competitiveness* – drawing on preceding work, this paper sought to connect competitiveness and Infrastructure, and particularly social infrastructure.
4. *Moving towards Sustainability: City-Regions and Their Infrastructure* – examined the dynamics of growth against the need to balance the economic, political and social demands of their residents.

The key findings drawn from this background research were:

- Infrastructure is most usefully defined as representing hard assets, as a platform from which services are supplied and demanded.
- For analysis of urban competitiveness, both “traditional” and “social” infrastructure is meaningful. Both relate to different types of physical assets. Thus a distinction between the two, particularly in a modern economy where enhancing the value of human capital is a key concern, is essentially meaningless.
- Investments supportive of human capital can, in this context, be described as either attracting human capital and business to the local economy, or improving the productivity of the existing human capital, both in the local economy and in the competing export economy.
- The competitive advantage of a local economy lies in the capacity of local firms to compete externally.
- A local government may hinder or facilitate this competitiveness, but in a global economy where most factors of production are mobile, a local government does have the scope to build persistent competitive advantages based on unique local characteristics of capital and labour.

- Competitiveness is distinct from productivity, although related, and refers to the long-term ability of the urban area to exploit its competitive advantages for gains from trade, while supporting sustained growth in incomes and employment.³

The key analytical concept for this project is that it is becoming important to identify the effects of infrastructure investment on, and the channels by which the effects are transmitted to, a city's trade in goods and services with distinct external local or international economies.

In order to examine this concept we must have an acceptable definition of “urban competitiveness.” A number of definitions have been suggested in the literature, and generally propose a balance of productivity, success in external markets and local income and employment growth. MacLennan quotes the 1999 European Commission's definition, which we have adopted for the purpose of this research:

Competitiveness is defined as the ability to produce goods and services which address the needs of international markets, while at the same time maintaining high and sustainable levels of income, or, more generally, the ability of (regions) to generate, while being exposed to external competition, relatively high income and employment levels.

This definition is rooted firmly in the concept that competitiveness is premised on interaction with external economies with implications for the local economy driven by these interactions.

For the purposes of this study, competitiveness is measured by the ability of the city or urban area to increase local income and wealth.

2.2 Refining the Research Questions

This phase of background research provided useful insight and suggested a need to refine the core research questions. In particular, the original research plan envisioned empirical analysis and econometric modeling to map and quantify the relationships between certain types of infrastructure investment and outcomes in terms of city competitiveness.

Explorations of existing empirical research identified a core body of research focused on the relationship between infrastructure and productivity, with a particular reference to the impact of public investment on the aggregate private output. Swimmer (1993) highlighted a trend associating a decline in productivity growth across all G7 countries with a concurrent decline in the proportion of nations GDP devoted to infrastructure investment. Although in seminal research in the late 1980s, Aschauer (1989) had posited a positive relationship between public infrastructure investment and aggregate private productivity, this was contested in later work.⁴

³ Productivity refers to a measurement of output relative to a unit of labour input or time (value divided by time) and is readily quantified; competitiveness is a much broader concept and is less specifically quantified.

⁴ Aschauer, David A. 1989. *Public Investment and Productivity Growth in the Group of Seven – Economic Perspectives*.

Detailed analysis in the early 1990s failed to categorically confirm a positive relationship between public investment and productivity growth. While many studies had attempted to get at this question, results were uneven and inconclusive. An important consideration is that much public investment goes to improving environmental and other goals that are not captured in national output measures. Munnell (1992) in particular noted that aggregate productivity outputs cannot be used to guide actual investment spending decision.⁵ She asserted that only cost-benefit studies at the project investment level can determine which specific projects merit implementation.⁶

Various cost benefit analyses on specific major infrastructure projects were also found lacking in their capacity to account for numerous externalities. The inconsistent outcomes of research that sought to quantify aggregate impacts of infrastructure spending suggested that disaggregated studies at a local or even metropolitan scale would face even more serious methodological challenges. It would be extremely difficult to segment the contributions of discrete specific forms of infrastructure on aggregate outcomes at the metropolitan scale. Thus a case study approach to identify specific linkages and effects is necessary to determine impacts and elements of this could potentially be included in an assessment framework to evaluate the business case for a specific investment.

This methodological challenge is most aptly captured by Mattoon (2004):

Assessing the contribution of infrastructure to economic growth is inherently a messy and often unsatisfying exercise. The analysis defies the use of a single statistical technique and relies heavily on good judgment and knowledge of the local economy. Proper assessment requires understanding how the infrastructure will interact with key sectors of the economy and recognizing that there is a spatial component to the analysis. Infrastructure that benefits one jurisdiction may well hurt another locality.⁷

2.3 A Revised Approach

The review of empirical research led to the following conclusions:

- Econometric studies have yielded a number of insights as to the impact of infrastructure on local factor productivity, but have said little on measuring attainment of “competitiveness” or identifying the channels by which productivity gains are so achieved.
- Turning to qualitative studies has yielded a reasonable but restricted number of indicators covering:
 - Urban competitiveness and competitiveness itself (measures of the state of the ultimate target);

⁵ Munnell, A. 1992. “Policy Watch: Infrastructure and Economic Growth.” *The Journal of Economic Perspectives* Vol 6, No. 4. pp. 189-198.

⁶ This insight was confirmed in the case studies undertaken in the current research; the investigation found that while common criteria can be developed, each case must be examined on an individual basis.

⁷ Mattoon, R. 2004. *Infrastructure and State Economic Development: A Survey of the Issues*. Proceedings of the Statistics Canada Economic Conference 2004. Ottawa, June 2004.

- “Drivers” or necessary conditions for competitiveness; and
- Productivity and the underlying quality of life and quality of infrastructure and municipal services.
- The estimates and measures thus uncovered can assist in structuring attempts to measure changes in local competitiveness and to focus on the key channels by which specific investments have affected these changes.
- We can use the examples of distinct city development strategies to identify the logic (although not the quantification) of specific investments or programs.

The literature pointed to a framework within which to assess three general types of investments, with respect to their relationship to competitiveness:

- “*External network infrastructure*,” facilitating the interaction of the local trading economy with external economies and networks;
- “*Local network infrastructure*,” such as road, transit and water systems, distributing services and people across the area; and
- “*In-place infrastructure*,” such as housing, educational facilities, industrial parks, and public amenities, which provide the basis for localized benefits and capture of externalities.

It was further determined that investments may be characterized as to their orientation to the external trading sector, or local economy, as well as by their physical/geographical orientation to delivering benefits in a specific location or via a network.

In following linkages between investments and outcomes, it is noted that a particular investment may have either direct or indirect impacts:

- Specifically and directly supporting the sectors of the local economy that are engaged in trade with external economies; and
- Indirectly supporting the trading sector via impacts on the local economy through enhancement of the labour supply, the supply of locally-produced goods and services, and the general health, safety, attractiveness and image of the city.

A number of questions about any discrete investment, or set of investments, were drawn from the literature and form the core of a model and methodology whereby this study identified a sample of cities’ economic strategies, and then examined specific investment in that context. Questions about governance were included from the perspective of how the investment decision-making process, from budget allocation to implementation, supported the desired outcomes in the economic strategy, to how the actual impacts of the investments were measured.

A list of indicators of competitiveness and its underlying “drivers” was also drawn from the literature. This list was used to assist in the identification of impacts and outcomes, where data exists, as well as in identifying data, which, if not currently available, should be collected in the future.

Finally, the potential application of the methodology was tested with an existing municipal economic strategy (Ottawa) and found to fit well, as many of the key questions are addressed in that city's strategic planning documents. This confirmed that the methodology would lend logic and structure to the investigation of the effects of discrete investments in the course of case studies.

This revised approach required a fundamental reconfiguration of the primary research question. Research by Bradford, suggested a possible alternative formulation of this project's summary research question, **from:**

Can you measure the outcomes of individual infrastructure investments for productivity and competitiveness at the level of a city or urban region and if so, how? And to what extent do municipal governments already do so?

to:

Have cities engaged in investments that were specifically meant to develop the competitiveness of the local economy, that have been or could be measured against their stated goals?⁸

This reformulation of the research question enabled the research team to explore the logic of the connection of an investment or program of investments to a city's competitiveness strategy and position, as well as what, if any, governance systems were in place to support decision-making to achieve the desired goals.

3. The Theoretical Model: Identifying Links and Measuring Outcomes

The analytical framework adopted in this research is primarily qualitative and follows conceptualizations by several key research reports that stand well as expressions of an evolving consensus view in the literature. The reviewed documents making the closest link to productivity and competitiveness are the *State of the English Cities* document and website and two chapters in Begg's volume, *Urban Competitiveness: Policies for Dynamic Cities*, based on United Kingdom and North American findings.⁹

The underlying structure, methodology and results of the selected analyses of urban competitiveness were summarized, followed by summaries of the measures used for competitiveness itself and for the drivers and underlying factors of competitiveness.

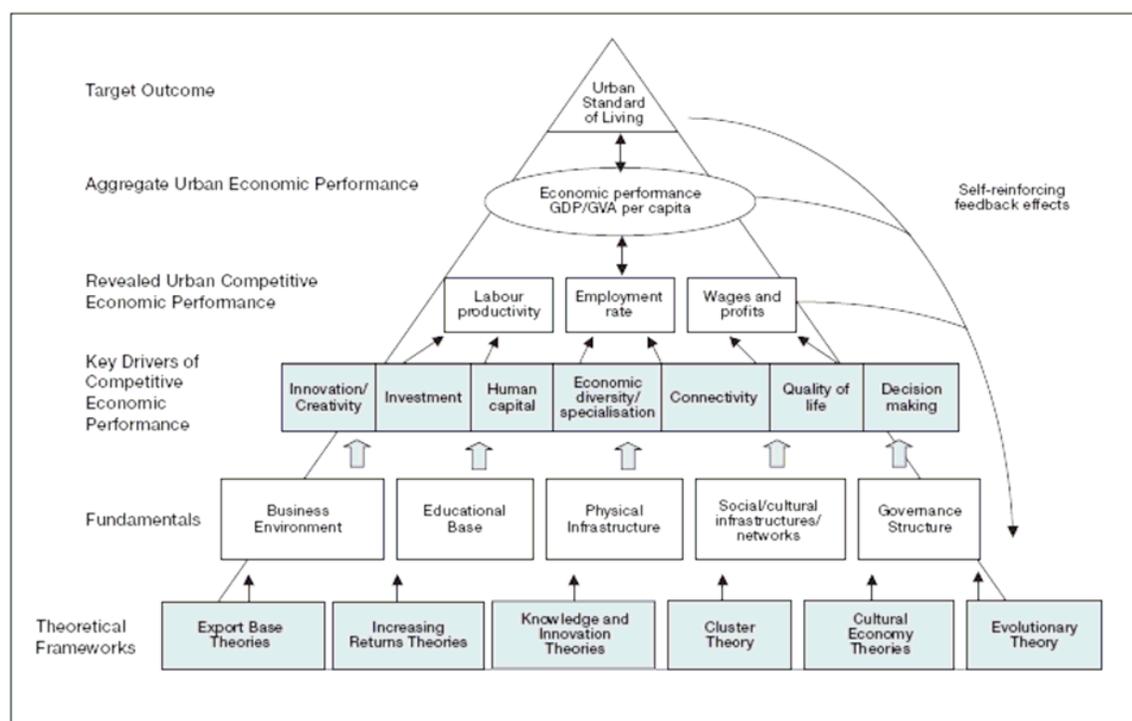
⁸ Bradford, Neil. 2003. *Cities and Communities that Work: Innovative Practices, Enabling Policies*. Ottawa: Canadian Policy Research Networks.

⁹ Kresl, Peter. 2002. "The Enhancement of Urban Competitiveness: The Case of Montreal." In Iain Begg (ed.). *Urban Competitiveness: Policies for Dynamic Cities*. Bristok, UK: The Policy Press; Office of the Deputy Prime Minister, UK. 2006. *State of the English Cities*. Volume 1; Deas, Iain, and Benito Giordano. 2002. "Locating the Competitive City in England." In Iain Begg (ed.). *Urban Competitiveness: Policies for Dynamic Cities*. Bristol, UK: The Policy Press.

These sources and other theoretical literature are discussed in the paper for this research project – *Urban Competitiveness and Infrastructure Investments: Model and Analytical Framework*. See, for this and other project papers, the project website:

http://ottawa.ca/residents/housing/infrastructure/research_program_overview_en.html.

Figure 1. Conceptualizing Urban Competitive Performance



Source: Framework from *State of the English Cities, Volume 1* (Office of the Deputy Prime Minister, UK: 2006: 67).

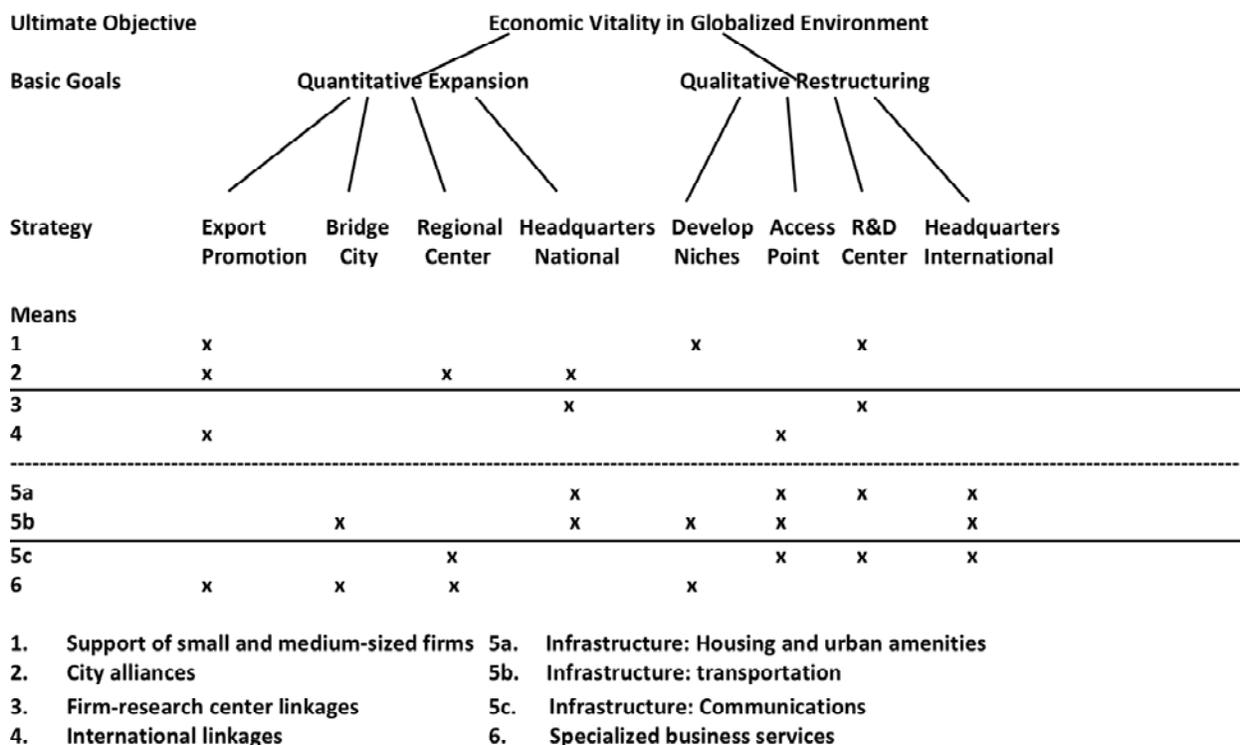
The most aggregated measures of urban competitive advantage concern a city’s standard of living, conventionally captured by GDP per capita. Underpinning measures of aggregate performance are measures of urban competitive advantage – namely productivity, the employment rate, wage levels and profit rates.

These are in turn the outcome of the key “drivers” of urban competitive performance – innovation, investment, human capital, economic structure, connectivity, quality of life and the structures of decision-making (governance). The drivers are themselves the outcome of more basic underlying determinants – a city’s business environment, educational base, urban social and cultural infrastructure and governance structures and organization.

Augmenting this, Kresl’s framework seeks to characterize and explain how certain activities and strategies enhance city competitiveness (or more correctly the competitiveness of a particular city’s urban economy).

Kresl outlines two approaches in thinking about urban competitiveness. In the first, which seeks to quantify competitiveness, he converges on three primary indicators (value of manufacturing added; retail sales; and number of business services) supported by a broader set of variables that exhibited strong correlations with these outcomes indicators.

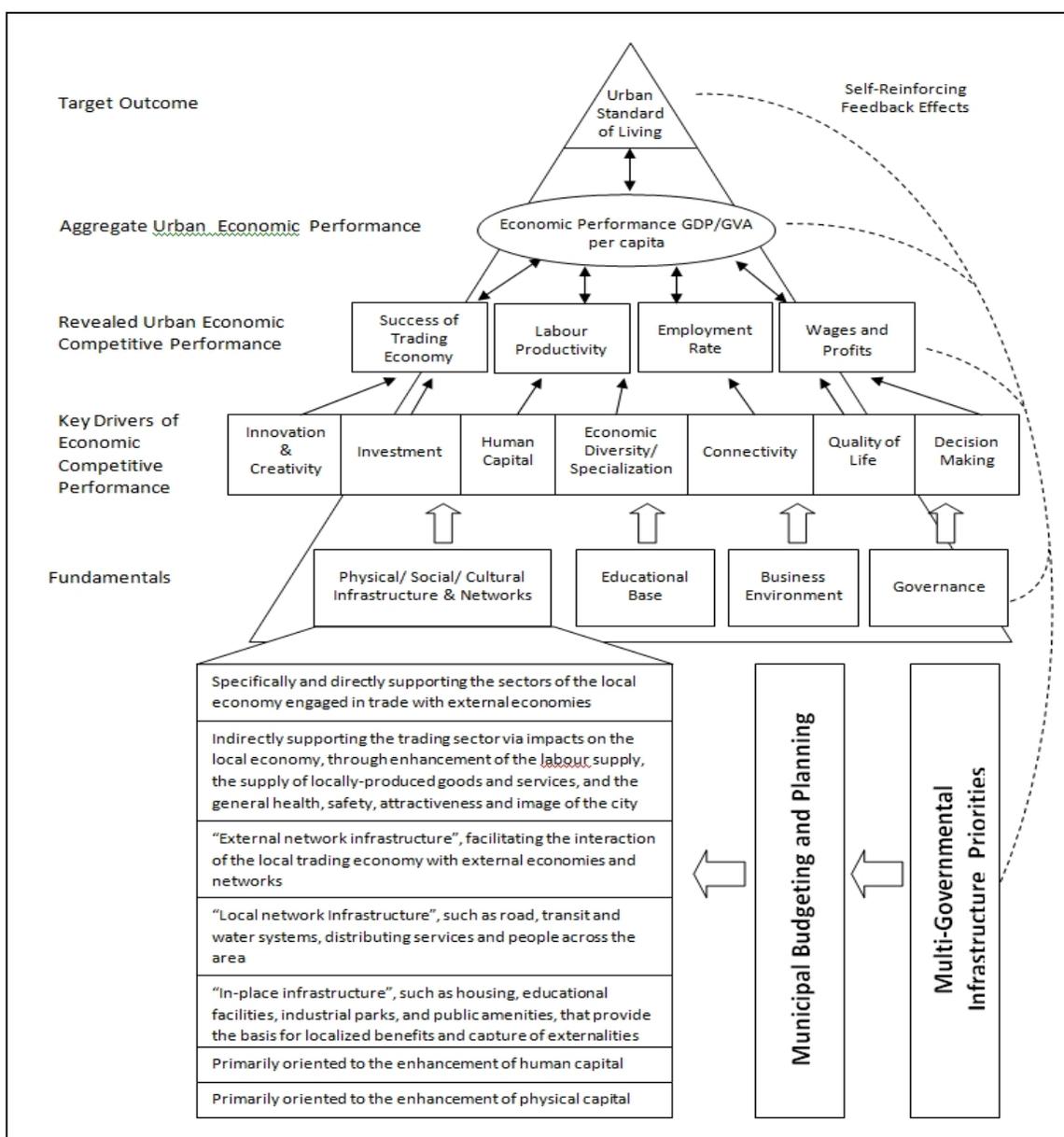
Figure 2. Strategic Model, Set Out by Kresl, for a Hypothetical City



Kresl’s second approach is more qualitative and involves mapping likely connections and relationships, although it is not possible to quantify these as data is not readily available (certainly not on a comparable basis). Kresl’s qualitative approach, presented diagrammatically above, illustrates the relationship and flows. This is a hierarchical framework beginning at the top with an overall objective (e.g. to increase economic vitality) and relates to basic goals. Kresl distinguishes two basic goals – a quantitative expansion of existing activities and a qualitative restructuring to refocus on new activities (especially relevant in transformation from an industrial to post-industrial economic base). In the project case studies, both goals are encompassed.

We have adapted (below) the work of the *State of the English Cities* and Kresl’s framework to develop a wiring diagram that is subsequently used in each case study. This helps to identify the relationships and the pathways through which an investment (and more particularly an infrastructure investment) can influence competitiveness – from fundamentals to outcomes.

Figure 3. Adapted Model of City Competitiveness (Research Team)



The main revision to the *State of the English Cities* model is the inclusion of the assessment of the kinds of infrastructure investments being made, plus acknowledgement of the governance context in which those investments are carried out. Specifically, in Canada, much of the decision-making for infrastructure programs is made by federal and/or provincial governments before the funding is made available to the city (and reflected in specific terms and conditions governing use of the funding). Thus, if funding is for transportation, then cities decide whether to invest in roads or transit, rather than whether or not new roads or transit are a priority over other potential social infrastructure projects. The governance issue is addressed later in the report.

Looking at the theoretical model, it is clear that the effects of infrastructure investments would affect the system at the level of “fundamentals,” leading to changes in the “drivers,” with potentially measureable effects and, ultimately, to “revealed urban competitive economic performance.” Changes to regional GDP or Urban Standard of Living are not attributable solely to any one infrastructure investment program. Rather, this model outlines that a combination of investments work in aggregate ideally, but not necessarily in synergy.

The difficulty of attributing effects of any one investment or program of investments escalates as one moves up the levels. Some infrastructure investments will have direct effects on drivers and competitive performance regardless of whether all of the fundamentals are affected.

Notwithstanding this effect, it is clear in the research and in observation that infrastructure investment decisions do affect how cities and regions function, and that the cumulative effect of all infrastructure decisions ultimately can affect urban quality of life, attractiveness and thus competitiveness.

This study attempts to untangle key elements of the process with the aim of improving understanding of how individual infrastructure investment decisions can be made towards supporting improved overall outcomes.

3.1 Framing the Case Studies

Review of these existing analytical models and development of a model synthesizing these to focus on our research priorities helped to frame the steps to take in a series of specific city case studies.

The following main questions were outlined, together with more detailed lines of inquiry. The first set of questions examines the city’s strategy for competitiveness, the context of that strategy and the intent of investments made under the strategy. These can be answered through interviews with city officials and from various planning documents.

- What is the city’s strategy for competitiveness?
- What is the context of the strategy and investments?
- What is the intent of major infrastructure investments made by the city?

The second set of questions, while partially answerable by reference to the city’s strategy and plans, also depends on the availability of evidence (measures and data) as to the specific, realized impacts and effects, and “on the ground” orientation of the case study investment, as it was actually implemented.

What is the more precise nature of the investment and its relationship to productivity and competitiveness? Did it:

- enhance human/physical capital?
- enhance the fundamentals/drivers of a successful externally competitive economy?

- exert direct effects on the externally oriented sectors?
- have indirect effects, via the local economy?

Moreover, was there evidence of:

- direct market effects (employment and income multiplier effects of the project’s construction and operations, as distinct from the generation of new externally-generated income)?
- distributional effects?
- environmental effects?
- financial effects?

The final set of questions is related to the structure of municipal governance and decision-making structures: What are or would be the implications for city processes and governance of widening the scope and expected role of infrastructure beyond “traditional” infrastructure?

3.2 Selecting the Case Studies

An initial list of potential case study cities was identified and briefings conducted with senior officials in a number of Canadian cities to determine interest in participating in the work. The analytical structure developed in the previous phases of the research provided the city staff a concise, theoretical description of the connections between the potential case study investments, through economic and social effects, ultimately to the economic competitiveness of the city. Given this, they were asked to confirm, deny or expand on the hypothetical connections and provide direction on the availability of documentation and data for each. This allowed the team to make a final choice of a case study.

The following set of selection criteria were used, in consultations with city staff:

- The project is of significant scale (this may lead to the selection of a related series of investments, or program of investments, rather than a single large investment) so that competitiveness effects are more likely to be observable.
- The project is substantially complete, and in operation, so that the investment will have had time to produce measureable effects.
- There is potential for/existence of *ex ante* and *ex post* documentation.
- The investment, and its effects, are geographically defined.
- There are available cases of “social” and “traditional” investment in each city, of comparable scale. *This would allow the selection of a range of “types” of infrastructure investment, from housing to transit, to facilitate observation of the different effects that might be produced.*

In addition to Ottawa (part of the research team), strong expressions of interest were returned from Calgary and Toronto. Through dialogue with city staff, six case studies were ultimately identified, although one was subsequently withdrawn (Ottawa airport).¹⁰

- Ottawa – expansion of broadband technology into rural areas;
- Toronto – extension of the Sheppard subway line;
- Toronto – MaRS, a new biotechnology incubator research cluster;
- Toronto – the brownfield redevelopment of the St. Lawrence neighbourhood; and
- Calgary – the city’s affordable housing investment program (2002-2008).

4. What Did We Learn by Looking at Specific Cases?

The analytical structure developed in the previous phases of the research project provided a concise, theoretical description that was used to guide discussions with city staff on the connections between the potential case study investments, through economic and social effects, ultimately to the economic competitiveness of the city.

What follows is a summary of the research team’s findings, with respect to the key research questions, from the case study evidence.

4.1 Do Cities Have Explicit Plans and Strategies Related to Competitiveness?

Our first level of inquiry was on the fundamental question of how cities have embraced the concept of competitiveness and how this has been incorporated into their planning and capital budgeting processes.

All case study cities have developed economic development strategies that explicitly identify city competitiveness as a central plank of their respective plans.

Through its recent strategic planning processes, Calgary has clearly identified the broad impacts of globalization and has accordingly developed its strategy with a view to sustaining Calgary as a competitive city in a global economy while building on its existing branding as an energy sector leader:

The rise of other global economies, as centres of service and knowledge-based activity, contributes to the sharpening of Calgary as a centre of global influence, particularly as it relates to the world’s energy sector. The changing nature of local economies, the increasing importance of cities, the impact of technological advancement and the increasing importance of innovation and entrepreneurship as a platform for growth, means a heightened level of national and international competition to attract financial capital, a skilled workforce and business investment. For Calgary to attain the position of a global city and to effectively compete on the world stage requires a shift in how we view our city, and our approach to

¹⁰ Authorities at the Macdonald-Cartier International Airport declined to participate.

lasting sustainable economic growth. It requires a bold vision of what we can become. It is about thinking and acting world class.¹¹

Meanwhile Ottawa completed an Economic Development Strategy (2003) as well as a long-range vision (Ottawa 20/20, adopted in 2005). This document clearly identifies the global impacts and Ottawa's need to support local businesses actively seeking to expand their external trading activities:

This Economic Strategy acknowledges that individual companies drive a city's prosperity. The more successful the export-oriented businesses, the more wealth flows back into the local economy, which in turn fuels further rounds of local purchases and employment. The result of export success is not just jobs and wealth, but an increased capacity to invest in and support other priorities within our city – from parks to hospitals to schools to theatre and music.¹²

The Ottawa Economic Strategy clearly sets out the city's emphasis on the importance of the export sector, and the drivers and fundamentals underlying this, with an emphasis on development of high-technology clusters.

The strategy and context outlined in the City of Ottawa's 20/20 Plan is oriented to the continued development of Ottawa as a centre of research and development by supporting local businesses and attracting new businesses to drive an expanding export sector focused on research and technology (diversifying the Ottawa economy away from its public service administrative activities).

Toronto is perhaps even more explicit in acknowledging the significance of city competitiveness. The background paper underpinning its 2000 Economic Development Strategy was titled *Toronto Competes: An Assessment of Toronto's Global Competitiveness*. Subsequently the mayor created an advisory committee, Toronto Mayor's Economic Competitiveness Advisory Committee, which was responsible for the development of the January 2008 Agenda for Prosperity, Toronto's vision and new strategic plan.

The Agenda for Prosperity outlines the City of Toronto's current approach to developing and consolidating economic competitiveness.

Although Toronto's explicit recognition of competitiveness as a driving force precedes that in Calgary and Ottawa, it is notable that in all three cities these strategic documents, and the processes they each culminate, are recent documents and reflect a fairly recent conversion to a global economy – competitiveness imperative. Many of the infrastructure investments in place, and certainly several of those examined in the case studies, precede the explicit endorsement of this conceptualization and framing of growth strategies.¹³

¹¹ City of Calgary. 2007. The Calgary Economic Development Strategy Initiative.

¹² City of Ottawa. 2003. *City of Ottawa 20/20 Plan*. p. 1.

¹³ This is the case for St. Lawrence and the Calgary Affordable Housing Program. Planning for the Sheppard Extension preceded the 2000 Economic Strategy.

The practice of undertaking strategic planning and developing economic development strategies within cities (or through affiliated agencies, as in Calgary) is not new. As such, the inclusion of broad statements and alignment of policies to position the city on a competitive basis are not surprising. The critical question is how meaningful these plans and statements are. That is, have they become a significant influence in planning and budgeting, and have investment decisions related to large capital projects been undertaken with an explicit view to enhancing competitiveness.

There is a challenge in translating from broad, almost “motherhood,” statements about overall importance of being competitive to specific actions and investments that can be identified as directly contributing to this goal. Moreover, as noted, competitiveness is not the ultimate goal, but represents a path to achieving and sustaining a high standard of living and quality of life. And sustaining high quality of life is as much a response to concern of existing residents as it is a desire to market the city and attract trade and investment.

4.2 Case Study Findings: How Does Investment in Infrastructure Relate to the Broader Strategy on Competitiveness and Can We Measure the Outcomes?

As discussed in earlier sections of the report, this project has set out a theoretical structure to characterize different kinds of infrastructure investment as to their form and function in an urban economy and specifically as to their links to the external competitiveness of the area’s economy. The very different types of infrastructure investment illustrated by the case studies would be expected to interact with the local and external economies through various and differing “channels,” or functional relationships.

The previously presented adapted wiring diagram (model) outlines a set of “fundamentals” and “key drivers” underlying urban competitiveness. It then characterizes the functional relationships or “channels” by which infrastructure investments, in their differing forms, would manifest their results. Below is a summary of each project and the key findings in relation to the study questions and model. For each case, this section addresses the following questions:

1. Did the case studies identify specific strategies and investment plans directly linked to the larger strategy or economic development plans?
2. Were the specific investments intended to relate to competitiveness?
3. Irrespective of intentions, did the case study investments have potential or observable competitive effects?
 - a) Did the investments have direct effects on competitiveness?
 - b) Did they affect fundamentals/drivers, with probable or future effects on competitiveness?
 - c) What about the extent to which you could connect, observably or otherwise, strengthening of the local economy to competitiveness?
4. Were the intended outcomes of the investments defined and measured? Specifically, what measures and data, relevant to the particular investment, as suggested by our theoretical and empirical review, exist in current municipal studies, or could be obtained from local-level data obtainable from the municipality or elsewhere?

Proceeding case by case, the following are our findings.

4.2.1 The Ottawa Broadband Initiative

This case study describes the City of Ottawa's 2006 investment in rural broadband telecommunications infrastructure. The investment took place in a local economy specializing in a range of high-tech research and development industry and was positioned as an economic enabler for the region.

Through a public-private partnership, the City of Ottawa was able to lever \$10.4 million of private investment at a cost of \$750,000. This enabled the city to ensure that every business and resident in rural Ottawa can access high-speed Internet. Although in part driven by political considerations to demonstrate improved access to services to the newly incorporated rural areas of the city, Ottawa's broadband project is clearly linked to efforts to enhance connectivity and facilitate communications and trade externally. It also supported the City of Ottawa's strategy to continue to build on its strengths in developed and developing clusters in high-technology research and development.

Interestingly, among the strategies of the Ottawa 20/20 plan, the only physical infrastructure elements appearing as priorities were the expansion of broadband service and expansion of the Congress Centre. This hints at the idea developed later in this paper that effective investments, for competitiveness purposes, are strategic and specific, and not necessarily large in scale.

Technology enabling broadband communications is an example of both an external network infrastructure, which allows users to interact with external economies and networks and local network infrastructure, providing benefits locally.

This study argues that, while the main investment in the initiative was for equipment and transmission towers, i.e. physical capital, its effect was primarily in the enhancement of human capital, increasing the efficiency and reach of communications and therefore facilitating the deployment of the skills and knowledge of newly connected businesses and households.

Improvement in these fundamental conditions could be expected to manifest in improved innovation, improved human capital resources and, in a more direct and immediate manner, increased connectivity, key drivers of urban competitiveness in our theoretical framework.

Following the model, this would logically support the success of the trading economy, productivity, employment, both in the trading economy and the supporting local economy, and therefore increased wages, salaries and per capita income.

The Ottawa rural broadband initiative is a very recent investment, so it was not surprising that there had been no examination of its success or impact prior to this study, nor had data been collected on rural business activity. In fact, the survey of rural broadband users undertaken in this study was the first such study undertaken in both Ottawa and in the business areas served by the broadband provider. There were several reports and evaluations of potential expansion of high-speed Internet access performed for the city by service providers as part of the preliminary discussion towards the issues related to expanding broadband into all rural areas. It should be noted that two major Internet access providers already served most of the rural villages in

Ottawa. The issues addressed were how to expand service to the more dispersed, and thus less profitable, homes and businesses outside of those more urbanized enclaves.

Our research showed that the investment in telecommunications infrastructure did in fact have some direct impact on externally trading business associated with Ottawa's economic development strategies, and on "drivers" of further competitiveness gains, as companies reliant upon high-speed Internet were able to establish themselves in rural areas, experienced higher profitability, and lower business costs. This research also showed that many rural residents in general were beneficiaries of this public investment, as 20% require access to high-speed Internet to maintain their current employment status and most utilize high-speed Internet service for personal uses.

The extent to which the benefits of the investment actually do result in these final outcomes will depend chiefly on the actual development of businesses in the rural areas of Ottawa, the attractiveness of the area for business and talent, connections to Ottawa's key external trading industries (in particular the high-technology sector) and their contribution to innovation and added-value.

4.2.2 The MaRS Centre, Toronto

The MaRS Centre is a facility located in downtown Toronto, which leases space to researchers and developing companies oriented to product development and commercialization of research in the area of biotechnology. The Centre, located in Toronto's "Discovery District" in which a rapidly-developing biotechnology research and industrial cluster is located, opened its Phase One facilities in the fall of 2005, with the intent of increasing the pace of commercialization of research results in biotechnology and related sciences. The MaRS Centre provides a number of services to the tenants of the business incubator to deal with one of the bottlenecks of commercialization, by providing early stage companies with affordable "plug and play" office and laboratory facilities that cover basic laboratory research space requirements, as well as advisory and resource services for businesses external to the incubator. As firms in the incubator mature, they move out to new locations in order to free up space for new start-ups.

The development of the MaRS Centre is a direct outcome of the strategy to expand research and commercialization of biotechnology as a new economic higher order activity. MaRS provides the principal locus of activity in research commercialization in the Discovery District. The District and its biotechnical cluster is the heart of one of the city's identified competitive niches. Therefore, MaRS is well positioned to be significant in Toronto's economic development and "branding" as a centre for high-value research and development. The investment was specifically directed at development of externally trading industry, and not directed primarily to the general local economy and quality of life. Nevertheless, the effects of a developing high-value industry would lead in turn to higher local incomes, not only in the sector itself but for those involved in industries supplying the sector and supplying general services.

The Centre is part of a city strategy to focus on an ongoing qualitative restructuring away from more mature industries toward developing an economic base characterized by research, innovation and high value-added industry. In this case, the investment was in support of the city's fast-growing biotechnical research and commercialization cluster.

Like the broadband case, most of this investment was in the physical building and facilities, yet the fundamental effect is on the value of human capital. This was to be achieved via proximity of researchers, product developers, entrepreneurs and business services, to internalize benefits of interaction or "synergies."

Following our characterization of the function of the investment, the MaRS Centre is clearly an example of "in-place" infrastructure allowing in particular for the capture of externalities, as researchers, business developers and financiers develop initiatives through close proximity and communication. MaRS also acts as "external network" infrastructure, as the Centre acts as a point of contact and access to similar clusters and sectors in the United States, Europe and elsewhere.

In this case, the investment is directly supportive of an externally competitive sector of the city's economy and does not work through the general local economy to achieve results. This in fact strikes us as being as clear an example of a directly supportive role as is likely to be found.

In terms of this study's theoretical "fundamentals," this is an improvement in infrastructure that directly improves the business environment. Over time, this may also affect the educational base, given the connection of educational institutions to the Discovery District.

Given the project's nature, it would be expected to directly influence the key "drivers" of city competitiveness: connectivity, economic diversity/specialization, human capital, investment and innovation. In fact, the MaRS Centre is expected to have directly influenced these drivers, without having to have influenced underlying fundamentals.

At this point, it is clear that the MaRS Centre does provide the principal locus of activity in research commercialization in the Discovery District. The District and its biotechnical cluster is the heart of one of the city's identified competitive niches. Therefore, MaRS is well positioned to be significant in Toronto's economic development and "branding" as a centre for high value research and development.

It appears that the MaRS Centre is in fact well designed to promote the "synergies" necessary to commercialize new research on biotechnology. Investigation into available data, however, revealed that, as yet, there is little evidence to support the conclusion that significant impacts on the commercial output of the biotechnical sector or on drivers of competitiveness and associated outcomes have manifested.

That being said, the MaRS Centre has been in operation for only three years and has hosted as tenants or provided services to upward of 400 firms involved in biotechnology, pharmaceuticals and information technology, so these effects may indeed become apparent in the future.

As with the other case studies, however, there does not seem to have been any concerted effort to assess the outcomes of the MaRS Centre activities. Management of the MaRS Centre report that while they closely monitor the business and technological progress of the companies they work with, they have yet to document the business volumes, revenues or market shares of firms in or having moved through the business incubator. One of the issues raised was the proprietary nature of individual-firm information. Most of the firms involved are not public, and so do not produce publicly available yearly reports. MaRS management did, however, indicate that a quantitative review of results is planned for the near future.

4.2.3 The Calgary Affordable Housing Strategy

This case study examines the impact of the City of Calgary's investments in affordable housing as delivered under the auspices of the city's Corporate Affordable Housing Strategy 2002 and successive implementation plans.

Like most cities across Canada since the early 1900s, Calgary has experienced a significant decline in both the construction of market rental property in general and more specifically affordable non-market housing. After almost a decade of undersupply and mounting concerns about affordability, especially for lower-income households, in 2002 the City of Calgary identified the need to develop a comprehensive housing strategy.

The impetus for the Affordable Housing Strategy and investment program came largely from social policy concerns. Affordable housing was a palliative response to housing need for vulnerable and disadvantaged individuals, many of whom may not be in the labour force. Investment in affordable housing was not framed as or promoted in the context of an economic development strategy until 2005, when in reaction to tight housing availability and escalating housing prices and rents, the city's Economic Development Strategy and plan for long-term sustainability began to make reference to the need to have a sufficient supply and availability of housing, including affordable housing, as an element in attracting and retaining labour supply.

The 2005 *Affordable Housing Sustainable Resources Management Plan Phase 2 (2005-2008)* highlights the need to locate new affordable housing near to employment centres, both as a way to support economic development and to facilitate access to employment opportunities to a sub-population that has historically had less success in securing sustained employment. As such, it is difficult to explicitly place the investments in the affordable housing strategy in the context of a competitiveness strategy, as it was not conceived with this in mind.

As discussed above, we can characterize investment in affordable housing both as an enhancement of physical capital and as affecting human capital, although this improvement in housing is only indirectly connected to labour supply productivity or production efficiency.

In terms of function, the construction of new affordable housing (or rehabilitation and conversion of existing property to residential use) is a case of "in-place" infrastructure providing localized benefits. Its effects would most likely indirectly support the trading sector via the impacts on the local economy, enhancing its labour supply and the basis for local production of goods and services consumed by the trading sector, and the general health, safety and attractiveness of the city.

A critical issue is whether the affordable housing primarily assists individuals and families that are not able to participate in the labour market (such as those on long-term disability or who are elderly), in which case there would be little direct, tangible link to competitiveness and productivity. On the other hand, a dysfunctional housing market lacking in housing opportunities can cause various stresses and undermine employability and productivity, so there may be an indirect link, especially in a tight labour market where it is more cost effective to access unused local labour compared to importing new labour from other places, which might exacerbate a tight housing market.¹⁴

The theoretical impact of housing on the fundamentals of the local economy, supportive of a competitive city, is broad, as discussed regarding the St. Lawrence neighborhood. It is apparent that this theoretical reasoning falls short of clearly associating investment in affordable housing with competitiveness outcomes, although the logic does suggest some indirect relationship through labour market effects and the local economy.

Because the benefits of providing affordable housing (or conversely the dis-benefit of an insufficient supply of affordable housing) are indirect, this impact has proven difficult to measure definitively. The half-dozen new affordable housing developments have been well designed and well located and have become assets in the neighbourhoods in which they are located. There is however no clear evidence that the supply of affordable housing, or lack thereof, have either enhanced or detracted from Calgary's competitive position.

Like the other case studies, no evaluative studies existed on the impacts and effects of the Calgary Affordable Housing Strategy. Significant amounts of census and other data existed on the patterns of housing prices, in-migration, employment and other key economic variables. There did not exist, however, sufficient data disaggregated to the Census Metropolitan Area scale to evaluate the relationship between investment in affordable housing and increase in availability of labour in entry-level jobs or the connections of such supply to the local economy, and either directly or indirectly to the externally-competing sectors.

Through a prolonged period of economic expansion, the benefits of prosperity have not necessarily been well distributed, with the most remarkable indicator being the eight-fold increase in point-in-time homeless counts since 1992. This, however, is an issue of social equity as opposed to economic competitiveness.

It has been postulated that the low availability of relatively affordable housing would undermine the city's competitive position and would act as a brake on economic growth. The evidence reviewed does not support this hypothesis. Certainly the market has been overheated and it subsequently experienced a marginal correction with prices still remaining much higher than five years ago. However, the evidence available does not point to lack of housing supply or excessive values as a cause or even contributing factor to economic slowdown. The economy continues to grow, albeit at a slower rate than that experienced mid-decade. Labour growth in

¹⁴ Such action to attract new labour can have a perverse effect. These new households add demand and drive up already inflated house prices. Buyers must spend more to purchase these existing assets, but the higher expenditure (due to price increases) have no productivity benefit; in fact, this undermines productivity by displacing expenditure from more productive investments.

the service sector does not appear to have been significantly impacted by any shortage of affordable housing, at least on any sustained basis. The data did reveal high vacancies in management and professional occupations, but it is unclear whether this is linked to a shortage of housing options or simply an excess global demand for highly skilled professionals and engineers.

Nonetheless, there is a perception, articulated in the city's Economic Development Strategy and long-term plan for sustainability, that a sufficient stock and supply of affordable housing is critically important to economic prosperity and competitiveness.

While a strong local economy does improve wage levels and many may benefit from stronger employment prospects, clearly it negatively impacts housing affordability. Strong housing demand creates competition for more modestly priced existing units, limiting access to those without deposits or perceived as less desirable (more risky tenants). Meanwhile, housing supply tends to focus on more upscale, higher priced product with little attention paid to concurrently building affordable housing (both for very low income as well as entry-level "workforce housing"). New development pressures also contribute to the erosion of existing older more affordable dwellings either through demolition to make room for new developments or through conversion of rental units into units for sale.

Nevertheless, despite reference to the importance of the supply of affordable housing in strategy (economic development and planning) documents, the city's Affordable Housing Strategy is premised almost entirely on social policy concerns and the noted externalities, rather than on any expected contribution toward competitiveness and economic prosperity.

This suggests that the premise for intervention and spending on social infrastructure like affordable housing is not as much as a means of supporting and sustaining a strong competitive economy as much as it is a *means to manage one of the externalities of a competitive economy*.

This is no less significant but a different premise than that hypothesized in the case study. In fairness, it is noted that the development of the city's Affordable Housing Strategy preceded the emergence of very tight housing conditions and the development of the Economic Development Strategy which, influenced by prevailing market circumstances at that time, did highlight the need for affordable housing on economic grounds.

4.2.4 The St. Lawrence Neighbourhood Redevelopment, Toronto

This case study looks at the development of a new residential and mixed-use development on a former industrial brownfield area adjacent to the Toronto central business district (CBD). Through a federally funded land banking program, the city acquired all properties for this redevelopment: from industrial to residential and mixed use commercial. There were very specific public policy objectives and, more importantly, through direct land ownership and control on development, the opportunity to directly pursue them.

From an infrastructure investment perspective, this represented a substantial investment of \$45 million in support of new social housing development in a mixed tenure neighbourhood, including 500,000 square feet of commercial space, public space, a school and a community centre. The investment created both housing assets, to provide permanent ongoing affordable housing, and elements of the public realm – linear parks, street art and road networks, including a gateway to the central business district from the east.

The St. Lawrence Neighbourhood Redevelopment occurred in the mid-1970s to mid-1980s and thus well preceded the more recent adoption of a competitiveness theme. However, in retroactively applying the filter of a competitiveness agenda, those investments can be seen to have contributed to that strategy. In particular, they have enhanced the quality of the inner city overall and as a destination for business, and generated a supply of relatively lower wage labour immediately adjacent to the central business district (although no study of whether this labour is in fact employed in the immediate downtown has been undertaken).

No doubt somewhat paradoxically for some, the redevelopment of the St. Lawrence neighborhood is easier to characterize as primarily an enhancement of physical capital, as opposed to primarily affecting human capital, in that this improvement in housing and surroundings is the least clearly connected to labour supply productivity or production efficiency (i.e. the links are indirect). That being said, the redevelopment of housing could affect labour supply by attracting residents with skills applicable to the competitive sector businesses located in the CBD location.

In terms of function, the redevelopment is a case of “in-place” infrastructure providing localized benefits. Its effects may indirectly support the trading sector via the impacts on the local economy, enhancing its labour supply and the basis for local production of goods and services consumed by the trading sector, and the general health, safety and attractiveness of the city. It is possible however that a more direct effect on the trading sector could occur if an attractive “enclave” for highly skilled and well-paid households was created. Arguably, this has occurred via the subsequent high-end condominium development that the initial (social) residential investment has stimulated in the adjoining area.

The theoretical impact of housing on the fundamentals of the local economy, supportive of a competitive city, is broad, affecting and creating social and cultural networks, educational attainment and a vibrant business environment. In turn, one would expect this, over time, to support key drivers of a competitive economy, and particularly human capital and economic diversity.

The St. Lawrence neighborhood was redeveloped over the space of a decade and therefore there existed a great deal of census and other data covering the demographics of the area. There also existed a significant amount of city-generated data on development and travel characteristics. However no reports analyzing the impacts of the investments that had been made in that neighborhood were found.

Evident in a number of indicators is the association between this investment and economic prosperity in a key area of the city for competitive industry location and development:

- Support for commercial enterprise by establishing and attracting a local labour supply to fill relatively low- to moderate-income occupations in and near the CBD;
- Supporting inner city/CBD vitality through creation of a mixed income, mixed use neighbourhood, adjacent to the major business hub of the city and to a key access route to the downtown; and
- Strong social cohesion and avoidance of extreme poverty and deprivation (detractors from vitality), including a rising social economic profile (by occupational category, over time).

While the available studies, data and projections show employment growth and growth in commercial space in the CBD, as well as further expansion of residential development in adjacent areas, the causal role of St. Lawrence as a stimulus and catalyst is difficult to categorically confirm. Nevertheless, the St. Lawrence Neighborhood Redevelopment appears to support the local economy principally by remediation of a derelict area adjacent to the key business hub of the city, which increases the attractiveness of location in Toronto for high-value business and staff.

4.2.5 The Sheppard Avenue Subway Line, Toronto

The Sheppard subway line involved an addition to the then existing Toronto subway system. It took eight years to build and cost \$933.9 million to build, opening on November 22, 2002. At 6.4 kilometres in length, the line connects the intersection of Yonge Street and Sheppard Avenue, at its western terminus, and Don Mills Road, at its eastern extremity. The Sheppard Avenue/Yonge Street terminus is located at the southern end of North York Centre, an area designated as one of the planned sites for commercial intensification outside of downtown Toronto.

The Province of Ontario supported over 60% of the cost and Metropolitan Toronto funded 25% of the total, with the balance funded by the Government of Canada. The line was originally planned to stretch 14 kilometres, from Yonge Street to Scarborough City Centre, but provincial government budgetary decisions intervened.

A significant feature of the investment was its pairing with zoning to allow three times the normal density of development along the subway corridor. The city staff interviewed regard this as an integral part of the investment and its results. The intent of the city's planned investments in transit infrastructure and density and of its actual investments has evolved over the period from 1980, when the planning process began, to the development of the current Official Plan. In this context, the justification and planning of and around the Sheppard Avenue subway line also evolved, as did its ongoing implementation.

Of the five cases, only the Sheppard Avenue subway line appears to be a disconnect with the then emerging strategy to establish Toronto as a globally competitive city. This is not because improved transit is not thought to contribute, but instead is due to the truncation of the line from its planned endpoints – it does not appear to significantly connect residential areas and employment centres associated with Toronto's competitiveness advantages.

The original motivation of the Sheppard Avenue subway line was to support and encourage further development in the designated growth node of North York Centre. A related motivation was to connect the North York node to Scarborough Centre, to the east, which would support the planned intensification of development of the latter area. In the end, the line did not reach Scarborough Centre because the province made funding decisions to truncate the line – a governance issue we will return to later in the discussion.

As with the St. Lawrence Neighbourhood Redevelopment, it is somewhat difficult to place the investment in the Sheppard Avenue subway line in a contemporary strategic context (re the 2008 Agenda for Prosperity), as it was not conceived, at the outset of planning, to be connected to economic development or competitiveness in terms of more recent thinking on those issues.

Our characterization of the investment as primarily supportive of human capital comes from the fact that its efficacy would be measured in the reduction of point-to-point trip times, the majority of which are made by people going to work or school. Thus the improvement brought about by the subway, if any, would translate to increased labour productivity.

The subway line, following our characterization of functions, is an example of local network infrastructure connecting and distributing people across the area, but not externally.

In terms of the subway line's relationship to the local economy and the externally-trading economy, our theoretical expectations are that both would be served, as transit is one of the means by which the labour force gets to work, and much (although by no means all) of the externally-competitive industry of Toronto is in the catchment area of the Toronto transit system. Thus the additional line could enhance the ability of the workforce to travel to work in both locally oriented occupations and occupations in the trading industries.

The new line, while by definition adding to the stock of physical infrastructure, would be expected to enhance social and cultural networks to the extent that intra-city travel became easier, and would enhance the business environment by making the commute to work less onerous and time consuming. Reduction of automobile traffic and congestion would also be expected to have environmental benefits.

Improvement in these fundamental conditions could be expected to manifest in improved human capital, one of the direct “drivers” of an externally competitive urban economy. Such effects and chains of causation would be expected to be readily observable for the transit system overall (one needs only think of what would likely happen to labour productivity if the entire Toronto transit system abruptly shut down). Whether or not measureable effects can manifest from an incremental investment, like the Sheppard line, was a key question for the case study.

Of all of the case studies, the Sheppard subway did demonstrate the most detailed analysis of post-investment outcomes. A great deal of documentation exists as to the City of Toronto's *intent* in making the Sheppard line investment, including well-quantified evaluations of traffic and development patterns. A number of city-generated documents, produced after the opening of the line, were useful in determining the results of the subway line to date, supplemented by additional research and commentary.

City of Toronto staff provided the research team with a variety of documents profiling the patterns of transit system use, employment and occupations by geographic disaggregation at the ward and neighborhood level, and patterns of commercial and residential development. Several analyses of transit use and development in the Sheppard Corridor, specifically, were available. Most of these studies were several years old and therefore may not have been representative of more current transit and development trends, especially given the relatively recent nature of the subway line's implementation. More up-to-date data, permitting updates to the detailed ward profiles and labour force analyses, done by the city and conforming to the city's geographic boundaries and sub-geographies, will not be available until the 2006 Census data has been received and evaluated for its quality and relevance by the city's planning research staff.

Fortunately, however, 2006 data on transit use was available in the form of the Transportation Tomorrow Survey, administered by the University of Toronto. With this data, and the city reports, it was possible to make solid conclusions on the role of the subway line in Toronto's economic development.

The available data and studies do not support a direct connection to the externally competitive sectors, either in the Sheppard Corridor/North York Centre, or outside of those areas.

Employment and business location in the Sheppard Corridor has not expanded significantly, nor changed in its composition, since the subway opened. New residential development has, however, been significant since the inception of the subway line and high density zoning. High density zoning was an important feature of the line's implementation, as the Danforth Avenue corridor, served by a subway line but without similar zoning, has had no comparable increase in residential development.

North York Centre contains a concentration of externally competitive business and financial services, but the evidence does not indicate an increase in transit users from these industries due to the Sheppard line. The evidence, moreover, does not indicate significant use of the Sheppard line to travel to work in key industries elsewhere in the city.

The significant development of residential units in the Sheppard Corridor lends some support to the possibility that the improvement in transit has increased the attractiveness of the city by creating a new residential area with integrated retail amenities. Most use of the new subway line for work trips, particularly for trips within the Sheppard Corridor and to North York Centre, is accounted for by the retail sales and services workforce. This is also the case in the Danforth Corridor, with the bulk of ridership heading downtown as well as to other areas.

These conclusions suggest that the new subway capacity has supported the local economy in general, providing better transit options for the retail and service industries workforce in particular. The investment has, however, had little impact on travel to work in Toronto's externally competitive industries, with, therefore, no observable direct effect on Toronto's competitive position. Nor has it impacted on "drivers" of future competitiveness.

4.3 Findings on Impacts and Outcomes

This section has reviewed, on a case-by-case basis, the extent to which the specific investments relate to and support broad corporate strategies to position the city on a more competitive basis.

It was noted that in three of the five cases, the investments either partially or completely predated formal articulation of competitive strategies. Nonetheless, these cases were reviewed through the more contemporary lens and analytical model adopted for this research. All were linked to some degree to the city competitiveness framework although the strength of this link and nature of competitiveness outcomes varied, as illustrated below.

	Ottawa Broadband	Toronto Sheppard	Toronto MaRS	Toronto St. Lawrence	Calgary Housing
Linked to city's competitiveness strategy	●	●	●	●	●
Orientation primarily to human capital	●	●	●		
Orientation primarily to physical capital				●	●
Functional form is:					
External network infrastructure	●		●		
Local network infrastructure	●	●			
In-place infrastructure		●	●	●	●
Investment supports the sectors of the economy engaged in external trade:					
Directly	●		●		
Indirectly		●		●	●

Two of the five case studies (Ottawa Broadband and MaRS) showed investments that were most directly linked to competitiveness. Both were linked to external trade and attracting income into the city. In the other three cases, the relationship was determined to be more indirect. Those that relate indirectly are also characterized by alignment with alternative priorities and arguably may not have been intended to enhance competitiveness. It was noted in both St. Lawrence and Calgary that the intent was more to manage externalities caused by growth (and thereby indirectly linked to competitiveness).

The latter cases presented greater challenges in terms of formally conceptualizing and measuring impacts. That is, how to measure the potentially negative, undermining impact of such externalities (such as distressed or deteriorating neighbourhoods, or insufficient supply of affordable housing) on a city's capacity to be competitive.

Regardless of whether direct or indirect impacts were expected, the research found little if any evidence of practices to monitor and measure impacts of investments on competitiveness or on anything else. However, it should be noted that in all of the case studies, elaborate business plans were developed that rationalize and outline anticipated outcomes and benefits of the proposed investment. The matter of measurement is discussed in greater detail in a following section of this report.

While the research also struggled with limitations in data (availability, timeliness or appropriate geographic scale), data was to some extent available and assembled to infer outcomes. Data was particularly available for the Sheppard case. In both the Sheppard and Calgary cases, the available data lead to conclusions that refuted the general hypothesis that infrastructure investments contribute to competitiveness outcomes. That is to say while it may be true that some forms of investment do have direct and tangible impacts, this is not the case for all investments. Each case must be evaluated separately and if competitiveness is a primary goal, some forms of investment may have greater merit than others. In this analysis, it appears that the broadband and MaRS initiatives may better respond to competitiveness outcomes than the other three types of investment.

A number of general, “cross-cutting” findings were identified regarding the impacts and effects of these investments:

1. The importance and efficacy of following specific goals and strategies in choosing investments where urban competitiveness is the goal.

The Ottawa broadband initiative and, although data was unfortunately too limited to categorically support this, the MaRS Centre were clearly the most directly supportive of externally competitive industry in their respective cities, and of key “drivers” of ongoing competitiveness. These were, not coincidentally it seems, the two investments that were specifically aimed at targets within the city’s competitiveness strategies. Meanwhile, the more general investments in transit and housing appeared to support the overall economy, but have few identifiable relationships with the externally competitive sectors of the cities’ economies.

The research has also revealed the clarity with which city economic development and competitiveness plans (and realities) can be determined by reviewing city documents, and the divergence of federal/provincial/municipal investment decisions (albeit for various reasons) from this focus.

One significant source of pressure for divergence from strategic plans comes when federal or provincial infrastructure funding is earmarked for purposes other than long-term city-building and competitiveness goals. A current example is the expedited funding of “shovel-ready” infrastructure projects, with the goal being economic stimulus and employment.

2. Addressing problems caused by economic growth pressures is part of an overall competitiveness and growth strategy.

As a corollary of the first policy implication, that investments need to be well-targeted to measurably influence competitiveness, in many cases, similarly well-targeted strategies may be required to manage the pressures of growth. This will be particularly important where high growth rates impact on the affordability of housing, the environment, and the general quality of life for all residents. This was clearly seen in the case of the Calgary economic boom and the city's Affordable Housing Strategy. While it is difficult to ascribe competitiveness benefits for the city from the housing strategy, it was necessary on social equity, health and safety grounds, in the context of sharply escalating shelter costs.

3. The relative importance of large-scale systems and targeted investments.

As pointed out above, large systems, like transit, housing and water, may not add significantly to competitiveness in an already well-equipped city, versus “niche” or “marginal” targets, like extended broadband service, that can have significant results, or at least exhibit a good return on investment. We can therefore see from the evidence that, depending on the context, it is not so much the magnitude of the investment as it is the nature of the investment that may contribute most to competitiveness. This highlights the apparent importance, particularly in the context of developing “new economy” competitiveness, of well-targeted, even if relatively small, investments relative to the major city infrastructure systems.

4. The importance of physical or functional connection of infrastructure to industry in achieving results.

The research highlighted what appears to be an importance of physical proximity or physical connection of infrastructure to the locations at which the externally competitive production takes place. This is particularly important where, as is very often the case, new economic development occurs in deliberate or de facto industrial and research clusters. So, for instance, it appears that for transit system investments to improve urban competitiveness, they must help connect areas where people live and where new industry locates.

As it stands, there appears to be a divergence of the needs of identifiable externally competitive industries and the overall pattern of transit, housing and other large-scale infrastructure as it now exists, particularly where the intent or impact of the infrastructure has been primarily on affordability and accessibility. For example, affordable transit, in the wrong places, has little to do with location or growth of high-value industry. The same seems to go for affordable housing. This type of infrastructure, as it is generally deployed, appears to have more to do with supporting the overall local economy, equity and general quality of life (not that those are unimportant goals) as well as managing the externalities of growth.

5. The importance of systems compared to discrete investments.

This highlights further, for large-scale infrastructure such as transit or housing, the importance of full systems of infrastructure, oriented in function and location toward support of planned city/business growth, as opposed to unconnected, discrete investments.

This finding was foreseen in early discussions with city staff, who said that single investments might be less meaningful in their effect on development, quality of life and urban competitiveness than a related set of investments that support and amplify each other's effects. Related to this point, municipal staff have observed that there is often a "tipping point," or achievement of critical mass, where the results of single investments lead to a state where another investment can trigger a change in the direction or pace of development. Further analyses may therefore have to be widened to look at major investments or series of investments, as well as investments that would support them to identify their cumulative effects and any "tipping point" experienced.

6. Human and physical capital and the meaning of "infrastructure."

The research confirmed the apparent close linkage in all cases of capital investment and human capital effects as their primary functional outcome. Most of the investments reviewed had their connection to economic development via increasing the value of human capital as it relates to production. This argues for the general irrelevance, from an analytical and policy perspective, of the old labels of "hard" versus "social" infrastructure.

This finding, particularly in the context of competitiveness goals and strategies based on development of high-value knowledge economy industry, highlights the importance of viewing infrastructure investments in terms of their precise functional impacts on the efficiency and supply of human capital and direct or indirect connections to either or both the externally competitive and local economic sectors of the city.

7. Potential for using this research to define a model to help guide infrastructure planning and budgeting.

This research has set out a qualitative, strategic model that should be of utility for policy-makers and planners in conceptualizing and defining investments that could systematically contribute to the competitive performance of an urban region, over the short and long term. Moreover, the model provides a template for decisions on performance measurement and data collection.

4.4 Findings on Governance Issues

One of the innovations of the research team's development of a model adapted from the earlier work (Begg, Office of the Deputy Prime Minister, UK, and Kresl) is the more explicit addition of governance as an overarching and critical influence that acts to modify and condition the fundamentals and drivers of competitiveness.

4.4.1 The Importance of the Capital Budgeting Process

The most important form of governance for decision-making relevant to cities' infrastructure is the municipal capital budget process, which varies across cities. The extent to which broad corporate directions are explicitly considered in formulating the budget determines the potential of major investments to purposefully (versus accidentally) support a city's competitiveness agenda.

Calgary's decision-making process provided perhaps the best example of explicit links between broad strategy (overall city strategy and planning, as opposed to competitiveness strategy, per se) and specific spending decisions. It is these established priorities that ultimately become the driving influence in developing investment-specific business cases in the budget process. The extent to which issues related to competitiveness (and the inextricably linked matter of sustaining high urban standard of living) are "front of mind" for councilors when they establish council priorities is critical in directing this process towards competitiveness plans.

In Toronto, the Agenda for Prosperity proposes a new budgeting process to ensure translation of the key directions of the strategy lead through the Offices of the Mayor and Chief Administrative Officer. This is the culmination of movements in the city's processes, since the late 1990s, toward integration of economic development and infrastructure planning.

For example, City of Toronto reports produced in 2002, in support of the development of the current Official Plan, began to connect economic development and transportation/transit/location decisions more directly. It is not clear when reading these together, however, whether planners viewed transit as a catalyst to development or, as appears more likely, viewed development and high density as being accommodated by, and necessary for, efficient transit.

The current Toronto Official Plan makes the connections between transit and economic development more explicitly, both for the continuing success of the downtown centre and for the ongoing development of key urban nodes such as North York Centre. Neither the Official Plan, however, nor any supporting documents make a clear and specific connection between transit/density planning and the externally oriented industrial clusters that the city has made a key focus of its competitiveness strategy. The MaRS Centre and the continued development of the Discovery District, however, while not being a major infrastructure investment for the city, but rather a project which the city has helped to put in place, fits hand in glove with the Agenda for Prosperity.

The Ottawa broadband case suggests that the budget process did pay attention to broad directions recommended in the Economic Development Strategy, although there was clearly a strong influence through the political process that had more to do with managing political interests (a vocal rural affairs committee). Ottawa has only recently, in their 2008 budget, adopted a strategic planning process whereby council identifies key objectives and assesses both capital and operating expenditures in light of how they address those objectives.

These insights highlight the reality that municipal infrastructure investment decision-making reflects multiple sources of influence. In particular, local issues and concerns (such as perceived lack of housing affordability or inequities in lack of access to broadband service in some rural parts of a city) as well as the prevailing preoccupations of the funding bodies (often meaning all three levels of government and, to a lesser extent, private-sector partners) come to bear on this process. As noted below, senior orders of government, through conditional funding arrangements, may exert the greatest influence of how funds are allocated.

In and of itself, this observation is not surprising given that all public investment decisions are inherently political and therefore responsive to currently identified issues and needs. The major shift that has occurred over the timeframe of these case studies is that cities are now tending to identify more strategic, long-term objectives for their investments.

In conversation with senior municipal officials throughout this project, one trend is clear: that the funding available for any investments in new infrastructure is much reduced compared to previous decades, and thus there is increased pressure on each decision, both politically in terms of competition for scarcer funds, as well as in terms of maximizing the impacts of those investments.

In this context, the overlay of the economic competitiveness theory, particularly in terms of urban competitiveness in the new “creative” economy, can help to provide a strong focus for strategic planning and, ultimately, for more purposeful investment decision-making.

4.4.2 The Influence of Multi-Layered Conditional Funding Mechanisms

A critical aspect of the budget decision-making process, to which the previous section alluded, is the influence of federal and provincial infrastructure programs. In many cases, the objectives for any particular investment or investment program are not exclusively set by the municipality, but come with strings attached to conditional federal and provincial government funding or private sector investments. Moreover, as illustrated by the Sheppard Avenue subway case, changes in existing funding decisions of the federal or provincial governments can effectively derail carefully planned strategies, leading to distinctly sub-optimal results.

The desire (and need) to access ever-scarcer infrastructure investment funding can, and probably will, override any other considerations. Therefore, it seems to be important that where local governments have clearly defined strategic plans for decision-making, that those plans be respected by all parties.

Given the critical influence of federal-provincial/territorial transfers it would be desirable for the senior orders of government to similarly have a well articulated vision and some clear strategic goals on how the large infrastructure allocations could best optimize aggregate outcomes that directly impact the national economy.

While recognizing the many political/jurisdictional and administrative complexities that may be involved, this suggests that a more coordinated multi-governmental process for decisions on infrastructure planning and funding would be beneficial. This might, for example, help avoid situations like those that influenced the Sheppard Avenue initiative, where a discrete investment becomes the focus of a politicized, all-or-nothing decision process, rather than the focus being on a broader strategy.

4.4.3 The Importance of Measuring Outcomes and Refining Strategies

The presumed benefits of a more defined approach to decision-making in support of clearly identified objectives rely to some extent on the ability to measure those objectives so that the effect of various investments can be assessed (populating the feedback loops in the adapted model diagram).

In general, and in contrast with documentation on the impetus behind most of the investments, this research effort found little measurement of any kind on the actual outcomes of the infrastructure investment, with the exception of the Sheppard Avenue subway line. Surprisingly, our research failed to turn up even basic analyses of direct economic multiplier effects related to the construction and operations of these investments, nor studies of environmental or other specific impacts. In other words, municipal officials' work went into getting the funding for the project, but little if any work went into assessing if in fact the targets behind the original decision were actually achieved.

The MaRS Centre provided a good example of this problem, where information was unavailable on its performance to date, even in aggregate terms. In this case, the availability of information was apparently hampered by the fact that the Centre, and its tenants, are not public organizations and are therefore not compelled, nor have the incentive, to report publicly on their economic performance. This raises an implication for governance, where accountability and transparency in multi-partner and, in particular, public-private partnerships, may suffer.

This lack of post-investment assessment appears to be a serious shortcoming of current practices in the municipal infrastructure investment decision-making as identified in these case studies.

This lack of an evaluation culture will only change if multi-governmental funding commitments call for increased accountability, transparency and demonstration of return on investments. Perhaps more importantly, however, monitoring of results could provide future guidance on the results that can be associated with various types of competing investments.

5. Findings on Data and Measuring Impacts

This section looks at the research team’s findings as to what data does or does not exist, and what kind of data/research design would be needed to measure competitiveness effects more conclusively.

The data and documentation available on the Sheppard Avenue subway line were the most complete of those in any of our case studies. As noted earlier in this report, city staff provided the research team with a variety of documents profiling the patterns of transit system use, employment and occupations by geographic disaggregation at the ward and neighborhood level, and patterns of commercial and residential development. Several specific analyses of transit use and development in the Sheppard Corridor were available, although slightly out of date, with new reports pending release and examination of new Census of Canada data. Fortunately, 2006 data on transit use was available in the form of the Transportation Tomorrow Survey, administered by the University of Toronto for the City of Toronto.

Nevertheless, while the available studies, data and projections show employment growth and growth in commercial space developed in the Sheppard Corridor and in North York Centre, they do not say enough about the *kind* of commercial development involved in order to see more clearly its relationship to the city’s competitive position.

Second, the data is not adequately suited, primarily because of its aggregation into certain “occupational codes,” to a precise analysis of the extent to which subway and projected Light Rapid Transit (LRT) lines connect the labour force to their jobs in specific occupations or industries of relevance to the question at hand.

In order to make such inferences fully, future research would require data on:

- types of industry/commercial activity in the study area (with disaggregation and coding that would allow focus on specific industries) in order to see the relationship of the industry/commercial activity in the area to the identified externally competitive cluster industries;
- occupations of residents in the study area;
- occupations of users of the transit line coming into the area for work;
- occupations of users of the transit line traveling from the area for work, and work destination; and
- occupations of users of the line going through the area on work trips.

All of these data elements must be correctly disaggregated by location and coded for occupations relevant to the question. This would require customized data or changes in the type of data that is collected as “standard.”

Inferences would be strengthened by current data on:

- development of industry/commercial activities at transit stops/nodes – type and extent of commercial density at transit stops/nodes;
- property value changes at transit stops/nodes, over time and relative to the surrounding area; and
- geographical mappings of the externally competitive cluster industries and their relationship to transportation routes and the residential population.

Information was particularly scarce on the MaRS Centre. As noted earlier, while general statistics are available on the number of institutions and firms involved with the Centre and the biomedical/biotechnical cluster in the Discovery District, there has been no concerted attempt, such as an interim performance review, to collect and explain, in a publicly-available form, the commercial results thus far.¹⁵

The key data to collect would be:

- the aggregate sales revenues/costs/profitability of “incubated” businesses;
- the value of the Centre’s business services to external clients;
- the aggregate market share domestically or internationally of MaRS tenants/former tenants and clients;
- patents granted;
- employment levels;
- aggregate leveraged investment of the firms; and
- aggregate return on public funding and any write-offs and preferential leases.

This, combined with statistics on international business volumes in this sector, and the commercializing output of comparable clusters in the United States and elsewhere, would help to indicate the impact that the MaRS investments have had, the potential for results through further investments and the return on public investment. The same analysis could be performed for the entire Discovery District.

A second line of inquiry that would likely yield value would be an analysis of the approaches of other biotechnical research-business clusters, such as in Boston, to determine how Toronto’s record on research commercialization could be improved.

This project’s research on the Ottawa broadband initiative was forced to rely almost entirely on original research, via expert interviews and a survey of rural subscribers, in order to develop conclusions.

¹⁵ The limitations in data available on the MaRS Centre stems in part from the fact that this is not a public entity, nor are the firms with which it is associated.

A more comprehensive evaluation of this initiative would be relatively easily done, if key data were tracked over time, as business develops in new areas. Key developments to track, along with the business-type/broadband usage statistics collected for this study, would include (with geographical disaggregation within the city boundaries):

- value of rural property;
- growth in rural per capita income;
- number of rural and regional research centres and the value of their manufacturing;
- growth in employment by rural businesses;
- growth in the number of rural cultural and educational institutions; and
- the value and type of exports as a share of total regional economic output

Additional value would be delivered by better information, both qualitative and quantitative, on the links between rural and urban businesses both within and outside of the Ottawa area and by comparative analysis against other urban-rural areas undertaking similar initiatives.

Turning to the St. Lawrence Neighborhood Redevelopment, while the available studies, data and projections show employment growth and growth in commercial space in the central business district (CBD), as well as further expansion of residential development in adjacent areas, the role of the redevelopment as a stimulus and catalyst is difficult to categorically identify as causal.

Although some association can be inferred from the data presented, the existing data and studies do not say enough about the stimulus or catalytic role of the initial St. Lawrence development to link the initial investment directly to later outcomes. A useful indicator of a stimulus or catalytic effect would be an analysis of levels of private investment in the immediate area.

Time series data on the volume and value of building permits in adjoining areas could shed light on this if appropriate comparable “control neighbourhoods” were determined. Such data could be used to determine if the strategic public investment in the (largely social housing) redevelopment has stimulated additional private residential investment and any commercial development over and above what may have occurred in the absence of investment (indicated by the control area). The assumed effect of additional private investment (as indicated in building permit values and in employment levels) in commercial and service sectors would be increased internal and external trade, our measure of competitiveness.

Another approach would be to investigate whether and how an absence or shortage of relatively affordable housing has detracted from, or in any way negatively impacted, employment in the service sector of the CBD. This would require greater detail linking housing availability and cost to employment demand (e.g. help wanted ads) in CBD employers.

The outward migration and suburbanization of poverty does suggest that households seeking affordable housing (especially families with children) are increasingly looking to more distant locations from the CBD. Long commute times, exacerbated by increasing traffic congestion, act as a deterrent to CBD employment, with preference for employment more proximate to place of residence.

As noted, data that links discrete populations and areas to employment effects (especially undersupply and employment vacancies in specific industries and area, and more particularly those directly engaged in external trade) is not generally available, except through customized surveys.

In the case of Calgary's Affordable Housing Strategy, in seeking to measure the relationship between specific investments (here sufficient availability of affordable housing) and competitiveness, a linkage has been identified between housing and the labour market. However existing data sets are not available to carefully assess this relationship at the neighbourhood or even metropolitan scale.

In terms of the main hypothesis, it would be necessary to assemble properly disaggregated time series data on key measures associated with a competitive urban economy (such as value of manufacturing added, value of retail sales and number of new businesses), combined with some fundamentals – total housing supply (starts), affordable housing supply, population growth, migration, employment, house carrying costs, rents, and vacancies. This may generate some statistical association between these factors and indicators of competitiveness. As noted in St. Lawrence, such data is not readily available on a disaggregated basis, so could not be included in this analysis.

A number of outcomes are inferred from the data described above, to the extent that it was available and useable for the questions at hand, but data is generally not available at an appropriate geographic scale to statistically evaluate any direct relationship between investment in affordable housing and increases in availability of labour in entry-level jobs, or the connections of such supply to the local economy and indirectly, or directly, to the externally-competing sectors.

In terms of the more specific contribution, or lack thereof, of affordable housing to competitiveness, it would be useful to know what portion of residents in affordable housing are actively participating in the labour market; how many have moved off income assistance into work, while living in affordable housing; and whether this is a continuing trend over time. To what extent does housing stability contribute to increased and sustained employment? And is this employment linked in any way to the local/externally competitive activities? This relates to earlier points regarding the primary basis for such investment being more related to managing externalities of competitive-based growth and how can the impacts of such externalities (and remedies for them) be measured in relation to competitiveness. Again, lack of data at an appropriate scale negated such analysis.

The observed trends in homelessness during a period of sustained economic growth refute the notion that a stronger economy lifts all boats. Indeed, consistent with research on “new economy” cities, the incidence of housing affordability problems has increased between 2001 and 2006. But further work is required to determine whether this is more related to contractions in available stock, though conversion and demolition, than increased demand.

Summarizing the preceding paragraphs from each case study on missing data and data requirements, it is clear that each type of investment requires examination of disparate sets of data in order to make conclusive determinations of competitiveness effects. This research effort has investigated the state of current data, and made some significant conclusions based on this data, and some original survey and qualitative data, where practical.

5.1 Toward a Quantitative Model

One of the aims of this project was to identify a “model” that would help decision-makers understand the implications of various choices in infrastructure investment, as they would relate to urban competitiveness. This was presented as the adapted model from the *State of the English Cities* and Kresl, in Section 2, above.

Our review of the literature unearthed a set of variables that could stand as measures, or proxy measures, of competitiveness outcomes and changes in the underlying competitiveness drivers and fundamentals. These are presented in this project’s report on the theoretical and methodological findings and underpinnings of this work.¹⁶

Our work revealed that a large number of such potential measures exist. This, while presenting something of a challenge to researchers because of their numbers and provenance from various jurisdictions, literatures and theoretical/methodological approaches, is actually helpful as data will not necessarily exist, or exist in a useable form, in any given jurisdiction nor will all variables apply equally well to all competitiveness strategies and types of investment.

In view of the heterogeneous results of our case studies, our analysis suggests that the means to understand and quantify the impact of infrastructure investment on competitiveness, in any meaningful way, requires focus on specific investments and strategies, or perhaps more feasibly, on specific programs of investment, rather than a more macro approach attempting to connect investments in general to general economic conditions and some measure of overall competitiveness.

The challenge for the quantitative modeler now becomes:

- specification of models of intermediate impacts (e.g. investment in training facilities and specific labour supply cohorts) and final impacts (i.e. on the variables specified to represent a state of competitiveness); and
- selection of methodologies to identify the best existing data (in terms of their ability to measure the impacts of investments).

The specification of the appropriate model will depend on the nature of the investment and might come from a variety of socio-economic literature and from industry-specific knowledge.

¹⁶ *Urban Competitiveness and Infrastructure Investments: Model and Analytical Framework*, op. cit.

For example:

A city wishes to establish itself as a centre of applied research and commercialization and to create conditions whereby expertise is generated locally. Accordingly, researchers would focus on relevant investments, such as investments made in educational facilities and in links to research centres and industrial development centres.¹⁷

In order to track, over time, the impacts of this investment, a model, or set of models, is required to relate increased expenditure on educational facilities to development of expertise, research results and commercialization, and ultimately to competitiveness outcomes, value-added exports, profits and incomes.

Theoretical models could be developed to structure empirical models and specify data. Such modeling might be straightforward, or very complex, depending on the issue. In most cases, this would require expertise in the specific type of social and economic activity being impacted and the industrial/market processes implicated in order to specify fundamentals, drivers and outcomes that would be meaningful in that particular context.

Alternatively, or as part of the exercise, more exploratory empirical techniques, such as factor analysis, could assist in model specification, or provide conclusions on the relationships and impacts themselves.

The example used above would probably be of moderate difficulty, relative to a more straightforward example such as a MaRS Centre-type investment (with direct impacts on competitiveness) or relative to a complex and difficult example, such as affordable housing (which has more indirect impacts).

This suggests a rich set of possibilities for further research.

This also suggests, however, that what we now have (the aforementioned adapted model), even in advance of further quantitative work, is a useful qualitative framework for decision-makers to structure their goals, strategies and investments, explain and compare the rationales for alternative investments, and track their results.

¹⁷ The city might, as well, invest in amenities that help to attract “knowledge workers” (Richard Florida’s creative classes), although this effect may be more difficult to track.

6. Implications for Governance and Policy

6.1 Governance Implications

This study has identified some key issues around municipal and multi-governmental governance and decisions process related to infrastructure investment. These are perhaps the most fundamental findings of this project.

6.1.1 The Importance of the Capital Budgeting Process

The extent to which broad corporate directions and, in particular, the competitiveness strategy in each case are explicitly considered in formulating the budget determines the potential of major investments to purposefully support a city's competitiveness agenda. The cities studied have moved from a relatively reactive model of planning to a more strategically-oriented planning over time and now explicitly include, and in fact emphasize, economic competitiveness and its link to infrastructure and other investments in their planning documents.

In this context, the overlay of the economic competitiveness theory, particularly in terms of urban competitiveness in the new "creative" economy, can help to provide a strong focus for strategic planning and, ultimately, for more purposeful investment decision-making.

This research project has identified a qualitative, strategic model that should be of utility for policy-makers and planners in conceptualizing and defining investments that could systematically contribute to the competitive performance of an urban region over the short and long term. Moreover, the model provides a template for decisions on performance measurement and data collection.

6.1.2 The Influence of Multi-Layered Conditional Funding Mechanisms

A critical aspect of the budget decision-making process is the influence of federal and provincial infrastructure programs. In many cases, the objectives for any particular investment or investment program are not exclusively set by the municipality, but come with strings attached to conditional federal and provincial government funding or private sector investments. The need to access ever-scarcer infrastructure investment funding can, and probably will, override any other considerations.

Therefore, it is important that, where local governments have clearly defined strategic plans for decision-making, those plans be respected and, better yet, that there be improved coordination of multi-government planning and decision-making regarding infrastructure. This is said with full recognition that jurisdictional and administrative complexities may continue to act as a barrier to this kind of improvement; however, it remains an obvious implication of this research.

6.1.3 The Importance of Measuring Outcomes and Refining Strategies

The general lack of post-investment performance assessment appears to be a shortcoming of current practices in the municipal infrastructure investment process as identified in these case studies.

This deficiency will become important if multi-governmental funding commitments call for increased accountability and transparency and demonstration of return on investment. Perhaps more importantly, however, monitoring of results would provide future guidance on the results that can be associated with various types of competing investments.

As discussed above, this research has identified a qualitative and strategic model to guide decision-making on infrastructure investments where a goal is economic competitiveness. The same model, therefore, would logically guide the collection of data and analysis in assessing, *ex post*, the performance of the investment.

In view of the heterogeneous results of our case studies, our analysis suggests that understanding and quantifying the impact of infrastructure investment on competitiveness, in any meaningful way, requires focus on specific investments and strategies, or on specific programs of investment, rather than a more macro approach attempting to connect general investments to general economic conditions and some measure of overall competitiveness. Our review of the literature unearthed a set of variables that could stand as measures, or proxy measures, of competitiveness outcomes and changes in the underlying competitiveness drivers and fundamentals across a variety of contexts and investments.

This, however, leads to an implication for governance and planning, similar to those above, on the need for increased multi-governmental cooperation. Just as more effective investments would follow from increased coordination of funding and planning across levels of government, more effective assessment of results could follow if the parties, all of whom have separate data collection agendas and agencies, were to agree on what data is required, down to specifics like geographic disaggregation and occupational/industrial coding.

6.2 Policy Implications

This research project's theoretical and case study findings have yielded a number of significant findings for policy and planning purposes, which are related to the governance implications presented above.

1. The importance and efficacy of following specific goals and strategies in choosing investments where urban competitiveness is the goal.

This policy implication is closely related to the first implication presented on governance, i.e. that decisions on investments for competitiveness, and the process in which they are framed, should be clearly oriented to that purpose.

If competitiveness is the goal, it is clearly in the interest of strategic planners and finance officers to define how investments will support this goal, as part of a deliberate strategy and aimed at specific targets and sectors.

The Ottawa broadband initiative and the MaRS Centre were clearly the most directly supportive of externally competitive industry in their respective cities, and of key “drivers” of ongoing competitiveness. These were the two investments that were specifically aimed at targets within the city’s competitiveness strategies. Meanwhile, the more general investments in transit and housing appeared to support the overall economy, but have few identifiable relationships with the externally competitive sectors of the cities’ economies.

Significantly, however, while investments for urban competitiveness need to be well-targeted to measurably influence competitiveness, in many cases, *similarly well-targeted strategies may be required to manage the pressures of growth*. This will be particularly important where high growth rates impact on the affordability of housing, the environment, and the general quality of life for all residents. This should logically be seen as part of a competitiveness strategy.

2. The relative importance of large-scale systems and targeted investments.

Investments in large systems of basic infrastructure may not add significantly to competitiveness in an already well-equipped city, versus “niche” or “marginal” targets, like extended broadband service, that can have significant results, or at least exhibit a good return on investment.

On the evidence, depending on the context, it is not so much the magnitude of the investment as it is the nature of the investment that may contribute most to competitiveness. This highlights the apparent importance, particularly in the context of developing “new economy” competitiveness, of well-targeted, even if relatively small, investments relative to the major city infrastructure systems.

An important caveat applies: This is not to conclude that a city could neglect its major infrastructure, such as transit, roads and cultural amenities, *and very importantly, a well-connected international airport*, and remain as attractive to business location as others. However, given that large Canadian cities are already well equipped, safe and stable, relative to many foreign cities, large-scale investments may not provide significant differentiation. That is, there may be only marginal benefits in improvements to existing “traditional” infrastructure compared to new investment in more externally focused knowledge creation and research type of activities (as well as the amenities and quality of life elements that often attract and help retain this part of the labour market).

3. The importance of physical or functional connection of infrastructure to achieving results.

The research highlighted what appears to be an importance of physical proximity or physical connection of infrastructure to the locations at which the externally competitive production takes place. This is particularly important where, as is very often the case, new economic development occurs in deliberate or de facto industrial and research clusters.

As it stands, there appears to be a divergence of the needs of identifiable externally competitive industries and the overall pattern of transit, housing and other large-scale infrastructure as it now exists.

This may also, depending on the case in question, add to arguments for higher density development and infill, particularly residential, to the general proximity of residence and employment. Again, this points to the importance of planning and investing in spatial forms that promote “new economy” location and employment patterns.

4. The importance of systems compared to discrete investments.

This highlights further, that for large-scale infrastructure systems such as transit or housing, the importance of complete systems, oriented in function and location towards supporting planned city/business growth, as opposed to unconnected, discrete investments. Our research showed that discrete investments can be ineffective in adding to the efficiency and outcomes of existing systems.

This finding was foreseen in early discussions with city staff; that single investments might be less meaningful in their effect on development, quality of life and urban competitiveness than a related set of investments that support and amplify each other’s effects. Such an interconnected set may lead to a “tipping point,” where the results of a single investment can trigger a change in the direction or pace of development.

Future planning exercises and analyses may therefore have to be widened to look at major investments, or series of investments, as well as investments that would support them to identify their potential or realized cumulative effects.

5. Human and physical capital and the meaning of “infrastructure.”

The research confirmed the apparent close linkage in all cases of capital investment and human capital effects as their primary functional outcome. Most of the investments reviewed had their connection to economic development via increasing the value of human capital as it relates to production. This argues for the general irrelevance, from an analytical and policy perspective, of the old labels or “hard” versus “social” infrastructure.

This, particularly in the context of competitiveness goals and strategies based on development of high-value knowledge economy industry, highlights the importance of viewing infrastructure investments, where competitiveness is the goal, in terms of their precise functional impacts on the efficiency and supply of human capital and direct or indirect connections to either or both the externally competitive and local economic sectors of the city.

7. Overall Conclusions

This research initiative set out to answer a fundamental research question:

Can you measure the outcomes of individual infrastructure investments for productivity and competitiveness at the level of a city or urban region and if so, how? And to what extent do municipal governments already do so? Or, alternatively, have cities engaged in investments that were specifically meant to develop the competitiveness of the local economy, that have been or could be measured against their stated goals?

7.1 Conclusions from the Review and Synthesis of the Literature

By way of a wide-ranging survey of theoretical and empirical literature, it became clear that these issues had not often been addressed from the perspective of a city or urban area, and had certainly not been satisfactorily answered. Nor was there enough quantitative background research to allow the direct specification of statistical models as a research strategy. Econometric studies have yielded a number of insights as to the impact of infrastructure on local factor productivity, but have said little on measuring attainment of “competitiveness” or identifying the channels by which productivity gains are so achieved.

Nevertheless, there appeared to be enough of an emerging consensus in the literature for this effort to identify a qualitative model of the impacts of infrastructure investments on urban competitiveness and to base a research methodology on that structure.

The literature yielded, first, a series of observations that allowed a characterization of infrastructure, “social infrastructure,” and the nature of its potential role in the economic competitiveness of an urban region or city:

- Infrastructure is most usefully defined as representing hard assets, as a platform from which services are supplied and demanded;
- For analysis of urban competitiveness, both “traditional” and “social” infrastructure is meaningful. Both relate to different types of physical assets. Thus a distinction between the two, particularly in a modern economy where enhancing the value of human capital is a key concern, is essentially meaningless;
- Investments supportive of human capital can, in this context, be described as either attracting human capital and business to the local economy, or improving the productivity of the existing human capital, both in the local economy and in the competing export economy;
- The competitive advantage of a local economy lies in the capacity of local firms to compete externally;
- A local government may hinder or facilitate this competitiveness, but in a global economy where most factors of production are mobile, a local government does have the scope to build persistent competitive advantages based on unique local characteristics of capital and labour; and

- Competitiveness is distinct from productivity, although related, and refers to the long-term ability of the urban area to exploit its competitive advantages for gains from trade, while supporting sustained growth in incomes and employment.

In order to examine this concept, an acceptable definition of “urban competitiveness” was required. A number of definitions have been suggested in the literature and generally propose a balance of productivity, success in external markets and local income and employment growth. This study adopted the European Commission’s definition:

Competitiveness is defined as the ability to produce goods and services which address the needs of international markets, while at the same time maintaining high and sustainable levels of income, or, more generally, the ability of (regions) to generate, while being exposed to external competition, relatively high income and employment levels.

This definition is rooted firmly in the concept that competitiveness is premised on interaction with external economies with implications for the local economy driven by these interactions.

Second, the mainly qualitative literature yielded a reasonable but restricted number of indicators covering:

- urban competitiveness and competitiveness itself (the target);
- “drivers” or necessary conditions for competitiveness; and
- productivity and the underlying quality of life and quality of infrastructure and municipal services.

The literature pointed to a framework within which to assess three general types of investments, with respect to their relationship to the geographical area and their function in supporting competitiveness:

- “*external network infrastructure*,” facilitating the interaction of the local trading economy with external economies and networks;
- “*local network infrastructure*,” such as road, transit and water systems, distributing services and people across the area; and
- “*in-place infrastructure*,” such as housing, educational facilities, industrial parks and public amenities, which provide the basis for localized benefits and capture of externalities.

It was further determined that investments may be characterized as to their orientation to the external trading sector, or local economy. In following linkages between investments and outcomes, it is noted that a particular investment may have either direct or indirect impacts:

- specifically and directly supporting the sectors of the local economy that is engaged in trade with external economies; or
- indirectly supporting the trading sector via impacts on the local economy.

These insights allowed the development of a theoretical model and research methodology suitable to the questions at hand, via adaptation of several existing models of factors and relationships affecting urban competitiveness that represented a reasonable consensus view from the literature.

This synthesis of the literature and consequent development of a model represents an advance in the theoretical understanding of urban competitiveness, which can be used in the future to help guide decision-making and performance measurement.

The model and methodology allowed the researchers to specify a set of questions. The answers to these questions were pursued by in-depth case studies, involving documentation of the investments by the participating municipalities, what other data was available from other sources, and by expert interviews, mainly with senior city staff. The questions, in summary form, were:

- Did the case studies identify specific strategies and investment plans directly linked to the larger strategy or economic development plans?
- Were the specific investments intended to relate to competitiveness?
- Irrespective of intentions, did the case study investments have potential or observable competitive effects?
- Did the investments have direct effects on competitiveness?
 - Did they affect fundamentals/drivers with probable or future effects on competitiveness?
 - What about the extent to which you could connect, observably or otherwise, strengthening of the local economy to competitiveness?

And finally:

- Were the intended outcomes of the investments defined and measured? Specifically, what measures and data, relevant to the particular investment, as suggested by our theoretical and empirical review, exist in current municipal studies, or could be obtained from local-level data obtainable from the municipality or elsewhere?

7.2 Conclusions from the Case Studies

In general, the case studies show that these cities have (recently) identified competitiveness as a significant consideration and have developed positioning strategies around the concept of city competitiveness. Evidence suggests that this theme is beginning to permeate across city corporations and greater consideration is starting to be given to how certain investments might or might not contribute. Competitiveness is not the only, or even the primary, driver of investment decisions. Also, the degree to which each city has taken steps to direct key infrastructure investments towards fulfilling that agenda varies, although in all cases this shift is still relatively new.

A key contribution of this research is the recognition of how governance processes influence decision-making and how this may in future relate to the successful pursuit of urban competitiveness.

In particular, the municipal capital budgeting process seems to be fundamental to the successful implementation of a city's competitiveness strategy. The extent to which corporate strategic objectives are explicitly considered in formulating the budget determines the potential of major investments to purposefully support a city's competitiveness agenda. This follows from the direct observation that initiatives designed with competitiveness effects as the goal are likely to have the most directly observable impacts.

Related to this is the critical influence of federal and provincial policy and practices. Municipal infrastructure investment decisions are often driven by federal and provincial funding conditions. Cities are embracing the concept of strategic planning towards defined objectives including improved competitiveness.

First of all, and fundamentally, the research found that most of the investments reviewed had their connection to economic development via increasing the value of human capital as it relates to production. This argues for the general irrelevance, from an analytical and policy perspective, of the old labels or "hard" versus "social" infrastructure and highlights the importance of viewing infrastructure investments, where competitiveness is the goal, in terms of their precise functional impacts on the efficiency and supply of human capital.

Second, if improved competitiveness is the goal, it is important to define how investments will support this goal as part of a deliberate strategy and aimed at specific targets and sectors. The theoretical model developed in this research study will be of use to such planning processes because it explicitly links how decisions are made to the intended outcomes.

Third, similarly well-targeted strategies may be required to manage the pressures of growth that may accompany competitive success. This will be particularly important where high growth rates impact on the affordability of housing, the environment, and the general quality of life for all residents. Because competitiveness is clearly and intimately linked to urban quality of life, both as an expected outcome as well as a determining factor of attractiveness to support increased competitiveness, attention to the social and environmental aspects of growth should logically be seen as part of a competitiveness strategy.

The importance of system-wide approaches to infrastructure and the relative unimportance of scale, for discrete investments, were highlighted in the case studies. In general, for large-scale infrastructure such as transit or housing, attention to complete systems of infrastructure, oriented in function and location toward support of planned city/business growth, is important as opposed to unconnected, discrete and/or unfocused investments. At the same time, the Ottawa Broadband initiative showed that relatively small-scale investments can have significant impacts on competitiveness when aligned to improving the overall system of competitive infrastructure. The relatively large-scale Sheppard subway line did not have similar effects mainly because it was not well-positioned to support an overall transit strategy.

The research also highlighted what appears to be an importance of physical proximity or connection of infrastructure to the locations at which the externally competitive production takes place. This is particularly important when new economic development occurs in deliberate or de facto industrial and research clusters. As it stands, there appears to be little linkage between the needs of identifiable externally competitive industries and the *overall* pattern of transit, housing and other large-scale infrastructure.

7.3 In Summary

This research project has synthesized the existing knowledge on the effects of infrastructure investments on urban competitiveness, developed an innovative analytical model and probed the evidence of competitiveness effects of a selection of investment types.

We have found that municipal governments have indeed moved significantly toward governance and planning mechanisms, which explicitly include economic competitiveness as a goal. This trend could be greatly facilitated by intergovernmental collaboration on competitiveness planning and on measurement of results.

“Social infrastructure,” in this context, becomes part of a continuum of infrastructure types, which are mostly relevant to competitiveness in the “new economy” in terms of their ability to improve the productive capacity of human capital. Social infrastructure, to the degree that the term is relevant, is also important as part of a competitiveness strategy in its ability to ameliorate stresses on quality of life and social equity that can accompany high rates of economic and population growth.

The work has, finally, shed significant light on the extent of knowledge and data available for decision-making and the current state of planning for competitiveness. Moreover, a general model has been developed that can be applied by planners and researchers. This planning and measurement capability would be significantly improved by development of better data and industry-specific knowledge, as well as knowledge on the interface between the state of the local economy and competitive industry.