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**An Analysis of Winnipeg's
Information and Computer Technology Industry
Within a Community Economic Development Framework**

By

Melodie Friesen

A Thesis
Submitted to the Faculty of Graduate Studies
in Partial fulfillment of the Requirements for the Degree of

MASTER OF ARTS

Department of Economics
University of Manitoba
Winnipeg, Manitoba

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Melodie Friesen

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of

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Of

Master of Arts

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ABSTRACT

The objective of this research is to analyze the extent to which the information and computer technology (ICT) industry in Winnipeg contributes to or detracts from the objectives of a particular economic theory of the whole community—namely, community economic development (CED). This was achieved by developing a CED framework for analysis, conducting a survey of ICT businesses in Winnipeg to gather the required data, and using the collected survey data to complete the analysis. The results of the analysis indicate that the ICT industry is contributing significantly more to some of the objectives of CED than it does to others.

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DEDICATION

To Cyril

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENTS	ii
DEDICATION	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
1 INTRODUCTION	1
2 SETTING UP THE FRAMEWORK FOR ANALYSIS	5
2.1 The Origins and Overview of the CED Model	6
2.1.1 <i>Dependence and Thomas’ Theory of Convergence</i>	6
2.1.2 <i>CED as a Modern Theory of Convergence</i>	10
2.2 The Objectives of CED	16
2.2.1 <i>Use of local goods and services</i>	18
2.2.2 <i>Production of goods and services for local use</i>	19
2.2.3 <i>Local ownership and decision making</i>	20
2.2.4 <i>Long term employment of local residents</i>	25
2.2.5 <i>Local skill and knowledge development</i>	27
2.2.6 <i>Local re-investment of profits</i>	28
2.2.7 <i>Physical environment</i>	28
2.2.8 <i>Health and well-being</i>	30
2.2.9 <i>Human dignity</i>	32
2.3 The Tools and Indicators to Complete the Framework for Analysis ..	33
3 METHODOLOGY	43
3.1 The Questionnaire	43
3.2 Survey Methodology	45
3.3 Potential Survey Errors	48
4 THE ANALYSIS OF WINNIPEG’S ICT INDUSTRY	54
5 CONCLUSION	85

6	BIBLIOGRAPHY	102
	Appendix A: A Review of Analytical Techniques	107
	Appendix B: A Copy of the Questionnaire	123

LIST OF TABLES

Table 4.1	Employment by Sub-Industry Group in the Survey of the ICT Industry Winnipeg, Manitoba 2003	56
Table 4.2	Employment by Sub-Industry Group in the ICT Industry Winnipeg, Manitoba 2000 (as reported by the 2001 Census)	57
Table 4.3	ICT Intersectoral Flows Table, Winnipeg, Manitoba 2003	60
Table 4.4	Exports of ICT Manufactured Goods and Services	65
Table 4.5	ICT Businesses by Size, Winnipeg, Manitoba, 2003	67
Table 4.6	Average Annual Salary Paid to Full-Time Employees	72
Table 4.7	Selected Groups as a Percentage of Total Employment in the ICT Industry	81

LIST OF FIGURES

Figure 2.1	Critical Minimum of the Average Cost Function	24
Figure 2.2	Framework for Analysis	35
Figure 3.1	Histogram of 'Year of Business Start Up'	49

1 INTRODUCTION

The information and computer technology (ICT) industry is a key player in the Winnipeg economy. The industry currently employs over 12,000 persons and generates over one billion dollars in total annual revenue. Total job growth in the industry has increased by nine percent from 1998 to 2003.¹ ICT is quickly growing to be a significant component within both the manufacturing and services sectors of Winnipeg's economy. The impact of the increasing importance of the ICT industry, or developments in technological innovation and information in general, may be studied in numerous ways. Analyses may be conducted to study how the composition of capital investment has largely shifted towards technology-based products; how innovative products and ideas flow from one industry to another; or how differences in the availability and use of innovation and technology strategies correlate with firm-specific growth and performance (Gellatly, 2003: 5). The impact of the ICT industry may also be analyzed for its contributions to the local community.

More specifically, the research conducted here analyzes the extent to which the ICT industry in Winnipeg contributes to or detracts from the objectives of a particular economic theory of the whole community—namely, community economic development (CED). CED theory is a comprehensive model of convergence of the whole community, which places the community at the centre of economic development—such that the community is both the beneficiary and the prime mover. In Winnipeg, the excitement about CED has never been greater. The provincial government of Manitoba recently developed a CED Policy Framework as a vital component of its strategy to “build a more inclusive, equitable and sustainable economy” (CED Initiative, 2001: 1).

¹As reported in Destination Winnipeg's “Quarterly Economic Highlights – 4th Quarter 2004”.

The policy framework used by the provincial government is similar to the analytical framework that will be set up here for the purposes of analyzing the alignment of Winnipeg's ICT sector with the goals of CED. Numerous non-governmental organizations in the city have also adopted CED principles—including, the Community Development Business Association, SEED Winnipeg, the Jubilee Fund, Christmas L.I.T.E, the Manitoba Co-operative Council, and Assiniboine Credit Union (CED Initiative, 2001: 1). Many Winnipeg businesses have also incorporated these CED objectives into their business practices—including, Neechi Foods Co-op., Tall Grass Prairie Bread Company and Deli, Mondragon Bookstore and Coffeehouse, and The Sedentary Nomad.² The widespread and growing support within Winnipeg for a more community-based, sustainable and fair economic development largely legitimizes this analysis of one of the key industries in Winnipeg within a CED framework. It is within this framework of the CED model that the ICT industry will be analyzed for its contributions to the objectives of CED.

The Information and Communication Technology Association of Manitoba (ICTAM), formerly the Manitoba Innovation Network (MIN), is a not-for-profit, membership based, industry organization representing the ICT industry in Manitoba. At the organization's inception, they adopted six strategic imperatives that fit within their commitment to building dynamic linkages between community and economic interests through co-operation and commitment from all constituents to ensure the future prosperity of the ICT industry in Manitoba. These imperatives are:³

² For a complete list of Winnipeg businesses who have adopted the CED objectives see the *Community Shopping Guide: Supporting a Healthy Local Economy in Winnipeg* published by SEED Winnipeg in 2003.

³ As reported in a June 10, 2002 News Release from the Manitoba Innovation Network.

- (1) All stakeholders—government, education, and business—need to invest in new technologies and must look to fulfill their needs by turning to Manitoba-based suppliers.
- (2) Governments need to foster policies that are conducive to investments in technologies from Manitoba-based companies.
- (3) Technology providers and developers need to continue to develop Manitoba-based capabilities and capacity to deliver technology solutions that are second to none.
- (4) Information technology is a proven stimulator of economic health. Promotion of local technology companies will enable those businesses to create and sustain Manitoba jobs, increase economic wealth, and build a robust tax base in Manitoba.
- (5) Educational institutions acting in their capacity as developers of human capital and users of technology need to foster the use of Manitoba-based suppliers.
- (6) Educators need to map their programs and curricula to market demand so that the Manitoba skill base will be continually rejuvenated.

Many of these imperatives of the industry association are very much in line with the stated objectives of the CED model, which will be identified and explained in the chapter to follow. To what extent has the industry association been successful in fulfilling these goals to build a cooperative and dynamically linked industry? The analysis conducted here will shed light on this question. Although the framework for analysis will be in the broader context of the identified objectives of the CED model, the imperatives above largely fit within the CED objectives.

The background and overview of the CED model, which will be used to set up the framework for analysis, will be detailed in chapter two. A list of objectives will be extracted from this overall model of CED, and will be used to analyze the alignment of the ICT industry with the goals of CED. To complete the framework for analysis, the objectives will be matched with the appropriate analytical tools and indicators, which will provide the measuring sticks by which we can evaluate the extent to which the ICT industry is contributing to or detracting from CED in Winnipeg. With the analytical framework in hand, appropriate data on the Winnipeg industry are needed to actually

conduct the study. A survey of the industry was conducted in the summer of 2004 to collect the required data for the study. Chapter three briefly reviews the content of the questionnaire, outlines the methodology used in conducting the mail-out survey, and describes the possible survey errors that may skew the results of the study. In the fourth chapter, the results of the analysis are reported within the framework set out in the second chapter. Chapter five provides a discussion on the final conclusions of the analysis, revisits the methodological difficulties and limitations of the study, and includes some questions and recommendations for further research.

2 SETTING UP THE FRAMEWORK FOR ANALYSIS

Community economic development (CED) was in practice throughout many parts of the world before it was ever referred to as such. Only in the early 1970s did the terminology of CED truly emerge onto the political and academic scene. It was in a 1971 report that the United Nations claimed that CED had gained universal recognition as a force for effecting social and economic change (Griffiths, 1974: 88). But the lack of a universally accepted definition of CED motivated many theorists to attempt its definition; and consequently much of the academic discourse of CED in the latter part of the century is primarily focused on defining CED and outlining its aims and objectives (Griffiths, 1974; Batten, 1974; Loxley, 1986; Perry, 1999). Despite these efforts, a universal definition of CED has not yet been commonly accepted.

Extracting various components of the works by Thomas (1974), Griffiths (1974), Batten (1974), Loxley (1986), Lutz and Lux (1988), Perry (1999), and others, CED will be defined here as *a comprehensive theory of convergence of the whole community, which places the community at the centre of economic development—such that the community is both the beneficiary and the prime mover. By matching local resources with local needs, community members are able to realize their higher order non-economic needs, as well as their basic material needs.* This working definition will provide the basis for section 2.1 of this chapter. In section 2.1, the CED model will be explained in terms of its origins in dependence theory, in terms of its characteristics as a modern convergence theory, and in terms of its overarching goal to meet the needs of the community. This section will provide the background and overview of the CED model.

The CED model that will be described in the first section will serve as the ideal model from which particular objectives of CED may be extracted. The CED objectives that arise out of the CED model may be used to analyze the alignment of particular projects and initiatives, particular businesses, or industry sectors with the goals of CED. It is these objectives that are of particular interest in setting up the framework for analysis to be used in this study of Winnipeg's information and computer technology (ICT) industry. The purpose of this study is not to claim that the ICT industry in Winnipeg either is or is not an absolute model of CED. Rather, the study will analyze the extent to which each CED objective is realized in the ICT industry. The industry may contribute to some of the objectives of CED better than it does to others. Section 2.2 will take up this discussion on identifying and explaining each of these CED objectives.

To complete the framework for analysis, the CED objectives must be matched with the appropriate analytical tools and indicators. The analytical tools and indicators provide the measuring sticks by which we can evaluate the extent to which the ICT industry is contributing to or detracting from CED in Winnipeg. Thus, the tools and indicators that will be used to analyze each of the CED objectives will be introduced and described in section 2.3. Upon matching the appropriate analytical tools and indicators with the CED objectives, the framework for analysis will be complete.

2.1 The Origins and Overview of the CED Model

2.1.1 Dependence and Thomas' theory of convergence

CED theory is deeply rooted in regional growth theories of underdevelopment—that is, theories stressing the negative consequences of capitalism. In particular, CED primarily draws upon the theory of convergence. The theory of convergence was developed by

Clive Y. Thomas to resolve the problems predicted by dependency theory. The now passé theory of dependence attempts to explain the underdevelopment that is so common in the 'developing' world, and many other smaller economies. Essentially, dependency theory postulates that the underdevelopment of the so called *peripheral* regions has much to do with the effects of the *colonial* regions. The colonial region is defined, by dependency theorists, as the larger and typically urban region that is the economic centre of the greater region, which is made up of many peripheral regions. Since very little processing is completed within peripheral regions, most of the extracted resources of the peripheral regions are transported to the urban centre for further processing or manufacturing (Loxley, 1981: 157). The processed goods are then sold back to the peripheral regions as consumer goods.

The exploitative nature of dependency hinders the development of the periphery. The dynamics of dependency centres on the "productive relations which give rise to the divergence of the pattern of domestic resource use, domestic demand, and the needs of the broad mass of the community" (Thomas, 1974: 123). Domestic demand and the resource base of the peripheral region diverge, so that it does not utilize its own resources to meet its own demand. "Furthermore, there is no recognition that people have resources and means within their communities and regions to meet many or most of their needs" (Nozick, 1993: 18). Most of the region's resources—in particular the resources of highest quality—are exported to the economic centre while many of the region's own needs are unmet (Loxley, 2003). Needs remain unmet because the driving force behind dependency is not to meet local needs, but to industrialize and develop export markets. Consequently, peripheral regions often lack the internal linkages to converge domestic demands with domestic resource use. "What is produced locally is

not consumed locally and what is consumed locally is not produced locally" (Loxley, 1981: 157-8).

As a result of the dependent structural relationships, peripheral regions are highly dependent on external markets for both imported inputs and primary exports, and are vulnerable to the goals and economic shocks of the centre. Hirschman (1958: 99-100) argued that a heavy reliance on importing is particularly risky due to balance-of-payments uncertainties that result from mismatched inflation rates and a depreciating exchange rate between the two regions. Wien (1986: 107) claimed that "the main problem with dependent development is that decisions are externally controlled and subject to external priorities, rather than meeting local needs". Because the peripheral regions rely so heavily on exports to the economic centre, their income and their ability to meet their most basic needs are heavily dependent on external priorities. "By dependence I mean the relations between centres and the periphery whereby a country is subject to decisions taken in the centres, not only in economic matters, but also in matters of politics and strategy for domestic and foreign policies" (Prebisch 1980: 25). As a result of an outward looking approach to development, the periphery's own needs and goals take the passenger seat to those of the economic driver. Consequently, the external pressure to satisfy the demands of the colonial region significantly hinders the peripheral region's ability to decide autonomously how economic development should, or should not, be carried out (ibid., 21).

Finally, the periphery is not only susceptible to external shocks and the persistence of unmet needs, but the region misses out on the profits generated from its own resources. Production in peripheral regions is almost entirely for primary export—that is, natural resources are extracted and exported out of the region for further

processing (Loxley, 1981: 157). Since value added is primarily generated by the processing and refining of raw goods, it is the colonial region that profits most from the economic activity of the peripheral region. In fact, the prosperity of the colonial region is itself dependent on the sustained underdevelopment of the peripheries. It is this mechanism of unequal exchange that significantly hinders mutually beneficial exchange between two regions (or between individuals, or classes of individuals within a region) of significantly different levels of development, or wealth. Multinational corporations are often regarded as the chief agents of such peripheral exploitation: "taking raw materials from the periphery (or internal colony) at low cost and gaining huge profits from their subsequent processing and sale" (Wien, 1986: 105).

In 1974, Thomas presented his theory of convergence as a solution to the negative outcomes of dependence and divergence. Thomas claimed that resource use must converge with needs in the region. Regions ought to examine their own resource base, and attempt to meet the local needs of the community by utilizing these resources. Rather than separating the needs of the community from the means of production, communities ought to plan production in such a way as to utilize domestic resources to satisfy domestic needs first. Surplus goods and services should be exported only once all of the needs in the community are met. Local resources ought to converge with local needs. If a community can depend upon their own resources to satisfy their needs then they will need to depend less on risky external markets to sell and buy goods. Communities which are able to converge resource use with demand will also strengthen the local economy by increasing value added. The uncertainty arising from relying heavily on imports makes domestic availability of goods and services a considerably more effective spur to economic development (Hirschman, 1958, 99).

2.1.2 CED as a modern theory of convergence

Thomas' theory of convergence rests on one particularly unrealistic assumption: that national states, or regions, are in transition from capitalism to socialism (Thomas, 1974: 26; Loxley, 1981: 163). Thomas (1974: 124) argued that planning consumption and production is possible only upon the complete elimination of capitalist markets and the implementation of socialism. Trapped in the capitalist-socialist dichotomy, Thomas believed production to be either planned or unplanned (i.e. determined by the market). Because of Thomas's assertion that the transition to socialism was a necessary condition of convergence theory, his theory has been largely ignored.

Ernst F. Schumacher's 1973 publication of *Small is Beautiful: Economics as if People Mattered* broadened the spectrum of the traditional dichotomy of capitalism-socialism to include eight possible types of economic systems. He claimed that every economy had three major choices in regards to its internal operation: "the choice between private ownership of the means of production and alternatively, various types of public or collectivized ownership; the choice between a market economy and various arrangements of 'planning'; and the choice between 'freedom' and 'totalitarianism'" (Schumacher, 1973: 264). Given these three choices, there are 2^3 or 8 possible types of societies (ibid., 265). At one end of the spectrum is a perfect capitalist society (choosing freedom, a market economy, and private ownership); and at the other is a socialist society in its purest form (characterized by totalitarianism, planning, and collectivized ownership). Somewhere between these two extremes lies a whole range of other possible societal structures (ibid., 266).

Schumacher's 'new vision' is thought to have set the foundation for alternative economic theories that are not restricted to the capitalist-socialist dichotomy. Even

within the capitalist market system there is room for various planning arrangements. Planning production and consumption *is* possible within capitalist systems. Thus, modern convergence theories—without the assumption of the transition to socialism—are still popularly used in regions that have the characteristics of dependent peripheries and are not in transition to socialism. Loxley, one of the leaders in modern convergence theory, is well known for his attempt to implement one such modified model of convergence in northern Manitoba—known as the Great Northern Plan—in the early 1980s. CED is another modern model of convergence that fits within the capitalist system (Lutz and Lux, 1988: 2). CED does not assume regions are in transition to socialism; and contends that production and consumption may be planned so that they converge.

Convergence, as defined by the *Oxford Canadian Dictionary*, is the process of coming together from diverse points to a common point. The process of convergence is fundamental to the CED model. The community—which lies at the very core of the CED model—converges. 'Community' will be defined here as a group of individuals within the same particular geographical locality⁴ who are unified by common values and interests, arising from their common locality (Perry, 1999: 20; *Oxford Canadian Dictionary*). Firms and individual members within a community share more than a geographical medium for market exchange. Community members share a wide variety of interests—including the sustainability of their physical environment and use of natural resources, the preservation and celebration of their cultural identity, as well as the planning and implementation of development projects. These common interests are what binds individual members to one another to form a community. Because members will work

⁴ The size of the geographical locality may vary in size depending on the specific context and may be defined as small as an urban neighbourhood or rural village, or as large as a province or country.

together to protect their interests, the community is by nature cooperative (Coveney and Highfield, 1995: 232; Fairbairn et al., 1991: 59). And this cooperative nature of the community makes the formation of collective decision-making groups to meet collective goals possible.

Assuredly individuals within communities will have diverse and often conflicting interests. CED is certainly not without conflict. One commonly noted tension is that since the community is defined as individuals within a particular geographical region, the benefits of particular CED objectives may go directly to specific residents (Perry, 1999: 20). For example, in a region characterized by deep poverty, the CED activities that are pursued should serve to better those who are impoverished rather than those who are wealthy. "If community development is effective in giving some members of the community more control over their lives and over the resources of the community, the chances are that someone else in the community is losing some control or influence" (Loxley, 1986: 9). CED theory relies on, at least to some degree, the cooperation among community members. There is extensive literature on such theories of cooperation for collective action,⁵ but they lie beyond the scope of this chapter and will not be discussed here.

CED is a comprehensive model of the 'whole community' whereby economic goals converge with non-economic goals. CED is deeply rooted in economics, but is not a pure economic theory. Community life includes all matters from economic growth to child rearing, and thus community decision-making will naturally include these wide-spanning goals (Griffiths, 1974: 92-3). The multi-faceted dimension of CED allows for numerous, varying goals to be pursued under the label of CED. Strategies to improve

⁵ For a review of these theories see Todd Sandler. 1992. *Collective Action: Theories and Applications*. Ann Arbor: University of Michigan Press.

housing conditions, increase the level of employment, develop a community library, or clean up the neighbourhood, for example, may all be components of a particular community's CED strategy. Although the strategies of CED are wide-spanning, CED will always include some level of economic or business development at its base (Perry, 1999: 21). Economic development is the foundation of the comprehensive CED goals of the community.

The convergence of all the widely spanning goals held by the community is the central feature of the CED model. Thomas (1974: 133) argues that the convergence strategy:

contains its own material, economic, scientific, social, and political dynamic. We shall seek to establish the convergence of these relationships as a *necessary* condition for transforming the mode of production and raising the level of utilization of productive forces, so that poverty and underdevelopment will no longer remain crucial features of the economic system....It is these relationships that give an economic system its internal autonomy and determine its capacity for sustaining growth and development.

It is the very nature of these converged relationships that transform the productive forces to reverse deeply rooted poverty and underdevelopment in communities. By converging these diverse, wide-spanning goals, the community is able to autonomously determine its own growth and development to meet identified needs in the community.

Thus, the overarching goal of CED is to meet the needs⁶ of the community. In the literature on CED, the notion of meeting needs in the community is central to its strategies. Loxley (1986: 12) claims, "that economic development should proceed in a

⁶ Although needs are often equated with demands, which are met through the market system, CED theory deliberately distinguishes 'needs' from 'demands' or 'wants'. Because demand is a function of income, revealed market preferences cannot reveal whether basic needs have been met; some basic needs may not be 'felt' and will not be revealed as market demands; and market failure may make the provision of basic needs unprofitable without some form of subsidization (Loxley, 1986:15-16).

way that meets the needs of communities is a proposition which, superficially at least, appears unobjectionable". Strategies for economic development in the community implies, by definition, that there are unmet needs in the community. Essentially, community members have two types of needs—basic material needs and higher order needs. Basic material needs include *physiological* needs (air, water, food, shelter, and sleep), as well as needs for safety and security (Maslow, 1954). The higher order needs consist of *social* needs—that is, the need for belongingness (to be loved, to be shown affection, and to be accepted), self-esteem, and the esteem of others—and *moral* needs of self-actualization—that is, the need to love and to serve, to seek truth and justice, to pursue perfection and aesthetics, and to experience meaningfulness (Maslow, 1954).

Only the physiological needs may be acquired with money (Lutz and Lux, 1988: 14). Acquiring the monetary means to attain basic material goods is essential for the initial development of individuals. But once these basic needs are met, less effort is required to maintain these needs for survival, and more effort may be afforded to procuring the higher order social and moral needs, which are only minimally dependent on monetary wealth. The capitalist market system is only able to deal with the economic, or physiological needs of individuals. Thus, the higher order needs are outside the reach of capitalism.

The higher order needs are best fulfilled in community, where individual members interact with one another. Because CED is not limited to economics, but is a model of the whole community, the higher order needs are well within its reach. Individuals who participate in CED work collectively to satisfy the most basic material needs; and this process in and of itself works to attain the higher order needs attained through participating in a community. Part of the strategy of CED is mobilizing people to

come up with strategies for structural change in their communities. Community action is not only for direct outcomes, but also for those learned in the process (Nozick, 1993: 39). Within the CED model, communities are able to sustain their physiological needs, while procuring many of the higher order needs as they cooperate and do development together.

Before moving on, it will be useful to briefly define what is meant by 'planning'. (This notion of community planning was specifically used and alluded to in the previous explanation of the CED model, and will be mentioned frequently in the following section.) In the CED model there is room for some type of community planning to manipulate the market in order to bring about outcomes that otherwise may not occur (i.e. market regulation, subsidization, strategic planning). Planning may take many different forms. Essentially, CED is a converging of community members—a converging of their needs, a converging of their resources—in order that needs are met. It is this converging of ideas, needs, and resources that is the planning component of CED. Planning is done, not by a socialist dictator, but on a grass roots level by community members. This 'conversation' will look different in different communities. Some communities may wish to elect members to a community board that is responsible for overseeing development and growth in the community. In others, this planning may be more informal and may take form as pockets of community members sitting down in local coffee shops discussing local issues, proposing solutions to these challenges, and exploring opportunities for future development. With this common understanding, community members may continue to participate in the market to bring about shared goals, that otherwise may be obscured in the market.

2.2 The Objectives of CED

The CED model described in section 2.1 may be thought of as the ideal model of a CED community. Such ideal CED communities are rare in reality, if not completely imaginary.⁷ The reality though is that individuals in a community are social beings who, despite the strong self-interested desires emphasized by capitalism, interact and cooperate with one another. Many pockets of individuals realize their interdependency with fellow neighbours and understand themselves within the community contexts in which they live. Many of these individuals also own businesses, and their humanistic values and commitment to community are reflected in the way they run their businesses. Thus, various extractions of the CED model are familiar realities in many communities, or particular segments of communities. Less than perfect CED thrives in many communities. Consequently, principles arising out of the CED model may be used to analyze the alignment of particular projects and initiatives, particular businesses, or industry sectors with the goals of CED.

It is these objectives that will be particularly useful in setting up the framework for analysis to be used in this study of Winnipeg's ICT industry. Such CED analyses are commonly conducted by proponents of the CED model for community transformation and development. The provincial government's CED lens, developed in 2001, is composed of a series of questions corresponding to ten CED principles. The lens is the particular tool that is used to apply the province's CED strategy to all areas within the provincial government and major development projects within the province (CED Initiative, 2001: 1). The policy framework used by the provincial government is similar

⁷ But this is no reason to disregard the theoretical principles of CED. Perfectly competitive markets are not realities anywhere around the globe either, yet the theoretical discourse of capitalism is of a perfectly competitive system. All theories must be based on some assumptions, even unrealistic ones, in order to simplify reality.

to the analytical framework that will be set up here for the purposes of analyzing the alignment of Winnipeg's ICT sector with the goals of CED. The framework for analysis consists of a series of tools and indicators relating to the CED objectives that will be identified and explained here.

Although specific interests and objectives will vary widely across different communities, the literature on CED has identified a number of generalized objectives that fit within the framework of the theory. The CED objectives that will be presented here are based on a list of principles developed in 1992 by Neechi Foods Co-op—a worker co-operative in Winnipeg.⁸ The first six the nine intertwined objectives focus primarily on the economics of CED. These first objectives are essentially the mechanisms by which communities may strengthen and foster their own development from within to procure for themselves a higher level of income so as to attain physiological needs. The final three objectives for this analytical framework are centrally concerned with the non-economic needs of the community. The CED objectives are: (1) use of local goods and services; (2) production of goods and services for local use; (3) local ownership and decision-making; (4) long term employment of local residents; (5) local skill and knowledge development; (6) local re-investment of profits; (7) physical environment; (8) health and well-being; and (9) human dignity. Each objective will be individually explained in the rest of this section in terms of its application to an industry, in particular.

⁸ Neechi Foods Co-op was a project of Winnipeg Family Economic Development Inc. (WNFED), Winnipeg, Manitoba.

2.2.1 Use of local goods and services

The first two CED objectives focus on strengthening the economic linkages within a region. Thomas (1974: 124-5) noted that:

If the material manifestations of underdevelopment have been expressed as the dynamic divergence in the pattern of domestic resource use, domestic demand, and needs, in the absence of an indigenous technology to provide the basis for an organic link between them, then the principal material goal must be to seek a dynamic convergence of these relationships.

Local resources are to converge with local needs. Matching local resources and production with local needs serves to strengthen local economic linkages: and linkages are central to convergence.⁹ Linkages within the economy may be either backward or forward. Forward linkages are the sales from one industry to other local industries or final demand sectors; while backward linkages are the purchases by an industry or final demand sector from various local industries.

One of the central objectives of CED is for the use of locally produced goods and services as inputs into the production processes of other businesses in the region. Strong backward linkages within a region serve to circulate income—of various types—within the local community and minimize leakages (WNFED, 1993). As businesses purchase locally produced goods and services for use in their production process, income is circulated within the local economy. If the ratio of imported input purchases to domestic input purchases is high, then the remittance of income to businesses outside of the local economy will also be high. Any income that accrues to individuals in

⁹ The importance of linkages as a mechanism for regional growth and development was widely accepted even before Thomas' work on convergence in 1974. Although, the theory of convergence is attributed to Thomas, many of its principles were central to earlier regional growth theories. In particular, Canada's own Staple theory heavily relies on the backward and forward linkages as the key to the success of a region's development, via a staple export (Watkins, 1963).

community (in the form of wages, profits, and rent) that is spent on goods and services outside of the region is also a form of leakages.

Strengthening the backward linkages does not only circulate more income within the economy; businesses' use of locally produced goods and services also reduces the dependence of the community on external markets. Divergence of needs and resources unnecessarily increases the dependence of the community in meeting its needs on import markets and subjects it to external shocks. Relying less on outside markets allows communities to have greater self-reliance and restores the balance of resources and needs within the local economy (WNFED, 1993).

2.2.2 Production of goods and services for local use

There are needs in a community that may be met by utilizing local resources and locally produced goods and services. In the convergence model of the 'whole community' it is vital that all needs in community are met before surplus goods and services are exported out of the region. The primary goal of CED is to meet needs, thus production should proceed in such a way as to meet the needs of the community first. Convergence theory tends away from dependence on external markets to meet needs, in favour of a more autonomous approach towards economic development. In order for businesses' production of goods and services to contribute to the objectives of CED, it should satisfy the needs of other local businesses and consumers (i.e. if production is for local use, then it is favourable for CED).

Beyond the goal to meet needs, production of goods and services for use in the local community serves to circulate income within the local economy through forward linkages. "While exports of commodities from the economy are necessary for

development, they must be matched with a strong internal component that captures and recirculates wealth and uses it to sustain wider economic activities" (Fairbairn et al., 1991: 49). By increasing the economic linkages between businesses and between businesses and consumers, the community benefits from greater value added, which circulates income within the local economy. By minimizing leakages, the community works to stop the drainage of profits out of the region. To widen and deepen the linkages, plans for development among individual sectors must be integrated so that they complement one another (Wien, 1986: 112).

2.2.3 Local ownership and decision making

Diffusionist theories of economic development—that is, theories of development stressing the positive consequences of capitalism—place the responsibility of economic development on private enterprises, multinational corporations, and entrepreneurs (Chilcotte, 1984: 10). In the CED model, however, decision-making is transferred to the community—so that the community itself is the primary initiator of its own development. CED is often mistaken as economic development within a community. Economic development within a community may be pursued without the initiation, participation, or even the approval of the community in question. This may occur where an external enterprise or non-local government takes the primary role in deciding, and/or implementing strategies for development in a community. Where the community is the primary driver of development, it is free to autonomously pursue its own development for its own benefit.

Within the inward-looking convergency framework, it comes as no surprise that local ownership is preferred to foreign ownership. "Local ownership and control are

considered essential if patterns of investment are to change to promote community development and if surpluses are to be reinvested locally to guarantee long term development” (Loxley, 1986: 24). If ownership is not local, the incentives or awareness required to plan production so as to strengthen linkages will be less likely to be present. Local members of the community are more likely to have a vested interest in the economic development within the community than do non-members. The non-economic aspects of community living—that is, the safety and state of the physical environment, the health and well-being of fellow community members, and the investments into training and knowledge development—are shared by those living within a particular community. Thus, planning production so as to strengthen economic linkages within the community will be more likely when ownership is local, than when it is not local. CED is a model that shifts decision making power, which stems directly from ownership, to stakeholders within the region.

Domestic ownership also serves to minimize leakages. Rents, interest and profits accrue to owners of resources, capital goods, and entrepreneurial ability. When owners are not also members of community, resource rents and profits leak out of the region (Loxley, 1981: 158). Non-community members who own resources, land, or businesses may be able to make large profits, but because ownership is not local, these profits tend to leak out of the community. Civic Economics, based in Chicago, recently published the results of *The Andersonville Study of Retail Economics* which compared the economic impact of ten locally-owned businesses and their chain competitors (Civic Economics, 2004: 1). The study found that “for every \$100 in consumer spending with chain firms, \$43 will remain in the local economy; if that same spending occurs with a locally-owned firm, that value jumps by 58 percent, to \$68” (ibid., 5). The results of similar studies

also show that locally-owned businesses may generate substantially greater economic impact than non-locally-owned businesses.¹⁰ Local ownership serves to minimize leakages and strengthen the economic linkages within the community.

Let us turn our focus to the type of ownership. A necessary condition of Thomas' convergence theory is the socialization of the means to production. Essentially, he argued that convergence of a society was only possible if private ownership was completely abolished, and a purely collective ownership system took its place. This requirement of collective ownership is a widely held belief by many CED and regional growth theorists. "Individual ownership, or competitive individual occupational mobility, is an approach that is said to yield benefits for the few at the expense of the many and to lead to the formation of elite families and extreme inequalities" (Wien, 1986: 112). Much of the backlash against private enterprise is due to the belief by many theorists that the productive forces of private enterprises within the capitalist market system are favourable to certain segments of the population only. The competition within the market system is driven by the pursuit of individual businesses' pursuit of profits, and economists critical of the market system question the impact this goal of profit maximization goal has on the community.

Thus, within some circles of CED theorists and practitioners, communally owned enterprises are the preferred business structure to achieve community development. "Communal ownership is thought to be the only type compatible with the strong democratic and participatory philosophy underlying some approaches to community development" (Loxley, 1986: 24). The primary types of communal ownership may

¹⁰ The Institute for Local Self-Reliance, a non-profit research and educational organization in Minneapolis, Minnesota, lists recently published studies on sound economic development strategies on its website <http://www.newrules.org>.

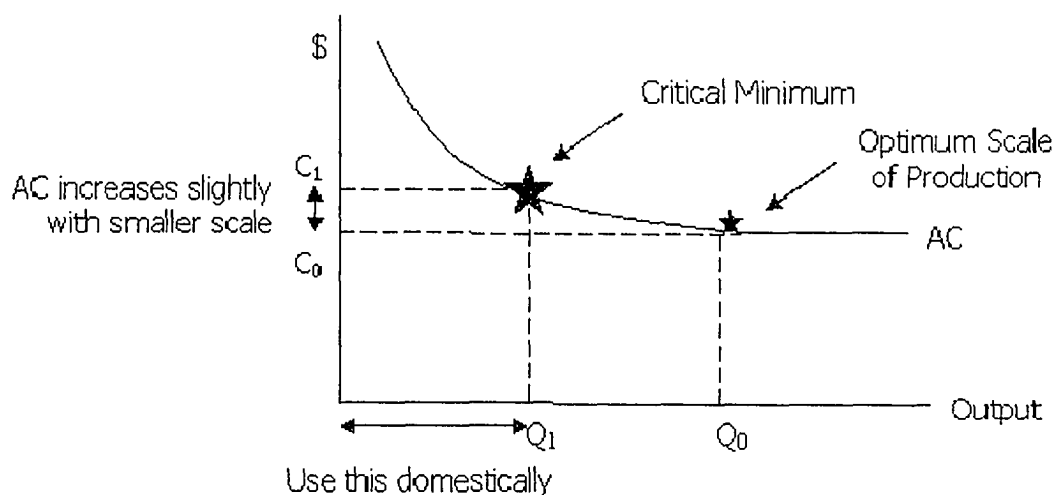
include consumer or worker owned cooperatives, community development corporations and non-profit incorporated entities (ibid., 25). Communal ownership, Loxley argues, may also be exercised through partnerships, and for-profit enterprises (25). Community ownership of its own economics is vital to its creativity for grassroots involvements, and the planning of production to meet domestic needs.

Collective ownership may better contribute to the needs of the community, but CED theory does not rest on this condition. "The state must assume a dominant role, but rather than socialize the means of production, it must work to coordinate private and public enterprise in order to overcome the obstacles and contradictions between centre and periphery" (Chilcotte, 1984: 27). It is very possible for communal ownership to be exercised through partnerships between the private and public sphere. "Even companies incorporated as profit making entities can be operated in a manner that permits community input and control if the desire is there" (Loxley, 1986: 26). A for-profit business may have broader community goals in mind than a purely profit maximizing one (ibid., 26). Schumacher (1973: 225) further argued that, in particular, small scale, privately owned enterprises were natural, fruitful, and just. Thus, it is believed that if private businesses are working together with the community, and vice versa, then private businesses may very well serve to strengthen the community as a whole.

Further, the convergence model is built upon an assumption regarding economies of scale. Given a downward sloping average cost (AC) curve, as depicted in Figure 2.1, there are gains to be made in terms of economies of scale. The percentage by which C_1 exceeds C_0 is a measure of the economies of scale to be gained by increasing output capacity up to point Q_0 (Perkins et al., 2001: 666). Average cost falls

as output rises up to point Q_0 , beyond this point there are no more economies to be gained by expanding output capacity. Most businesses produce at this optimum level of output so as to minimize costs. However, the complex factors influencing the "relationship between physical input and output factors belies the relationship of money costs of production, output levels, and the prices at which the output becomes available" (Thomas, 1974: 208). Especially in underdeveloped regions, the anarchy of the production system skews the real significance of economies of scale (ibid., 208). Prices must reflect domestic constraints and domestic demand priorities; the greatest efficiency in production is not attained by the blind pursuit for the optimum scale of operation (ibid., 210).

Figure 2.1 Critical Minimum of the Average Cost Function



It may be feasible to produce at a point other than the optimum scale of operation. The point Q_1 , half of Q_0 , is what is known as the 'critical minimum' and is "that range of the cost function over which the rate of inversion (i.e. rates of costs changes) is such that the cost savings are greatest, and the social costs of

industrialization are rapidly reduced" (Thomas, 1974: 210-211). In most small or undeveloped regions the increase in average cost of producing at the critical minimum instead of at the optimum point where average cost (AC) equals marginal cost is only slight (i.e. the percentage by which C_1 exceeds C_0 is minimal). The gains to increasing capacity to Q_0 are minimal. When the 'critical minimum' approach is adopted, the preliminary planning requirement is whether production is near this minimum range. "At this point, further gains in social cost savings obtained by waiting for output requirements to grow and approach the optimum are outweighed by the structural imperatives of transforming the economic system" (ibid., 211).

With the assumption that basic goods may be profitably produced on a smaller scale, the key investment decision is not a question of choice of technique, but the choice of product. The choice of product is based on essentially three characteristics: (1) high value added; (2) highest growth elasticities (measuring the rate of change of per capita value added for a change in per capita income); and (3) high forward and backward linkages (Loxley, 2003). The value added and potential forward and backward linkages that may arise from 'transforming the economic system'—that is, producing a certain good locally for local use—more than compensates for the slightly higher cost of producing on a smaller scale (Thomas, 1974: 211). Essentially, there are ways to gain production efficiencies other than the blind pursuit of economies of scale (i.e. through economic diversification).

2.2.4 Long term employment of local residents

Many communities face chronic unemployment or underemployment which causes high dependency on social assistance and charitable donations. The creation of good long-

term employment is essential to reducing dependency and increasing personal esteem and community morale. The greater the number of community members that are gainfully employed, the higher will be the level of wages and salaries that may then be spent within the community. A portion of these wages may be spent outside the community—which is a form of leakage out of the region. For CED, the employment of available local resources is given priority over the employment and use of imported resources.

Strengthening the economic linkages within a community also works to increase employment within the region. Fred Wien (1986: 109) notes that:

The increasing modern industrial activity (i.e. resource extraction or product manufacturing) is capital intensive, and in the absence of linkages, such industrial activity will provide few jobs. Most economies have labour surpluses, and thus development of capital intensive industries may not serve to fully utilize the resources available in the community.

As a community strives to use its own resources for meeting its own needs, labour surpluses will be considered a more valuable resource as a production input than, say, heavy amounts of imported capital goods. Thus, as the community matches production with domestic resources, more jobs are created for its members.

Cultural barriers are an often cited reason for high unemployment of certain groups of individuals—minorities and immigrants, in particular. Cultural barriers exist in communities where certain members are forced to conform to the ideals and patterns of the majority, or the owners of capital. CED breaks down these barriers in at least two ways. Firstly, as communities begin to work together to meet local demands by utilizing local resources, members will find employment within their own communities. There is likely to be fewer and less debilitating cultural barriers to employment for individuals within their own communities than for individuals who must leave their communities in

search of employment. Secondly, the cooperative nature of the community working together for *all* of its members increases the opportunities for employment of individuals who would otherwise be excluded from the labour market. The community includes and values all members. Presumably, the community is aware of the barriers to employment of certain groups, because those members are voicing their concerns, and the other members are listening. Thus, the community cares enough about all its members that it will actively pursue strategies to provide long term employment for all its members.

2.2.5 Local skill and knowledge development

Training members of the community for employment within the community is a highly valued characteristic of the CED model. Businesses are encouraged to participate in youth employment programs in order to contribute to the development of the community's future workforce. Business involvement in community decision making also spurs the development of other community members, as they benefit from the shared expertise and knowledge of established business owners. Each community member is a resource to his or her own community. Further development of these 'resources' increases their productivity (WNFED, 1993), while increasing the employability of individuals in communities that have historically experienced high unemployment. Higher labour productivity also serves to increase the production capacity of communities.

Education, in general, serves to increase individual well-being. Cognitive and skill development is fundamental for every day community living. Education may also provide training and skill development for specific jobs. In particular, the training of individuals for particular careers or skills should correspond with the assessed needs of the community. One of the features of a partially planned economy is that skill and

knowledge development may be matched with local production of goods and services. In order for the community to satisfy a particular need, it may develop labour so as to converge with the production process required to meet that need. Community members are thus trained to be the agents of their own transformation.

2.2.6 Local re-investment of profits

Another objective of CED is for profits to be re-invested back into the community. If profits are produced within the region, then they ought to remain in the region so as to benefit community members and increase economic activity. Local re-investment of profits serves to further minimize leakages. Investment that increases a community's autonomy in converging needs with resources is particularly of benefit for the goals of CED. Again, the likelihood that profits will be re-invested locally will be higher when ownership is local rather than non-local. Re-investing profits locally will minimize the leakages associated with income drainage, and also works to increase community self-reliance and cooperation (WNFED, 1993).

2.2.7 Physical environment

Economic development projects and strategies aimed at procuring the monetary means to attain material needs lies at the basis of the CED model. However, CED is not only concerned with economic development. Thus, economic development should not be blindly pursued at the expense of other interests. One interest that tends to be particularly overlooked in the narrow pursuit of economic development is the sustainability of the physical environment.

CED has a strong sustainable development component because it is believed that the key to vibrant communities are healthy, safe, and attractive neighborhoods (WNFED, 1993). Ecological sensitivity in business decisions, individual activity, and community projects is paramount in ensuring that economic development is pursued in such a way so that interference with the natural environment is minimized. CED encourages businesses and community groups to create innovative ways to conserve natural resources and improve the physical environment (CED Initiative, 2001: 3) Communities depend upon the physical environments they live in for (at the very least) clean air to breathe and clean water to drink. The physical environment and its natural resources also form a significant component of a community's local resources. A sustainable physical environment is a shared need of the community; and the physical environment is also a valuable resource for the community. It is the goal of the community to converge these two constraints in planning economic development.

Local ownership of businesses and natural resources enables the community to take greater control over the sustainability of their environment. If property rights are held by stakeholders within the community (i.e. private business owners, local government, community organizations), then decision-making power over the use and depletion of its natural resources is at least in the hands of some community members. Members of the community, as opposed to non-members, will be able to evaluate the impact of a particular strategy for economic development on their environment, and subsequently decide whether plans should proceed. Those who hold property rights who are not also part of the community will be less likely to share the common interest of the community to preserve their natural environment. Even if property rights are held by only some particular individuals in the community (i.e. privately owned, rather than

communally owned), this is still preferable than if property rights are held by individuals outside of the community, who do not personally share the interest of the community for the preservation of their natural environment.

The physical environment also greatly benefits from the close proximity of production and consumption. Nozick (1993: 29-30) explains that:

The self-reliant community—which consumes what it produces and produces what it consumes, which replenishes itself with its own reprocessed wastes, and which extracts the maximum work out of its own existing resources—is contributing to the sustainability of the planet by reducing pollution and depletion of the earth's resources.

The physical movement of goods and services across air, land, and water from one global market to another is costly for the environment. The further goods and services must be transported before they are consumed, the greater is the potential damage to the natural environment. If goods and services are both produced and consumed within a small geographical area, production and transportation externalities will be more likely to be internalized. Convergence of production and consumption also creates bioregional feedbacks which may expose many of the environmental consequences of consumption, and thus encourage a more harmonious integration of economic development and nature (Nozick, 1993: 29).

2.2.8 Health and well-being

The physical and mental health of individuals in the community is an importantly sought-after goal in CED. People are a community's most valuable resource. The community has a vested interest in the health of all its members. "A community is only as healthy as its individual members: at the same time, an individual's health depends upon the health of the community which shapes social attitudes and provides the individual with

opportunities to live up to his or her potential” (Nozick, 1993: 29). In conventional economic models, humans are restricted to roles in market transactions only. However, humans have other roles other than those in the market: individuals have responsibilities that include active participation in politics (as voters, political activists, party members, party candidates), in family (as mothers, fathers, sons, daughters, grandparents), and in the community (as board members, community volunteers, church members). Individuals are also involved in numerous activities to maintain their health, including *physical exercise, and attending medical appointments.*

Including an objective of health and well-being, CED makes room for responsibilities and needs that lie beyond those in the market. Employers may offer particular benefits to allow employees to better meet these responsibilities. Employers who give leeway to employees to schedule work around medical appointments, volunteer work, or parenting serve to increase well-being. The environments in which individuals work have significant effects on their physical and mental health. Various factors—including safety, cleanliness, lighting, and relationship dynamics—within the work environment can contribute or detract from both the physical and mental health of employees. Research also shows that healthier, happier employees are more productive.

Psychological research shows that “the extent to which an individual feels ‘in control’ of his or her life has numerous benefits, including improved health, more active social engagement, and greater resistance to the stressors of daily life” (Roese, 2002: 155). Employers who provide employees with benefits that afford them to be more flexible and in control of their schedules is certainly an important contributor to individual health and well-being. However, individuals have even greater control of their own lives if they are not employees of large corporations, but are self-employed. Self-

employment offers the greatest flexibility in balancing the numerous responsibilities every individual has. Thus, it is believed that owning a business, while providing a sense of accomplishment and of being 'in control', also serves to increase personal well-being. Small businesses are thus an important contributor to the health and well-being objective of CED.¹¹

2.2.9 Human dignity

The CED community is made up of all members living within a particular geographic region. The community not only includes all members in the physical sense, but it highly *values* and *respects* all members of community. Essentially, all individuals are worthy of dignity regardless of their own personal, physical, or mental differences and regardless of their national or ethnic background (WNFED, 1993). The community is proudly diverse, and in its diversity is perfectly complete. All community members are valuable to the formation and workings of the community as a whole.

The CED objective of human dignity is closely linked with the higher order needs. The need to love, know truth, to serve, see justice, and experience meaningfulness are all important components of self-actualization. Where communities do not value and respect members equally, certain individuals face significant obstacles to fully developing or achieving their potential. "A community plays an important role in helping its individual members to meet the full range of both their material and non-material needs" (Nozick, 1993: 37). Strategies should be aimed at eliminating any of these

¹¹ Preference for self-employment is not completely universal, however. The number of self-employed persons in the labour force often falls in periods of low unemployment, as people desire to trade the insecurity of self-employment, for a larger more stable income as an employee.

obstacles that restrain certain members from attaining their needs. In the process of fulfilling the higher order needs, community members gain an incredible sense of pride in their own contributions to the communities in which they live. Thus, it is vital that community members have equal opportunities for self-actualization.

The reality is, however, that numerous individuals and groups of individuals are not equally valued and respected. Particular groups of individuals are often excluded from fully participating in their communities. CED theory is particularly concerned with these groups who are marginalized within their communities. The most basic and fundamental form of community life is the labour force—for it is through active participation in the labour force that individuals are able to procure the monetary means to afford the basic physiological needs to sustain life. Women, visible minorities, disabled persons, immigrants, and Aboriginals are typically excluded from Winnipeg's labour force. Because CED is centrally concerned with the betterment of these marginalized groups, most of the CED strategies and policies that arise out of the literature on CED focus on particularly marginalized members of communities. CED is centrally concerned with removing the obstacles that tend to exclude certain groups from actively engaging in community life.

2.3 The Tools and Indicators to Complete the Framework for Analysis

Relevant analytical tools and indicators must be found as the measuring sticks to analyze the extent to which the ICT industry in Winnipeg is contributing to each of the nine CED objectives identified and described above. Matching the appropriate tools and indicators with each of the CED objectives will complete the framework for analysis required for this study of the ICT industry in Winnipeg. The framework for analysis,

which matches the CED objectives with the relevant analytical tools and indicators, is presented in Figure 2.2.

There are three main tools used in regional economic analyses: economic base multipliers, income-expenditure multipliers, and input-output matrices. These three analytical tools are reviewed and discussed in terms of their advantages and disadvantages for regional analysis in Appendix A. The extent to which the industry uses local goods and services and produces goods and services for local use—that is, the first two CED objectives—will be best measured using a simplified form of the input-output (I-O) analysis. This simplified version of I-O analysis—known as, intersectoral flows (I-F) analysis—is also outlined in Appendix A. Both the I-O and I-F tables may be used as tools to identify a region's production and use of intermediate goods. Intermediate goods are the key focus for developing convergent economies (Loxley, 2003) because the idea of converging resources with demand is that value added (i.e. value of the intermediate goods) is produced within the economy. The value of the intermediate goods measures the strength of the economic linkages within the region. The more extensive are the backward and forward linkages, the greater is the level of convergence within the economy. An I-F table will be constructed to measure these backward and forward linkages within the ICT sector itself, and between the ICT sector and the rest of the Winnipeg economy. The I-F matrix will be used, rather than the I-O matrix since the data collected in this study are of sales flows only (see Appendix A for further discussion).

Other than the construction of the I-F matrix, the analysis will rely on descriptive statistics to construct relevant indicators. The descriptive statistics used will include percentages, sums, means, frequencies, ratios, and correlations. A survey of Winnipeg

Figure 2.2 Framework for Analysis



ICT businesses was conducted in the summer of 2004 to collect the required data to compute these indicators and the I-F matrix. The questionnaire used in this survey was specifically designed to obtain the data needed to analyze the ICT industry's contributions to or detractions from the nine CED objectives. The content of the questionnaire and the methodology used in conducting the survey is explained in detail in the following chapter. In various parts of the analysis, this primary data source will be supplemented by Census 2001 data and other industry-level data collected by Statistics Canada. This supplementary data will either be used as a reference point to check for the accuracy of the survey data or in comparisons of the ICT industry with the Winnipeg economy as a whole. Wherever supplementary data is used, the source will always be explicitly mentioned. Thus, unless stated otherwise, the data used in the analysis are survey data.

Throughout the entire analysis, what will be of particular interest is the connection between the type of businesses (i.e. size, type of ownership, and locale of ownership) and the likelihood of the business contributing to or detracting from the various CED objectives. CED theory contends that small, locally-owned businesses will be more likely to make valuable contributions to community development, than would larger firms that are not locally-owned. The analysis of the industry on each objective will most often include a discussion on these correlations.

The alignment of the industry with the first objective will be analyzed by examining the backward linkages of the constructed I-F matrix of the ICT industry. Because the I-F table is only of the ICT industry, and not of the Winnipeg economy as a whole, the backward linkages will only indicate the extent to which the sub-industry groups of the ICT industry are convergent. The industry's use of goods and services

produced by non-ICT businesses in Winnipeg is, unfortunately, not captured in the industry I-F table. To have completed an I-F table for the entire Winnipeg economy would have required significantly more data than would have been feasibly collected for this study. However, the industry's use of local goods and services will be analyzed using data on the industry's decision-making process about whether to purchase from Manitoban-owned businesses and/or Canadian-owned businesses.

The extent to which the industry produces goods and services for local use will be measured using the forward linkages of the constructed ICT industry I-F matrix. The forward linkages provide a picture of the convergence between the sub-industry groups of the ICT industry, as well as the convergence between the ICT industry and Winnipeg economy as a whole. Data collected on the geographic destination of ICT exports will further the analysis of this objective. The connection between the industry's production of goods and services for local use and the type of business will also be examined to shed further light on the hypothesis stated above.

The extent to which the ICT industry aligns with the objective for local ownership and decision making will also be analyzed using a variety of indicators. The number of persons hired by the businesses in the survey will be a good indicator of the size of businesses making up the industry. Supplementary data will be used to check how closely the sample represents the actual population, in terms of business size. The locale of ownership underlies many of the CED objectives to minimize various forms of leakages, and data on the geographical residency of owners will be useful for this part of the analysis.

Data on the types of business structures will be useful to contextualize the kinds of businesses that make up Winnipeg's ICT industry. Although the structure and nature

of cooperatives and sole proprietorships may be better suited to contributing the objectives of CED, larger or privately owned businesses may also contribute to CED. Businesses that are publicly traded and thus owned by numerous shareholders may also differ from other types of businesses in their contributions to CED. Publicly-traded businesses have shared ownership which may be favourable for community ownership and decision making (i.e. decision making power rests in the hands of many, rather than of few). However, the possibility that these shareholders may reside anywhere in the world is certainly not favourable for local ownership and decision-making. Businesses that are publicly-owned may also need to be more conscious of maintaining their stock value (i.e. the bottom line), and may be less likely to justify any extra contributions to developing the local community. Further, these businesses tend to be larger businesses (most multi-national corporations are publicly-owned) and are less likely to contribute to the objectives of CED.

Survey data will also be used to analyze the extent to which employees share in the decision-making process of the business. The proportion of employees who are partial owners of the business will also serve as a useful indicator of the level of decision-making power held by employees. Data from the survey will also be used to indicate the extent to which businesses include other members of the community in the decision-making process.

Fourthly, the objective of long term employment for local residents will be analyzed using three measures. The stability of employment is vital for building stable communities, and this part of the objective will be analyzed using data on the average length of employment. Data on the origin of labour employed in the industry will be used to analyze the extent to which the industry employs local residents. It is also

important in the CED model for jobs to be good jobs, so as to minimize underemployment. Thus, the average wages of full-time employees will be used to analyze the extent to which the industry contributes to providing well-paying jobs to community members. Wages of employees will be contextualized in terms of educational attainment to further study the extent to which the industry is contributing to good long term employment for local residents. Data from the 2001 Census will be used as benchmarks in this part of the analysis.

The fifth objective, local skill and knowledge development, will be analyzed using a variety of data on the industry's participation in these areas. Business participation in youth employment and mentorship programs serves to develop the knowledge and skills of future entrepreneurs and labourers of the community. Businesses that offer training programs to employees and/or subsidization for further education are also effectively developing the skills and knowledge of community members. Survey data will be used to indicate the industry's contributions to these objectives. ICT businesses also have significant knowledge and skills which they may or may not share with the local community. Survey data on the sector's participation on community boards and mentorship of other start-up businesses will be used for this part of the analysis.

Local re-investment of profits, the sixth CED objective, will be analyzed using data on the industry's internal capital investments. Ideally, the distribution of profits or the social surplus may be measured using income-expenditure analysis (see Appendix A). Using income-expenditure analysis, the surplus may be examined so as to trace its distribution to those within the community, and those agents outside of the community. However, to trace the distribution of profits of a particular business or industry requires availability of very detailed financial records from businesses within the industry. Such

confidential information of business investments is neither readily available nor easily collected. Thus, the analysis of this objective relies on less sensitive data, and simply measures what types of internal capital investments over \$1000 were made in the last year. If the business is locally-owned, then internal capital investments will be local investments. Although this will not provide quantitative data on the percentage of profits re-invested locally, it will provide the analysis with some insight into whether profits are being used to invest into further economic development within the region or are leaking out of the local economy. The extent to which re-investing profits into the community is a priority of the industry will also be analyzed using information on the existence of specific policies on re-investing profits held by businesses within the industry.

The physical environment, the seventh objective, will be analyzed using data on the industry's consideration of the environment in selecting suppliers. The connections between ecological sensitivity, concern for local ownership and decision-making, as well as the type of business will provide extra insight into the analysis here. Data collected by the survey on businesses' direct involvement in building healthy and safe neighbourhoods will also be used to analyze the ICT industry's contributions to this environmental objective. To actually quantify the environmental impact of the industry far exceeds the scope of this research, thus no attempt to estimate the sector's actual contribution to a clean, green environment will be made.

The CED objective of the health and well-being of community members will be analyzed using the survey data on the employee benefits offered by the ICT sector. Businesses that offer dental and medical plans, day-care, flex-time, and job-sharing contribute to the physical and psychological well-being of employees and their families. The availability of these employee benefits will be used to analyze the extent to which

businesses in the industry are concerned with the well-being of their employees and their families. The second measure that will be used to analyze the contributions of the industry to health and well-being is the number of self-employed persons in the industry. If owning your own business increases well-being, then an industry that is made up of many small businesses contributes to community health and well-being.

Identifying the indicators that will be used to analyze the extent to which the industry contributes to or detracts from the ninth objective of human dignity will complete the analytical framework. Businesses may work towards this objective by implementing employment equity to deliberately hire individuals who have been typically excluded from the labour market. Data on the composition of labour in the ICT industry in Winnipeg will be used to construct employment ratios of particular groups of individuals who are typically marginalized in the labour market. These groups will include women, visible minorities, disabled persons, immigrants, and Aboriginals. These employment ratios in the ICT industry will be compared with the corresponding employment ratios of the entire labour force in Winnipeg.

This CED framework is now complete and ready for analysis of the ICT industry in Winnipeg. The extent to which the industry is contributing to or detracting from the nine objectives of CED will be measured using the analytical tools and indicators identified and explained above. These nine objectives stem from the CED model's goal of meeting the needs of the whole community. Communities look within themselves for affecting change to meet both their economic and non-economic needs. How well does Winnipeg's ICT industry contribute to these goals of CED? How does the growth and development of the ICT industry affect the growth and development of the Winnipeg community? Answering these questions is the task of this study. Chapter three describes

the methodology and design of the survey that was used to collect the required data to use the framework for analysis. The results of how well the ICT industry in Winnipeg contributes to the objectives of CED will be presented in chapter four.

3 METHODOLOGY

The analytical framework developed in the previous chapter is useful for analysis of the ICT industry only so long as there is available data to compute the analytical tools and indicators. A literature review of research on Winnipeg's ICT industry found very little on this relatively recent component of Winnipeg's economy. Industry-level data on some characteristics of the labour force collected by the 2001 Census are available from Statistics Canada, and will be used to supplement the analysis of this study where applicable. However, most of the data required for this study goes beyond any research yet conducted on the ICT industry in Winnipeg. In fact, the lack of Winnipeg-specific data on the industry was the major factor in the decision to conduct a mail-out survey of Winnipeg ICT businesses to obtain the needed data for this project.

This chapter outlines the methodology used in conducting the survey of the ICT industry in Winnipeg. The first section briefly describes the content of the questionnaire and outlines the methodology used in the design of the questionnaire. The methodology used in conducting the mail-out survey is outlined in section 3.2. The final section of this chapter reviews the four types of survey errors that may skew the results of this study.

3.1 The Questionnaire

The purpose of the survey was to gather the required data to evaluate the extent to which the Winnipeg ICT industry is contributing to or detracting from the nine objectives that make up the CED framework of analysis. The questionnaire was divided into six sections. The first section—section A—was designed to gather contact information of the businesses for classification purposes only. The remaining five sections, including 45 questions in total, formed the core of the five-page questionnaire. Section B included

questions on ownership and decision making; section C was made up of questions on the purchasing and type of the business; section D included questions concerned with the distribution of sales; questions on employment formed section E; and section F was made up of questions on the nature of investments made by the business. A copy of the questionnaire is included in Appendix B.

Two previous Manitoba studies significantly influenced the development of the questionnaire for this research. In the first of these, SEED Winnipeg surveyed Winnipeg businesses in 2003, in order to determine those that met the criteria for inclusion in the 'Community Shopping Guide: Supporting a healthy local economy in Winnipeg'. SEED Winnipeg used the survey to distinguish between CED businesses and non-CED businesses. In contrast, the questionnaire used to gather data for this research will be used to analyze the *extent* to which the ICT industry as a whole is contributing to or detracting from CED in Winnipeg.

In the second previous study, Richard L. Kenny (1981) surveyed all businesses in the municipal boundary of Leaf Rapids, Manitoba to collect the data required for the completion of his Master's thesis. His research centered on applying the economic base multiplier and input-output analysis to the entire economy of Leaf Rapids. Consequently, his questionnaire was mainly concerned with gathering data from each business on total employment and on the percentage breakdown between sales to customers located outside the area and sales to customers located inside the study area (Kenny, 1981: 64). The questions regarding the breakdown of sales between intermediate industries and final demand sectors in Kenny's survey were drawn upon extensively in formulating the questions in section D of the questionnaire developed here, on the distribution of sales.

3.2 Survey Methodology

Recognizing the importance of these two previous Manitoba surveys in the phrasing of questions and in the overall development of the questionnaire used in this research is fundamental. Don A. Dillman (2000) presents some important principles to be followed in surveying businesses in particular. The most important principle in business surveying is to “conduct on-site cognitive interviews to help tailor the questionnaire to people’s ability to respond and to gather intelligence information for targeting its delivery and retrieval” (ibid., 347). These cognitive interviews are important for shaping questions that will enable respondents to understand the questions and to answer them correctly (ibid., 347-8). Although the development of the questionnaire for this research did not include conducting cognitive interviews with a small sampling of ICT businesses as Dillman strongly suggests, the questionnaire did largely develop out of the two cited surveys previously conducted in Manitoba. Thus, the questionnaire benefits from employing questions already defined and successfully used in previous studies. Furthermore, two individuals who have conducted numerous surveys in various fields of study were also consulted to review the questionnaire for its general design and wording of questions.

The survey population for this research consists of the ICT industry in Winnipeg, Manitoba as of May 2004. The Winnipeg Information Technology Directory compiled by a sector of the Government of Manitoba in September 2003 served as the sample frame, or the list of businesses in the industry from which the sample to be surveyed was drawn. In this case, all businesses in the directory were included in the survey, such that the entire sample frame was included in the sample. In other words, the sample rate was 100 percent (i.e. a census).

The sample frame included mailing addresses, contact names, phone numbers, fax numbers, email addresses, and web pages for 434 ICT businesses in Winnipeg, Manitoba. Thus, the appropriate contact person for each business, along with their contact information, was readily available. Dillman (2000: 341) highlights that identifying the appropriate respondent is an important element of business surveying so that all communication may be directed towards the same person. Throughout the research, knowing the contact person up front simplified phone calls and aided in ensuring the mailed survey arrived on the appropriate desk, especially in middle-to large-size businesses.

Dillman (2000: 151) recommends five elements to achieve high survey response rates: a brief pre-notice letter; a questionnaire mailing; a thank you postcard; a replacement questionnaire; and a final contact. In this research, all businesses to be included in the survey were initially contacted by telephone to provide pre-notice of the survey that was to follow in the mail. In total, 308 out of 434 businesses were contacted before the first mailing of the survey (152 of these 308 pre-notices were left as voicemail messages). This initial contact by telephone, as opposed to the pre-notice letter suggested by Dillman, was also used to verify and correct mailing addresses and contact names. The phone numbers of 39 businesses were found to be either not in service or wrong numbers. Eighty-seven businesses were not called before the mailed survey for various reasons: including that there was no phone number given, there was no answer after repeated attempts, or the line was repeatedly busy.

The questionnaires were mailed to all 434 businesses within the same week that these initial phone calls were made. A cover letter explaining the research and the importance of their response was included with the questionnaires, as suggested by

Dillman (2000: 151). Postage-paid self-addressed envelopes were also included in the mail out package. Seventy-seven questionnaires came back as 'Return to Sender' due to wrong addresses (many of these were the same businesses with phone numbers that were not in service). Efforts to find correct addresses by checking for current mailing addresses on the business websites and the MTS Yellow Pages resulted in 14 surveys being re-mailed to new addresses (one of these came back 'Return to Sender'). At this stage 64 ($77 - 14 + 1$) businesses were removed from the sample frame. Forty-seven surveys were completed and returned before further contact.

Dillman (2000: 151) suggests that the third contact to all businesses be in the form of a thank you postcard to express gratitude for responding, or as a gentle reminder to those who have not yet responded. Within 2 to 4 weeks of the thank you postcard, a replacement questionnaire is to be sent to all non-respondents (ibid.). This fourth contact is to be followed by a final contact by telephone or priority post mail within a week (ibid.). In the survey design used here, the final three contacts in the sequence were not followed as closely as the first two were. This was due in large part to the costs of the extra two mailings required in Dillman's survey design. Four weeks after the mail out, non-respondent businesses were contacted by telephone to encourage completion of the questionnaire. In this stage of the survey, 208 businesses were contacted by telephone (117 of these reminders were left as voice mail messages). Fourteen replacement questionnaires were sent to businesses, upon their request.

The final contacts by telephone revealed that at least 15 businesses were not completing the questionnaire because they were not in the ICT industry. Numerous businesses included in the original sample frame were new media, or graphic design businesses—a sector which the provincial government included in their Winnipeg

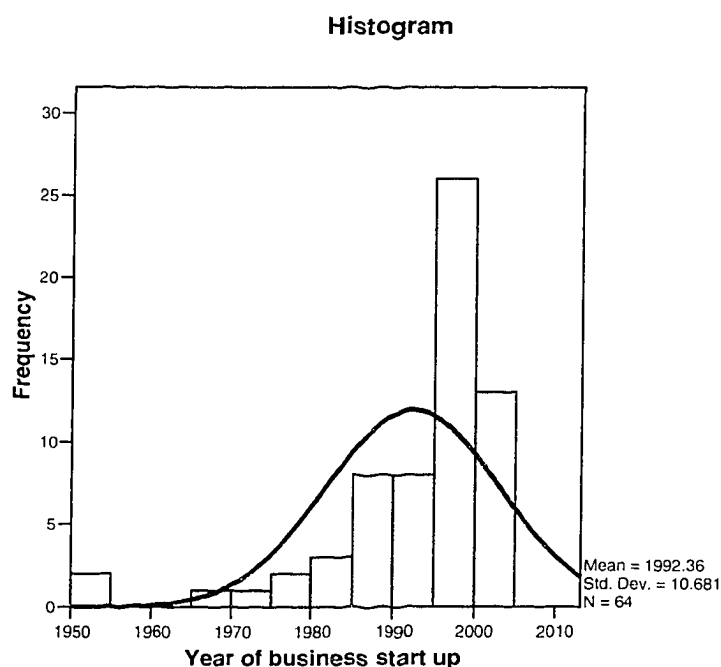
Information Technology Directory. The research conducted here did not intend to include new media within the ICT industry, and consequently three questionnaires completed by new media businesses were not usable for analysis. Thus, the 18 (15 + 3) new media businesses were also excluded from the sample frame. Subtracting the 64 nonexistent businesses and 18 new media businesses from the sample frame left the sample frame with 352 businesses. In all, 64 complete and useable questionnaires were returned to be used in the analysis. Dividing the number of returned surveys by the sample frame yields the response rate of the survey equal to 18.2 percent (64/352). This response rate seems low in comparison to many of the examples of response rates given by Dillman (2000).

3.3 Potential Survey Errors

There are four types of potential survey error: coverage, sampling, nonresponse, and measurement. Minimizing all four types of potential survey errors is the "most difficult challenge of surveying" (Dillman, 2000: 197). The better is the sample frame the smaller is the potential coverage error in the survey. If the list is up-to-date and includes all businesses of the survey population, and does not include those not in the survey population, then coverage error is minimized (*ibid.*, 198-200). The list used in this survey was compiled in September 2003, only 8 months before the survey was conducted. Yet 77 questionnaires were returned undeliverable, which seems high given the recently compiled sample frame. However, looking at the distribution of business start-up dates shows that more than 55 percent of businesses were established after 1995 (see Figure 3.1). Newly established businesses characteristically have the highest rate of failure. Given the very high number of new businesses in the sample frame, the

high number of businesses no longer in existence (identified by the 77 questionnaires returned as undeliverable) is reasonable despite the recently compiled directory. Further, recall that the sampling rate for this survey was 100 percent. That the survey was essentially a census works to further reduce the coverage error of this survey.

Figure 3.1 Histogram of 'Year of Business Start Up'



Measurement error, which arises from survey questions that are misunderstood or incorrectly answered, can be minimized by taking efforts to produce and administer a 'respondent-friendly questionnaire'. Sections C and D of the questionnaire, particularly the questions requiring the use of disaggregating sales by the North American Industry Classification System, appeared to be somewhat misunderstood by respondents. In an attempt to minimize the measurement error due to this problem, 29 respondents were contacted by telephone to clarify their responses of particular questions. Using these clarifications, margin notes made on surveys by some respondents, and some

information collected from business webpages, the data collected from sections C and D are believed to be 'cleaned'. The data cleaning process served to minimize the potential measurement error in the survey data.

If the 18.2 percent of the sample who did respond differs from the 81.8 percent who did not respond, then the survey may suffer from nonresponse error (ibid., 197). There are no obvious reasons why this survey would suffer significantly from self-selection error. However, business size may have somewhat determined response or nonresponse, and the possibility of this self-selection error is acknowledged. Almost 75 percent of respondents reported that their total revenue in 2003 was less than one million dollars (based on 44 responses to this question); 36 percent of all businesses do not have any employees; and of the businesses that do employ labour, 50 percent of them employ 5 or fewer persons. Clearly, a significantly greater number of small to medium sized businesses than large businesses completed and returned the survey.

Comparing these results with national data for the proportions of small businesses to larger businesses in the ICT industry, it would appear that the data from this survey may indeed be more representative of small to medium-sized firms, than larger ones. This result may be explained by the high probability that contact persons of the larger businesses may not have known the answers to the wide-range of questions on various aspects of the business, whereas the contacts of small single-owner businesses would better know all areas of their business. On the other hand, a few of the businesses that were contacted in various stages of the survey design indicated their hesitation in responding because they believed their "home" businesses to be too small to matter to the survey. Thus, an actual prediction of this potential error, and even its direction of bias is difficult to estimate.

Sample surveys are attractive in that their results may be generalized to the survey population, so long as a large enough sample completes the survey to estimate closely the distribution of a characteristic of the population. Sampling error, unlike the three other types of potential errors, may be “precisely calculated for each variable based on the number of completed questionnaires and the distribution of respondents’ answers across response categories” (ibid., 197). The formula used to determine how large a sample is required to produce precise estimates of the characteristics of the population is derived such that:

$$N_s = \frac{(N_p)(p)(1-p)}{(N_p - 1)(B/C)^2 + (p)(1-p)}$$

where N_s is the completed sample size needed for desired level of precision; N_p is the size of the population; p is the proportion of population expected to choose one of the two response categories; B is the acceptable amount of sampling error; and C is the Z-statistic associated with the confidence level (ibid., 206-7).

Using Dillman’s formula, the sample size needed to generalize the survey results of each question to the entire population within a certain level of precision may be calculated. The value of p depends on the proportion of the population expected to choose one of two response categories for the binary questions (i.e. with yes/no answer). Thus, the sampling error and the level of precision will vary for each question. However, to get a sense of the size of sample required for this analysis in general, let’s set $(p)(1-p)$ at the most conservative value possible, $(0.5)(1 - 0.5)$, such that maximum heterogeneity is assumed (ibid., 207-8). B , which measures the amount of precision, will be set so that we will be able to estimate percentages of the population within plus or minus ten percentage points (ibid., 207). Using the common 95 percent confidence

level, C is set at 1.96, such that 19 out of 20 times that a random sample is drawn from the population, the estimates drawn from the completed sample will be within the desired range of precision (ibid., 207-8). Assuming that the size of the population is equal to the sample frame, N_p is set at 352. Plugging these values into the formula, we get:

$$N_s = \frac{(352)(0.5)(1-0.5)}{(352-1)(.10/1.96)^2 + (0.5)(1-0.5)}$$

$$N_s = 75.45$$

Using these values of heterogeneity, level of precision, and level of confidence, 75 completed questionnaires are required. This minimum requirement exceeds the number of questionnaires that were completed and returned in this survey.

This result is not completely disastrous, however. In fact, just by increasing the 10 percent band of precision by 1 percent to 11 percent, the number of surveys required decreases to 64 (holding all other values constant). Coincidentally, this is exactly the number of questionnaires that were returned in this study. Alternatively, if we alter the level of confidence from 95 percent to 90 percent while holding all other values constant, only 57 completed surveys are required. Thus, in order to ensure that the estimates drawn from the completed sample will be within the desired range of precision, we need only to slightly alter the level of confidence or the band of precision.

Further, examining the frequencies of the yes/no questions on the questionnaire shows that the p value is actually 0.80 or higher for almost half of the binary response questions. This indicates that the level of homogeneity is high for many of the questions with yes/no answers. Plugging in 0.80 for p , rather than the more conservative 0.50 value, with a 10 percent margin of precision and 95 percent confidence interval into the

formula yields 52.46 required surveys. Thus, at least half of the binary response questions may be confidently analyzed without sampling error using a 10 percent band of precision. And just less than 25 percent of binary questions (all those with p values of 0.95 or higher) may be estimated within a 5 percent band of precision at the 95 percent confidence interval. The level of precision allowable for individual questions, or variables, will be further discussed in the following chapter as they are used in the analysis.

4 THE ANALYSIS OF WINNIPEG'S ICT INDUSTRY

The analysis of Winnipeg's ICT industry will be structured within the framework set out in chapter two. Each of the nine objectives of CED will be analyzed using the data collected by the survey of the ICT businesses, which is described in the previous chapter. Wherever supplementary data are used, the data source will be explicitly noted. Thus, unless explicitly identified otherwise, all data used in the following analysis are the data obtained by the survey conducted specifically for this study. Before moving on to the analysis of the nine CED objectives individually, the intersectoral-flows (I-F) table will be constructed using data collected by the survey, for use in the analysis of the first two objectives. The I-F matrix will provide an overview of the economic linkages both within the ICT industry and between the ICT industry and the Winnipeg economy as a whole.

This study will use Industry Canada's definition of the ICT industry to disaggregate the ICT industry in Winnipeg.¹² Using the North American Industrial Classification System (NAICS), the ICT industry is broken down into three parts—manufacturing, intangible services and goods related services. The manufacturing component consists of:

1. Commercial and Service Industry Machinery Manufacturing (NAICS 3333);
2. Computer and Peripheral Equipment Manufacturing (NAICS 3341);
3. Communications Equipment Manufacturing (NAICS 3342);
4. Audio and Video Equipment Manufacturing (NAICS 3343);
5. Semiconductor and Other Electronic Component Manufacturing (NAICS 3344);
6. Navigational, Measuring, Medical and Control Instruments Manufacturing (NAICS 3345); and
7. Communication and Energy Wire and Cable Manufacturing (NAICS 33592).

¹² As is defined on their website: http://www.strategis.ic.gc.ca/epic/internet/inict-tic.nsf/en/h_it05391e.html.

The intangible services include:

8. Software Publishers (NAICS 5112);
9. Telecommunications (NAICS 517);
10. Internet Service Providers, Web Search Portals, and Data Processing Services (NAICS 518); and
11. Computer Systems Design and Related Services (NAICS 5415).

The goods related services are:

12. Computer and Communications Equipment and Supplies Wholesaler-Distributors (NAICS 4173)
13. Office and Store Machinery and Equipment Wholesaler-Distributors (NAICS 41791)
14. Office Machinery and Equipment Rental and Leasing (NAICS 53242)

In order to appropriately include part-time employment in the construction of the I-F table, employment is conventionally measured in full-time job equivalents. The survey collected data on the number employed full-time (30 or more hours per week), part-time (10 to 30 hours per week), and casually (less than 10 hours per week). Statistics Canada reports that the average number of hours worked by part-time employees in 2004 was 15.8 hours a week. This average includes hours worked by casual labour, which is separated from part-time labour in the survey used in this study. To be consistent with the Statistics Canada data, part-time and casual employment may be summed together and weighted accordingly. Essentially, this sum of all part-time employees is weighted by one half and added to the number of full-time employees (those working over 30 hours a week), such that:

$$\text{Full-time job equivalent} = \text{full-time employees} + \frac{1}{2} \text{part-time employees.}$$

The breakdown of total employment by sub-industries for the survey of the ICT industry is shown in Table 4.1. As a comparison, Table 4.2 shows the number of persons employed in the sub-industry groups of the ICT industry in Winnipeg according to the 2001 Census. Comparing these two tables yields two very different pictures of the

Table 4.1 Employment by Sub-Industry Group in the Survey of the ICT Industry
Winnipeg, Manitoba 2003

	Number of Employees ^a	Number of Self-Employed Persons	Total Number Employed	Percentage of Total ^b
1. Commercial and Service Industry Machinery Manufacturing	0.0	0.0	0.0	0.0
2. Computer and Peripheral Equipment Manufacturing	16.5	3.1	19.6	1.8
3. Communications Equipment Manufacturing	0.0	0.0	0.0	0.0
4. Audio and Video Equipment Manufacturing	0.0	0.0	0.0	0.0
5. Semiconductor and Other Electronic Components Manufacturing	0.0	0.0	0.0	0.0
6. Navigational, Measuring, Medical and Control Instruments Manufacturing	13.0	2.0	15.0	1.3
7. Communication and Energy Wire and Cable Manufacturing	0.0	0.0	0.0	0.0
8. Total Manufacturing	29.5	5.1	34.6	3.1
9. Software Publishers	288.0	31.0	318.9	28.7
10. Telecommunications	3.6	0.8	4.4	0.4
11. Internet Service Providers, Web Search Portals and Data Processing Services	50.2	13.0	63.2	5.7
12. Computer Systems Design and Related Services	629.3	47.3	676.6	60.8
13. Computer and Communications Equipment and Supplies Wholesaler-Distributors	10.2	1.7	11.9	1.1
14. Office and Store Machinery and Equipment Wholesaler-Distributors	0.0	0.0	0.0	0.0
15. Office Machinery and Equipment Rental Leasing	3.3	0.0	3.3	0.3
16. Total Services	984.6	93.7	1078.3	96.9
17. Total Employment in Industry	1014.1	98.8	1112.9	100.0

^a In full-time job equivalents^b May not add exactly to total because of rounding

Table 4.2 Employment by Sub-Industry Group in the ICT Industry
Winnipeg, Manitoba 2000 (as reported by the 2001 Census)

	Total Number in Labour Force	Percentage of Total^a
1. Commercial and Service Industry Machinery Manufacturing	60.0	0.5
2. Computer and Peripheral Equipment Manufacturing	115.0	0.9
3. Communications Equipment Manufacturing	220.0	1.8
4. Audio and Video Equipment Manufacturing	15.0	0.1
5. Semiconductor and Other Electronic Components Manufacturing	150.0	1.2
6. Navigational, Measuring, Medical and Control Instruments Manufacturing	755.0	6.1
7. Communication and Energy Wire and Cable Manufacturing	410.0	3.3
8. Total Manufacturing	1725.0	14.0
9. Software Publishers	230.0	1.9
10. Telecommunications	3905.0	31.8
11. Internet Service Providers, Web Search Portals and Data Processing Services	1055.0	8.6
12. Computer Systems Design and Related Services	3095.0	25.2
13. Computer and Communications Equipment and Supplies Wholesaler- Distributors	650.0	5.3
14. Office and Store Machinery and Equipment Wholesaler-Distributors	1165.0	9.5
15. Office Machinery and Equipment Rental Leasing	460.0	3.7
16. Total Services	10560.0	86.0
17. Total Employment in Industry	12285.0	100.0

^a May not add exactly to total because of rounding

Source: 2001 Census Data, Statistics Canada

distribution of employment within the ICT industry. The most obvious incongruence is in the percentage of employment in telecommunications. Employment in telecommunications represents less than one percent of the total employment captured in the survey. Yet in reality, telecommunications is the largest component of the ICT industry in Winnipeg—employing 30 percent of the labour force in the ICT industry. Most of those working in the telecommunications industry are employed by Manitoba Telecom Services—the third largest telecommunications company in Canada. Unfortunately, *Manitoba Telecom Services (MTS)* was not one of the businesses that completed and returned the questionnaire, and thus it is not included in the sample survey. Thus, telecommunications are highly underrepresented in the survey.

The distribution of employment in the other sectors of the ICT industry captured by the 2001 Census and the survey are certainly not completely consistent, but they are similar. The services sector of the ICT industry in Winnipeg is significantly larger than the manufacturing sector—a characteristic that is captured in both datasets. Of course, it would be ideal for the survey to be representative of the population in terms of the distribution of employment. That it is not representative in terms of the distribution of employment may increase the non-response error of the survey. Essentially, the error in surveying would be most severe if the businesses not included in the survey—MTS, for example—significantly deviate from the businesses within the sample. Yet, as noted in the previous chapter and as will be seen below, the survey is very representative of the industry in terms of the size of businesses. The industry is primarily made up of small to medium-sized businesses—a characteristic which is certainly captured in the survey results. The results of the survey are, of course, limited by these potential survey errors, and where appropriate, supplementary data will be used as checks for accuracy.

The I-F table for the ICT industry is shown in Table 4.3. Each row in this table shows how much employment in the sub-industry was generated by sales to each sub-industry group, other local businesses, local government, local consumption, and exports out of Winnipeg. For example, looking at the tenth row—internet service providers, web search portals, and data processing services—it can be seen that 0.6 percent of total employment in this sub-industry group (0.4 full-time job equivalents) was generated by sales to telecommunications, 2.2 percent (1.4 full-time job equivalents) by sales to itself, 35.3 percent (22.3 full-time job equivalents) by sales to other local businesses, 0.6 percent (0.4 full-time job-equivalents) by sales to local consumers, 12.2 percent (7.7 full-time job equivalents) by sales to local government; and 48.7 percent (30.8 full-time job equivalents) by sales to markets outside of Winnipeg.

1. Use of local goods and services

In an I-F table of an entire economy, the backward linkages are able to measure the extent to which local businesses, consumers, and governments use goods and services produced in each local industry. The greater the magnitude of linkages, the greater is the level of convergence within the economy. However, in the ICT industry I-F table, the backward linkages are not as useful. The backward linkages only indicate the extent to which the sub-industry groups of the ICT industry use other goods and services produced by other sub-industry groups of the ICT industry. Unfortunately, the industry's use of locally produced non-ICT goods and services is not captured in the I-F table. To complete the I-F table to include all employment in Winnipeg would have required significantly more data than would have been feasible for this study.

Table 4.3 ICT Intersectoral Flows Table, Winnipeg, Manitoba 2003

Purchases from \ Sales to	Sales to														Total				
	1. Commercial and Service Industry Machinery Manufacturing	2. Computer and Peripheral Equipment Manufacturing	3. Communications Equipment Manufacturing	4. Audio and Video Equipment Manufacturing	5. Semiconductor and Other Electronic Components Manufacturing	6. Navigational, Measuring, Medical and Control Instruments Manufacturing	7. Communication and Energy Wire and Cable Manufacturing	8. Software Publishers	9. Telecommunications	10. Internet Service Providers, Web Search Portals and Data Processing Services	11. Computer Systems Design and Related Services	12. Computer and Communications Equipment and Supplies Wholesaler-Distributors	13. Office and Store Machinery and Equipment Wholesaler-Distributors	14. Office Machinery and Equipment Rental Leasing	15. Other Local Businesses	16. Local Consumption	17. Local Government	18. Exports out of Winnipeg	19. Total Employment
1. Commercial and Service Industry Machinery Manufacturing																			
2. Computer and Peripheral Equipment Manufacturing		2.6 (0.5)												67.3 (13.2)	1.0 (0.2)	10.7 (2.1)	18.4 (3.6)	100 (19.6)	
3. Communications Equipment Manufacturing																			
4. Audio and Video Equipment Manufacturing																			
5. Semiconductor and Other Electronic Components Manufacturing																			
6. Navigational, Measuring, Medical and Control Instruments Manufacturing																	100 (15.0)	100 (15.0)	
7. Communication and Energy Wire and Cable Manufacturing																			
8. Software Publishers	1.0 (3.5)							0.1 (0.3)	0.3 (1.0)					5.8 (18.4)	0.1 (0.3)	0.3 (0.8)	92.4 (294.6)	100 (318.9)	
9. Telecommunications														6.8 (0.3)		20.5 (0.9)	68.2 (3.0)	100 (4.4)	
10. Internet Service Providers, Web Search Portals and Data Processing Services								0.6 (0.4)	2.2 (1.4)					35.3 (22.3)	0.6 (0.4)	12.2 (7.7)	48.7 (30.8)	100 (63.2)	
11. Computer Systems Design and Related Services		0.0 (0.1)	0.4 (3.0)	2.4 (16.1)			0.2 (1.1)	0.1 (1.0)	0.3 (1.9)	0.7 (4.5)	0.0 (0.1)	0.8 (5.4)		27.0 (183.0)	13.0 (87.3)	40.4 (273.5)	14.7 (99.5)	100 (676.6)	
12. Computer and Communications Equipment and Supplies Wholesaler-Distributors		5.0 (0.6)												31.9 (3.8)	3.4 (0.4)	23.5 (2.8)	33.6 (4.0)	100 (11.9)	
13. Office and Store Machinery and Equipment Wholesaler-Distributors																			
14. Office Machinery and Equipment Rental Leasing														39.4 (1.3)	3.0 (0.1)	27.3 (0.9)	30.3 (1.0)	100 (3.3)	
15. Total Employment	0.3 (3.6)	0.1 (1.2)	0.3 (3.0)	1.4 (16.1)		0.0 (0.1)	0.1 (1.1)	0.1 (1.0)	0.2 (2.6)	0.6 (7.0)	0.0 (0.3)	0.5 (5.5)	0.0 (0.1)	21.8 (242.2)	8.0 (88.8)	26.0 (288.8)	40.6 (451.6)	100 (1112.9)	

1 Percentage distribution is shown as the top entry; employment distribution, in full-time job equivalents, is shown in parentheses

2 Rows may not add up exactly to total due to rounding

The backward linkages that are captured in the I-F matrix of the ICT industry are minimal—the ICT industry uses very little other ICT manufactured goods and services in the production process. Audio video equipment manufacturing is the greatest user of manufactured goods and services produced within the industry (down column four). Yet, the percentage of total employment dedicated to providing computer and systems design and related services for use in producing audio and video equipment is still only 1.4 percent. The Winnipeg ICT industry is only weakly connected through sales and purchases of other manufactured goods and services. Businesses within the ICT industry purchase very few goods and services from other ICT businesses in Winnipeg.

Although the backward linkages between the ICT industry and the Winnipeg economy as a whole are not captured in the I-F table, the survey did include one question regarding the selection of suppliers that will serve as a useful indicator of the extent to which the ICT industry uses locally produced goods and services other than those produced by the ICT industry. The survey asked respondents to select what criteria, other than price and quality that the business uses to select its suppliers. This list of criteria included two that are of relevance for the discussion here—that is, 'Manitoban-owned' and 'Canadian-owned'.

Just over half of the businesses responding to the survey indicated that the locale of ownership was an important factor when selecting its suppliers. Fifty-three percent of businesses indicated that their decision-making process for selecting suppliers included whether or not the potential supplier was a Manitoba-owned business. Slightly more businesses indicated a preference for using 'locally' produced goods and services when the question was broadened to Canadian-owned businesses. In this case, 58

percent of businesses reported that they considered Canadian ownership to be an important criterion to select suppliers.

Only 27 percent of the surveyed businesses indicated that they did not consider the locale of production an important criteria in selecting suppliers (i.e. reported that neither Manitoban-owned nor Canadian-owned businesses were important criteria to select suppliers). Thus, more than three out of four ICT businesses in Winnipeg take the locale of ownership (either Manitoban and/or Canadian) into consideration when purchasing goods and services to be used in the production process. Unfortunately, no attempt to estimate the extent to which businesses actually do purchase from other local businesses in Winnipeg may be made with the survey data.

We may also determine the types of businesses that are more likely to use locally produced goods and services. The size of the business is not a predictor of whether or not the business will take locale of ownership into consideration when selecting suppliers. Sorting the data set in terms of business size reveals that those businesses taking location into consideration are almost perfectly distributed. Small businesses are no more likely to choose suppliers based on location of ownership than are larger businesses. Examining responses in terms of residency of business owners reveals that businesses that are 100 percent locally-owned are more likely to consider the location of ownership when making decisions to purchase goods and services for input into the production process than are businesses that are not completely locally-owned.¹³

Three of the four publicly-owned businesses in the survey (i.e. businesses that are owned by many shareholders who may reside anywhere in the world) indicated that they take the locale of ownership into consideration when purchasing goods and

¹³ This result is based on a sample size of 60, excluding the four businesses that are publicly-owned and of which residency of ownership is not known.

services to be used in the production process. Two of the four publicly-owned businesses selected both 'Manitoban-owned' and 'Canadian-owned' as being important factors. The results of this analysis only weakly support the CED theoretical hypothesis that those businesses concerned with supporting the local economy are more likely to be small locally-owned businesses.

2. Production of goods and services for local use

As was emphasized in the chapter on setting up the analytical framework, the model of CED used in this research is that of convergence, following in the tradition of Thomas. Convergence centres around the idea that exports of goods and services produced within a region are a symptom of a divergence of resources and needs. Other regional growth theories, such as, staple theory and the economic base model, consider exports as the engine of growth for the region. Yet, even these two theories include components to encourage the strengthening of dynamic linkages between industry sectors either to supplement the export sector, or to eventually replace the staple export. The bias of this particular study is towards the model of convergence—such that the production of goods and services is most beneficial for CED if they are purchased and used to meet needs within the region, rather than exported out of the region.

The forward linkages of the I-F matrix between the sub-industry groups of the ICT industry are minimal. Approximately five percent of employment in the computer systems design and related services industry is generated by sales to other businesses in the ICT industry (summing columns one through 14 across row 11). Just over eight percent of computer and communications equipment and supplies wholesalers-distributors employment is generated by purchases from other businesses in the ICT

industry in Winnipeg (along row 12). In total, sales from Winnipeg ICT businesses to other Winnipeg ICT businesses only accounts for 3.5 percent of total employment in the ICT industry (along row 15). Very few linkages exist within the ICT industry itself.

However, the linkages between the ICT industry and the local Winnipeg economy are much stronger. A high percentage of goods and services are purchased by other local non-ICT businesses, local governments, and local consumers. For example, sales of manufactured computer and peripheral equipment to other businesses in Winnipeg generates 67.3 percent of employment in this sub-industry group; sales to local government generates another 10.7 percent; and 1.0 percent of employment is generated by sales to local consumption markets (along row two). Less than 20 percent of employment in this component of the industry is generated by sales to markets out of Winnipeg. Many of the services provided by the ICT industry are also for local use. The most significant exception is software publishers (row eight). Over 90 percent of packaged software that is developed and published by Winnipeg businesses is sold to customers outside of Winnipeg. Software developers, which are a major component of Winnipeg's ICT industry, produce very few goods for the local economy. On the other hand, businesses that custom design software and computer systems for individual customers (i.e. the sub-industry of computer systems design and related services) are much more involved in satisfying local demands for ICT services. Only about 15 percent of services by these businesses are exported out of Winnipeg.

The I-F table shows that overall, 21.8 percent of employment in the ICT industry is generated by sales to local businesses; 8.0 percent is generated by sales to local consumers; and 26.0 percent is generated by sales to either the City of Winnipeg, or the provincial government of Manitoba (along row 15). Thus, approximately 40 percent of

employment in the industry is generated by exports out of the city, while just less than 60 percent is generated by sales to other Winnipeg businesses, local consumers, and local governments. Using the data from the survey on total adjusted gross revenue (gross sales less sales tax), as opposed to full-time job equivalents as the base measure to estimate ICT export activity, yields that 58.1 percent of goods and services are sold to Winnipeg markets. This result is almost identical to the percentage of ICT employment involved in exporting out of Winnipeg shown in the I-F table (row 15). A very high percentage of the goods and services produced by the ICT industry are purchased and used by various stakeholders within Winnipeg.

The survey permits a further break down of exports to more detail than we have discussed up to this point. Table 4.4 shows revenue accrued from sales to various markets as a percentage of the total. The primary export market for firms in this survey is the United States: one quarter of the goods and services produced are sold to the United States. Very few ICT goods and services are sold to demand markets outside of Canada or the United States. The breakdown of exports by geographic destination for the ICT industry, as shown in Table 4.4, is similar to the breakdown of export markets for Winnipeg industries in general.

Table 4.4 Exports of ICT Manufactured Goods and Services

	Within Winnipeg	Out of Winnipeg, but within Manitoba	Out of Winnipeg, but within Canada	In the United States	In other Countries (excluding the United States)
Percentage of ICT manufacturing and services sold to markets	58.1	9.5	6.1	25.1	1.2

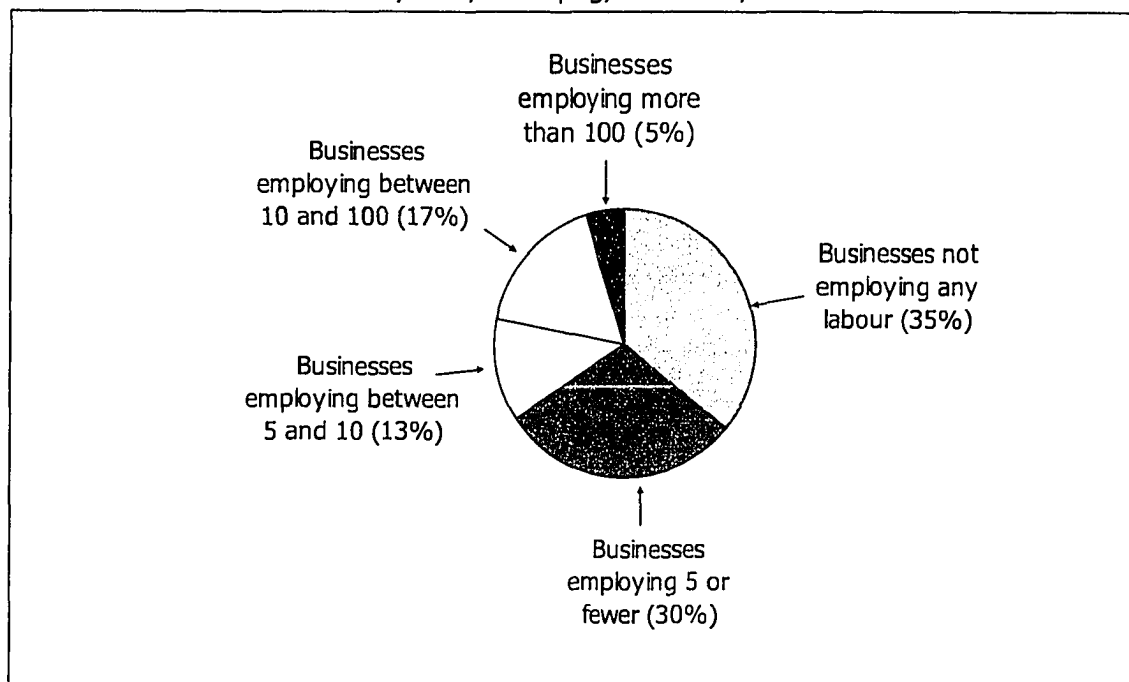
Sorting the businesses according to size shows that the 32 smallest businesses in the survey sell 63 percent to Winnipeg markets on average, while the 32 largest businesses in the survey sell 59 percent to Winnipeg markets on average. Thus, smaller businesses are only slightly more likely to sell goods and services produced to local markets, than are larger businesses. Examining the locale of ownership indicates that on average, 59 percent of the goods and services produced by businesses that are 100 percent locally-owned stay within Winnipeg; while 66 percent of the goods and services produced by businesses that are not completely owned by Winnipeg residents stay within Winnipeg. Thus, locally-owned businesses are slightly less likely to produce goods and services to meet local needs than are businesses that are not completely locally-owned. Size and location of ownership are not significant predictors of the likelihood that the business will produce goods and services for local use.

3. Local ownership and decision making

The industry is mainly composed of small locally-owned businesses. Table 4.5 shows the distribution of ICT businesses in the survey by size. More than one third of the businesses in the survey do not employ any wage labour. Only three businesses in the survey hire more than 100 full-time employees. The ICT industry is primarily made up of small businesses employing little or no labour. Many small businesses share the market with only a few very large Winnipeg ICT businesses. Comparing these numbers with data reported by the Information and Computer Technology Association of Manitoba (ICTAM), a not-for-profit membership based industry organization representing the ICT industry in Manitoba, indicates that the sample survey is very representative of the disproportionate number of small and medium-sized businesses in the ICT industry.

ICTAM reports that 26 percent of the ICT industry in Manitoba is made up of businesses with less than 10 employees; 67 percent is made up of businesses employing between 10 and 50 employees; three percent is made up of businesses employing between 50 and 100 employees; and businesses employing over 100 employees make up four percent of the industry.

Table 4.5 ICT Businesses by Size, Winnipeg, Manitoba, 2003



As is generally the case with small firms, ownership is predominantly local. Over 90 percent of the owners of the ICT businesses surveyed live within Winnipeg.¹⁴ Sorting the data set according to the size of business shows that the 42 smallest businesses are all 100 percent locally-owned. Many of the other 22 businesses in the sample are also completely owned by Winnipeg residents, but certainly the size of the business is a

¹⁴ Four businesses are removed from the sample here because they are publicly-owned and thus the location of ownership is not known. The sample size for this question is 59. These four publicly-owned businesses will be discussed separately for this analysis on the type of ownership.

predictor of the locale of ownership. Further, 68 percent of owners live within five kilometers of their businesses. This bodes incredibly well for the particular CED objective of local ownership. Decision making for these businesses is done by its owners, who are also members of the immediate Winnipeg community.

Four of the businesses responding to the survey are owned by numerous shareholders who, presumably, may reside anywhere around the globe. These four businesses were removed from the sample in the above discussion, because the residency of shareholders is not known. Upon examination of the characteristics of these four businesses, it is found these publicly-owned businesses make some contributions to the goals of CED. Employees of two of the four publicly-owned businesses hold at least some of the publicly traded stock, and all four businesses reported that employees share in the decision-making. Each of these businesses also attempt to choose suppliers that are local to the immediate community. Over 75 percent of the goods and services produced by these publicly-owned businesses are for local use, which is 20 percentage points more than the proportion of production for local use of the entire survey. These four businesses also contribute more to the CED objectives than does the sample survey on average in terms of benefits offered and participation in youth employment. Yet, they perform poorer in terms of concern for the environment, hiring of typically marginalized persons, and recruiting employees who are also residents of local community. The impact of these publicly-owned businesses on the community is mixed.

Of the businesses employing labour, 42 percent of businesses are at least partially owned by their employees. Having partial ownership of the business allows employees to share the profits of the company. It may also provide more opportunities for employees to participate in the decision-making process in some capacity than would

otherwise be the case where employees do not share ownership. Even if they are not also owners of the business, employees may be able take part in the decision making process regarding how the business will be managed. In the ICT industry in Winnipeg, just less than 70 percent of businesses report that their employees are actively involved in making decisions pertaining to various aspects of the business. Indeed, the survey data indicates that employees who are also part owners of the business are 39 percent more likely to participate in the decision-making process.¹⁵ The opportunity for so many employees to participate in this way works well to increase self-esteem and the development of numerous cognitive, professional and communication skills. Employees who feel valued in their jobs will have higher well-being and will generally be more productive than those who are not. The ICT industry contributes strongly to local ownership and local decision-making by both owners and employees.

However, the extent to which these locally-owned businesses include other members of the community in the decision-making process is not as favourable. Only 6.5 percent of businesses identified that they had ever taken steps to include the local community in decision making.¹⁶ Of these, only one of the businesses has taken formal steps to discuss their plans for expansion with local residents and city representatives. Formal consultation with the community on matters regarding decisions of the ICT industry is virtually non-existent.

¹⁵ Upon separating businesses that are partially owned by employees from those which are not, this statistic is the difference between the proportions of these businesses which involve employees in business decisions.

¹⁶ Because two businesses did not answer this question the sample size for this question is 62.

4. Long term employment of local residents

Of the 41 businesses who employ labour, the average length of employment was reported as 59.3 months, approximately five years. This is remarkable longevity considering that so many of the ICT businesses in Winnipeg are very young. More than 60 percent of businesses are less than 10 years old. Thus, the ICT industry is contributing well to long term employment in Winnipeg. The most significant predictor of length of employment is the age of the business. Location of ownership has no correlation with average length of employment. Interestingly, the size of business is a significant predictor of the average length of employment. Larger businesses are much more likely to retain employees longer than the average (i.e. more than five years) than are smaller businesses. Larger businesses are more likely to hire employees for longer durations on average, simply because these businesses are more likely to be older businesses.

The analysis is also concerned with the geographic residency of employees in the industry. On average, 95 percent of employees hired by the ICT industry are Winnipeg residents. Almost 75 percent of businesses report that 100 percent of their employees are recruited from Winnipeg. Less than 20 percent of the 41 businesses employing labour reported that they hire more than 10 percent of employees from regions outside of Winnipeg. The industry is contributing well to CED by employing local residents.

Locale of ownership is a good predictor of the likelihood of a business recruiting labour from the local community. Businesses that are 100 percent locally owned hire nine percent more employees from Winnipeg than do the 12 businesses that are not completely locally owned. The size of business is also a significant predictor of local resident recruitment for jobs within the ICT industry. Of the 75 percent of businesses

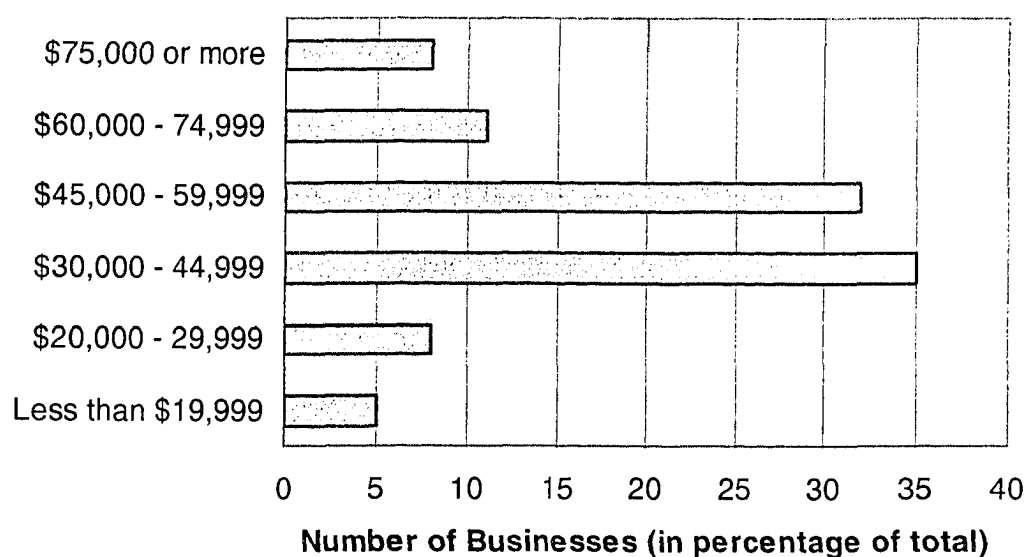
that only recruit labour from Winnipeg, the average number of persons employed is 15; while of those businesses that hire at least some labour from outside of Winnipeg, the average number of persons employed is 57. Smaller and locally-owned businesses are more likely to contribute to the CED objective to hire local residents.

It is also important to determine the wages of ICT jobs. Of the 41 businesses that employ labour, two businesses did not answer this question because they do not employ any labour full-time and another two chose not to disclose this information. Table 4.6 shows the average annual salaries paid to full-time employees as indicated by the 37 responses to this question. From this table, we can see that five percent of businesses report that they pay full-time employees less than \$19,999 on average; eight percent of businesses pay employees an average annual salary within the \$20,000 - 29,999 range; 35 percent of businesses pay full-time employees between \$30,000 and 44,999 on average; 32 percent of businesses pay full-time employees between \$45,000 and 59,999 on average; employees of 11 percent of businesses earn between \$60,000 and 74,999 on average; and eight percent of businesses pay employees over \$75,000 per annum on average.

Thus, just over half of the businesses pay an annual average salary greater than \$45,000 (summing the last three categories). If we factor in the size of each business (i.e. weight businesses according to the number of full-time persons employed) this number increases from 51 percent to 74 percent. Using this weighted approximation, it can be stated that on average, three out of four employees in the ICT industry are paid an average annual salary greater than \$45,000. Data from the 2001 Census indicate that the average annual employment income for full-time employees in Winnipeg was \$39,210 in 2000. Employees in the ICT industry are paid an above average wage. When

asked if the business attempts to pay above average wages as a form of benefit to its employees, just less than half of businesses answered that they did. Certainly, the data of the average salaries paid to employees support these intentions by businesses to pay employees an above average wage.

Table 4.6 Average Annual Salary Paid to Full-Time Employees



If we make salary comparisons based on education, the results are not quite so favourable for the industry. One half of employees in the sample have a University degree; and just over 75 percent of employees have either a University degree or a College diploma. Data from the 2001 Census indicate that only 20 percent of persons in the total labour force in Winnipeg have a University degree—that is, the ICT industry employs 150 percent more University graduates than do other industries in Winnipeg on average. Clearly, a very high proportion of persons employed in the industry are highly-skilled technicians, engineers, and analysts. The average annual salary of full-time

employees in Winnipeg who hold a University certificate, diploma, or degree for all industries (according to the 2001 Census) was \$54,418 in 2000. For those with a College certificate or diploma, the average annual salary was reported as \$38,081. Thus, when we account for the high percentage of highly skilled labour in the ICT industry (based on the very high number of employees in the industry who hold a University degree), it would appear that on average, businesses pay employees average wages relative to their level of education. Overall, the ICT industry contributes well to providing long-term employment for well-educated local residents at above average wages.

5. Local skill and knowledge development

Nine out of the 41 businesses hiring labour indicated that they participate in youth employment programs. These programs include summer student term positions, work experience programs, and co-op practicum programs. Although it may seem that larger businesses would be more likely to participate in youth employment programs, the total number of workers is not a predictor of the business' participation in youth employment programs. Only one of the three largest firms (which each employ over 150 people) is engaged in employing and training youth and students. The other businesses that are participating in youth employment programs range in size from employing 1.3 to 37.3 full-time persons. Small businesses are participating in youth employment programs as much, if not more, as are the larger businesses in the ICT industry. Smaller businesses are probably more likely to participate in youth employment programs to benefit from subsidized labour, whereas larger firms would be less likely to have need for labour subsidization.

More firms offer and/or subsidize training programs than participate in youth employment programs. Nearly one in three of the 41 businesses hiring labour provides or finances formal training programs for their employees. Larger firms are more likely to provide these programs. More than 75 percent of those businesses offering formal training programs are businesses that also employ more than the median number of employees—of 6.7. Larger businesses tend to offer more training programs for their employees than do smaller businesses. The high costs of training programs are more easily absorbed by larger firms than smaller ones, and thus it is logical that larger businesses are more likely to offer or subsidize training programs for their employees.

Mentorship of other businesses is another way in which businesses may contribute to the skill and knowledge development of the local community. More than 15 percent of businesses in the ICT industry are involved in mentoring other locally-owned businesses in Winnipeg. More than 20 percent of all businesses surveyed indicated that they also participated in other forms of activities to support local community businesses. These activities include offering free services to non-profit organizations, actively serving as members of the Chamber of Commerce, serving as business advisors to other local businesses, and financially supporting local business districts. The extent to which participation as members in organizations, such as the Manitoba Chamber of Commerce, actually contributes to the objectives of CED is debatable. It could be said that participating as members of business organizations and industry associations may actually detract from the community, since much of the work carried out by these organizations involve political lobbying for reductions in taxes and government regulations.

Numerous businesses within the industry are also involved in community decision-making. Over thirty-five percent of ICT businesses have representatives that act as board members to at least one local community organization. As board members of community organizations, business owners utilize their own skills and knowledge to better equip the decision-making of community groups. Just as many businesses are involved in contributing to knowledge development through their participation in various community events. A handful of businesses also sponsor Red River College students enrolled in technical programs. Thus, nearly half of the businesses in the industry either participate on boards of community organizations and/or participate in community events. ICT businesses are working well to participate in the community to develop many of the skills and the knowledge that is beneficial to participating both in the labour market and in the other aspects of community life.

6. Local re-investment of profits

The survey question on the nature of internal capital investments indicates the extent to which profits of the ICT industry are re-invested in the local community. Ninety-seven percent of businesses in the ICT industry report that they purchased some type of equipment in the last five years. More specifically, 44 percent of businesses invested profits in repairing buildings; 59 percent made significant investments in office furniture and fixtures; and 28 percent purchased company vehicles. Respondents were also given the opportunity to select an 'other' option to report other internal capital investments not included in the list—13 percent of businesses did so. All but one of these responses specified the 'other' investment as an investment into software.

Do ICT businesses have formal policies on local reinvestment of profits? Just over 20 percent of businesses in the ICT industry report to have a policy on re-investing profits locally. Businesses specified that they make it a priority to support and invest in local charitable organizations, local businesses, local culture, and local education. Two businesses indicated that they have specified a certain percentage of profits for reinvestment into the community, while the other twelve businesses have not specified a certain amount, but are committed to reinvest nonetheless. The businesses that indicated they have a policy on local re-investment are also all 100 percent locally-owned. The sizes of these businesses, however, varied widely from a handful hiring no employees up to the third largest employer in the sample. Thus, the size of the business is not a predictor of a business' conscious effort to reinvest profits within the Winnipeg community.

7. Physical environment

Only 13 percent of the businesses reported that ecological sensitivity of potential suppliers factored into their decision-making process for selecting suppliers. Upon examining responses more closely, it is found that all but one of the businesses' concerned with choosing suppliers that are ecologically sensitive (i.e. 7 out of 8) also selected the locale of ownership (Manitoban and/or Canadian) to be part of the selection criteria. Thus, concern for the physical environment is a good predictor of concern for local ownership and decision-making.

There is a correlation between the size of business and its ecological sensitivity. Seventy-five percent of the businesses reporting that they take the environment into

consideration when selecting suppliers hire less than four employees.¹⁷ All businesses selecting a 'yes' answer to this question employ fewer than 10 employees. Thus, the size of business is a good indicator of the likelihood of a business' concern for the physical environment. Certainly not all of the smallest businesses factor the impact of the production process on the environment, but the likelihood of selecting suppliers partially based on ecological issues certainly decreases with business size. None of the businesses employing 10 or more full-time employees (i.e. the top quartile of businesses with respect to size) report that they consider the environment when selecting suppliers.

The correlation between locale of ownership and ecological sensitivity is even more significant. Of the eight businesses that are not completely locally-owned and the four publicly-owned businesses (which are very unlikely completely locally-owned) none reports to select suppliers based on ecological sensitivity. Thus, all of the businesses that consider ecological sensitivity an important criterion to select suppliers are also 100 percent locally-owned. Thus, small and locally-owned businesses are more likely to take an effort to encourage ecological sensitivity. This survey result fits nicely with CED theory.

Beyond considering the environment when making decisions of the production process, businesses may directly participate in activities to build healthy and safe neighbourhoods. However, only three percent of ICT businesses in Winnipeg are active participants in physically cleaning up neighbourhoods. Businesses engaged in neighbourhood safety programs only make up another three percent of the ICT businesses surveyed. The businesses directly involved in the community either in clean up or safety programs appear to be randomly distributed with respect to their size. At

¹⁷ In full-time job equivalents.

one end of spectrum is the largest business to respond to the survey (with 300 employees), and at the other are two businesses not employing any labour—each actively involved in building clean and safe environments in the Winnipeg community.

Summing each of the businesses that report to be contributing to a sustainable environment in some way (i.e. either consider the environment when selecting suppliers and/or are directly involved in community activities to build a safe and clean environment) we can find a rough approximation of the overall concern for the physical environment by businesses in the ICT industry. Overall, only 17 percent of ICT businesses are working in some capacity to build a safe, clean, and sustainable environment in the local community. The requirements for businesses to be included in this 17 percent are very lax. For example, businesses are included just for participating in activities as the blue box recycling program. Businesses in the ICT industry in Winnipeg are not contributing very much to the sustainability of Winnipeg's natural environment, or safe and healthy neighbourhoods.

8. Health and Well-Being

In order to get an indication of how businesses in the ICT industry are contributing to the health and well-being of its employees and their families, the survey included a question on the nature of benefits offered to employees. These questions were only answered by those 41 businesses employing labour, so the analysis here draws upon a smaller sample size. Eighty-five percent of businesses in the industry provide leeway to employees to decide when they will work the required number of hours per week. Flex-time allows employees the ability to schedule daily appointments and numerous responsibilities away from work with minimal stress. Approximately 10 percent of

businesses allow for job sharing to better accommodate the demands and needs of its employees. Again, just less than half of the businesses in the industry offer training and educational opportunities to its employees to develop specific job-related knowledge and skills, as well as self-confidence—a major contributor to health and well-being.

ICT businesses contribute very little to parental benefits to employees, however. Less than 25 percent of businesses claim to offer parental leaves as a benefit to its employees. Further, no business responding to the survey offers any type of child care. However, since the majority of businesses responding to the survey hires less than 10 people, the fact that child care is not offered is understandable. Small businesses would have difficulty justifying day care services to employees—of which only a small proportion would have children requiring this service. Yet, with respect to any benefits offered by the industry for employees who also have parental responsibilities, the industry fairs very poorly.

The lack of parental benefits offered may be compensated by higher wages—that is, since wages and benefits are thought to be substitutes there may be an inverse relationship between wages and benefits. However, the survey data on parental benefits, as well as the other types of benefits, do not support this hypothesis. In fact, the businesses that pay more than the median average annual salary (i.e. those paying employees 45,000 or more on average) offer 20 percent more benefits than the businesses in the other half of the survey paying lower wages.

Twenty percent of businesses also indicated that they offer other benefits to employees. Some businesses offer stock option plans, profit sharing, and other financial bonuses to provide incentives for employees. A handful of businesses provide employees with dental and medical benefit packages, on-site massage therapy, entertainment (i.e.

an air-hockey table), home internet, free beverages, and/or a casual dress code. One business also specified that it strives to offer employees a creative and respectful environment. Many of these benefits serve to increase the well-being of those employed within the ICT industry.

The second indicator of health and well-being is the number of self-employed persons in the ICT industry. The survey of ICT businesses identified just less than 100 persons with ownership of an ICT business in Winnipeg (see Table 4.1). Of the total number employed in the businesses included in the sample of the ICT industry, nine percent are self-employed. As a benchmark, the 2001 Census reports that self-employed persons (of both unincorporated and incorporated businesses) make up 8.7 percent of the labour force in Winnipeg. Thus, the ICT industry is made up of approximately the same proportion of self-employed persons as Winnipeg businesses in general. Further, the ability to work in a small firm may allow employees greater connection to employers, allowing employees to feel more valued and heard. Thus, the disproportionate amount of very small ICT businesses—hiring only a handful of people—bodes well for contributing to this objective of CED as well.

9. Human dignity

Of the 41 businesses employing labour, 40 answered questions regarding the distribution of labour among various groups. The results are shown in Table 4.7. The table indicates that of the total number of employees in the survey, 34 percent of them are women. This proportion of women employed in the ICT industry is 25 percent less than the actual proportion of women in Winnipeg's labour force—that is, 45.4 percent (as identified by the 2001 Census). Census data also reveal that women made up

approximately 40 percent of the labour force in Winnipeg's ICT industry in 2000—which is a slightly higher percentage of women in the industry than was captured in the 2003 survey. However, not all jobs in the ICT industry are ICT technical jobs. Statistics Canada data on the breakdown of employment on the type of job in the industry by gender for Manitoba reveal a somewhat different picture. Only 25 percent of the technical, highly skilled jobs in the ICT industry are held by women. Many of the women employed in the industry are not ICT technicians, engineers, or analysts. ICT jobs are *dominated by men*.

Table 4.7 Selected Groups as a Percentage of Total Employment in the ICT Industry

	Women	Aboriginal	Immigrant	Disabled Persons	Visible Minority
As a Percentage of Total Employed	33.9	3.3	7.7	1.3	6.1

Disabled persons make up 12.5 percent of the entire Canadian population.¹⁸ The proportion of disabled persons employed in the ICT industry is 1.3 percent—which is one tenth of the actual distribution of disabled persons in the Canadian population as a whole. Although Aboriginals make up 6.5 percent of the Winnipeg labour force, only 3.3 percent of employees in the ICT industry are Aboriginal. Six percent of employees in Winnipeg's ICT industry are persons of visible minorities. According to census data for 2001 it is known that visible minorities actually make up 12.5 percent of Winnipeg's labour force—which is more than double the proportion of visible minorities employed in the ICT industry. Data were also collected on immigrant workers in the ICT industry.

¹⁸ Canadian population data is used here instead of labour force data on Winnipeg because this statistic could not be obtained.

Immigrants make up about 8 percent of Winnipeg's ICT industry, while immigrants make up 18.2 percent of the total labour force in Winnipeg. The industry is not contributing very well to the objective of hiring people belonging to typically marginalized groups.

Examining the characteristics of the businesses that do hire persons from the selected groups provides an interesting insight into the industry. Of the ten smallest businesses that employ labour, women employees make up 65 percent of the number employed. Very likely however, the jobs held by these women employed in these very small businesses—hiring two or less persons—are administrative. However, the size of business is negatively correlated with the proportion of women, immigrants, and visible minorities employed. Businesses employing less than ten employees are significantly more likely to employ persons that are typically marginalized in the labour market. Smaller businesses hire ten percent more women, three percent more immigrants, and seven percent more visible minorities as a percentage of total number of people employed than do larger businesses. However, there is no significant connection between the locale of ownership and the proportion of these certain groups employed.

To summarize the analysis then, the ICT industry in Winnipeg is making some significant contributions to many of the CED objectives, while making only weak contributions to others. The economic linkages between the sub-industry groups are very weak, but the ICT industry is strongly committed to supporting other local businesses. Most of the goods and services produced by the industry are sold to meet the needs of local businesses, governments, and consumers. Further, the industry is primarily composed up of small locally-owned businesses, which are thought to be more likely to contribute to CED than large foreign-owned businesses. Businesses in the

industry also predominantly hire local Winnipeg residents for a relatively long period of time at above average wages. Contributions of the industry to local skill and knowledge development are less straightforward, or significant. Businesses do participate in various capacities to aid in the training of employees and other members of the local community, but the extent to which memberships in organizations such as the Manitoba Chamber of Commerce actually contribute to the goals of CED are uncertain. Most businesses in the sample also have made internal capital investments to re-invest profits locally in the last five years, and a significant number have adopted a specific policy on re-investing profits locally.

The industry is performing very poorly in regards to its concern for the physical environment. The ICT industry is also making some contributions to the health and well-being of the local community—that is, a high number of persons in the industry are self-employed and a significant proportion of businesses pays above average wages and allows employees flex-time. The industry does not perform as well to this objective in terms of parental benefits or job-sharing benefits offered. Further, the industry makes virtually no contribution to hiring typically marginalized persons. All the selected groups are grossly underrepresented in the industry.

The extent to which locale of ownership and size is a predictor of a business' contributions to the objectives of CED is somewhat unclear. Local ownership does not predict businesses' contributions to long term employment of local residents or human dignity, and actually is negatively correlated with businesses' contributions to the production of goods and services for local use. Local ownership is however, positively correlated with businesses' use of locally produced goods and services, local re-investment of profits, hiring of local residents, and concern for the physical environment.

Smaller businesses are more likely to be locally owned and encourage employees and community members to share in decision-making; they are more likely to employ local residents; they are more likely to be concerned for the physical environment' and they are more likely to foster human dignity. However, business size does not predict its contribution to the use of local goods and services, the production of goods and services for local use, the investment of profits locally; and has a significant reverse effect on contributing to health and well-being of employees and community members. The conclusions of these analyses are mixed. Overall however, the hypothesis is weakly supported—that is, it would appear that business size and locale of ownership are sometimes connected with contributions to CED in the expected direction.

5 CONCLUSION

A major component of this study has included the development of the framework for analysis that arises out of the literature on both CED and regional growth analysis. This framework, specifically designed to analyze an industry's contributions to or detractions from CED, may be applied to any industry of any economy. Similar analytical frameworks have been used in various capacities in Manitoba in the last several years. Since 2001, the Government of Manitoba has used their CED lens to gauge the extent to which major development projects in Manitoba meet the objectives of CED, as well as a way to apply their CED initiative to all aspects within the provincial government. SEED Winnipeg successfully used a survey—asking many of the same questions as the survey conducted in this study—to compile a directory of CED businesses in Winnipeg in 2003. Thus, the application of the CED analytical framework to the ICT industry in Winnipeg, as is conducted here, follows in some good company.

There is one important similarity among all of these various applications of the CED analytical framework. The CED analytical framework, or CED lens, may be applied to development projects, areas within the provincial government, an individual business, and an entire industry regardless of the main goals of the stakeholders. The primary goal of stakeholders does not need to be 'to contribute to CED' in order to make the analysis legitimate. Development projects, program delivery, policy making, and private businesses may contribute to the objectives of CED without intentionally planning to do so. For example, although major development projects—including the construction of the MTS Centre in downtown Winnipeg, the expansion of Biovail in Steinbach, Manitoba, and the construction of the Centre for Disease Control in Winnipeg—are not labeled as being development projects for CED specifically, the provincial government may apply

their CED lens to gauge the impact these projects may have for CED. Thus, contributions to CED may happen accidentally, so to speak.

Certainly, in the CED model there is need for some type of planning, or manipulation of the market, to bring about outcomes that otherwise may not occur. Essentially, this planning may be thought of as 'community conversations' in which fellow members within the community may express their own needs, learn of other needs and goals within the community, identify available resources to meet these needs, and discuss opportunities and challenges for future development and growth. The actual form of these conversations will vary depending on the specific dynamics within each community. Planning, in the context of private business, is generally more subtle than a town hall meeting to discuss the impact of a proposed development project in the region, for example. Rather, it exists to the extent that local residents who own businesses in the region may make decisions based on their own individual goals and ideals, as well as those that have been expressed to them through community conversations. Local community members who are employed in businesses in the community and participate in making decisions within the business may also incorporate their own individual needs and goals, as well as those shared by the community in this decision making process. Thus, even though for-profit private enterprises are largely driven by profit maximization, there is room for other goals, ideals, and needs to be reached within this context.

Contributions to CED by private for-profit enterprises may also come about accidentally, however, as consequences of profit maximization goals. Even if private businesses may not be actively involved in community conversations or incorporating goals other than profit maximization in business decisions, they still have an impact on

the community. Decisions made as suppliers are selected, plans for expansion are developed, and employees are hired all affect various aspects of the community and have various implications for contributions to or detractions from the objectives of CED. Thus, to apply the CED framework to an industry that does not claim to be aligning itself with the objectives of CED is completely legitimate. A contribution to long term employment of local residents is a contribution to long term employment of local residents regardless of intentions. Planning in CED is to complement the market where it fails to bring about the objectives of CED on its own.

It would seem then, that some objectives of CED are more likely to be met by private for-profit businesses than others. One of the key components of a successful and profitable business is its employees. Thus, there is much incentive for businesses to attract and retain productive and highly skilled labourers. If employees feel valued in terms of their participation in business decisions, are paid competitive wages, are offered good benefits, and share in the profits of the business, then they are not likely to seek employment elsewhere. Thus, high wages, long term employment, good benefits, employee participation in business decisions, and profit sharing are more likely to align with goals of profit maximization than some of the other indicators of contributions to CED. This is not to say that businesses contribute less to CED if their contributions to the objectives are not intentional, or purely self-less. Rather, that some contributions to CED may happen unintentionally through the market system simply is indicative that some of the goals of CED may be more profitable for private enterprise than others.

Objectives that may be less likely to be met by private for-profit businesses are those that would tend to increase production costs without increasing revenue, or

productivity—or at least not in the short-run. Businesses may be discouraged from hiring typically marginalized groups because it may be unprofitable to do so. Individuals within these typically marginalized groups may be less employable (i.e. they may have less work experience, less education, and have other language, cultural, or physical barriers to employment), and thus may be less profitable to the business than an individual who is more employable. Efforts to sustain a healthy and sustainable natural environment are also costly endeavors. These costs are generally not directly recovered by the business. Thus, although a commitment by private business to positively contribute to the physical environment will significantly benefit the community, the direct benefits to the business of doing so will be minimal.

For these objectives—including, contributions to sustaining the physical environment, hiring individuals from typically marginalized groups, involving community members in decision making—that are less likely to be met accidentally by private businesses, some type of planning is required. This planning may be thought of as specific initiatives or policies to encourage contributions to certain objectives. For example, if it is seemingly unprofitable to hire individuals from typically marginalized groups because they lack the skills and knowledge, it would be important for the local government, or a local community development corporation (CDC) to step in to provide and/or fund educational programs for these individuals. Or alternatively, local businesses may be encouraged to sponsor a particular individuals' training if offered partial subsidization of labour for the initial year of employment.

Businesses may also be encouraged to make valuable contributions to the physical environment by way of tax incentives, or various other proposed methods of reducing wastes and emissions. A commitment to a greener and safer community may

be incorporated into the marketing scheme of the business, so that the extra costs spent on the environment may become directly profitable. Local community organizations and community members can encourage these private businesses to take these efforts by increasing public awareness of the state of the physical environment of the community and by lobbying government and private businesses for change.

Tax incentives are a great tool that local government may use to encourage private for-profit business to contribute to CED. For example, the Government of Manitoba offers a CED tax credit—in the form of a 30 percent personal income tax credit on a maximum annual investment of \$30,000—to Manitobans investing in approved local enterprises. In order for the private enterprise to be eligible for the tax credit, they must be small (i.e. employ no more than 200 employees), be owned by a Manitoba resident(s), and at least 25 percent of employees must reside in Manitoba. This tax credit program serves to encourage and support the growth of small, locally owned businesses which are committed to creating jobs for Manitobans. Certainly, such policies exist to encourage contributions to CED by private businesses that otherwise may not be encouraged within the market.

From the onset, the study did not intend to draw conclusions of whether the ICT industry is or is not a CED industry. Rather, the analytical framework was set up so as to analyze the extent to which the industry contributes to or detracts from each of the nine objectives. The stated objectives were not given any sort of hierarchical ordering. To compile their shopping guide of CED businesses, SEED Winnipeg did, however, use a weighted list to separate CED businesses from non-CED businesses. To be listed in the guide, businesses had to be located in Winnipeg, be Winnipeg-owned, earn at least 50 percent of their revenue from customers in Winnipeg, and demonstrate a commitment

to at least three of six areas: purchasing locally or from other CED businesses; using progressive employment policies; re-investment profits locally; making decisions locally; participating in community-building activities; and being ecologically sensitive (SEED Winnipeg, 2003: vii-viii; L. Simbandumwe, 2004).

If the research conducted here were to have used a similar formula, what could have been concluded? All businesses in the survey were located in Winnipeg: 90 percent of business owners live in Winnipeg; and 59.4 percent of revenue is earned from various customers in Winnipeg. Thus, based on the data collected by the survey, the ICT industry meets all three essential characteristics, as set out by SEED Winnipeg. But upon these three necessary conditions, CED businesses must also demonstrate a commitment to three of six other areas, as outlined previously. At this point, the analysis becomes less straight forward. To what extent does the 'demonstrated level of commitment' need to be? The analysis rests largely upon the tools and indicators used, and the limitations of each. Let us examine the indicators used in this study more closely.

Firstly, to analyze the extent to which the ICT industry uses local goods and services, the study relied on the backward linkages of the I-F matrix and an indicator on local sourcing. As noted in chapter four—which reports the results of the analysis—the backward linkages that are captured in the I-F table are not very useful. Only the backward linkages within the ICT industry itself may be identified using the data collected by the survey. The industry's use of goods and services produced in Winnipeg may not be measured using the survey data. Thus, the analysis of this particular objective must rely on a significantly less detailed or reliable indicator: a yes/no question on the businesses' consideration of locally-owned businesses as a valuable criterion in selecting suppliers.

This indicator may be skewed due to problems of self-selection, as businesses may select 'yes' simply because it may be thought to be a more desirable response. A question regarding the businesses' actual proportion of input costs spent on locally produced goods and services may have been less subject to the self-selection errors of the indicator used. Further, an indicator that would have provided the magnitude of the use of local goods and services would have been significantly more useful. A question asking "What proportion of inputs into the production process of your business is purchased locally?" would have provided a more useful and possibly less biased indicator. Given the limitations of this indicator, the extent to which this objective is realized in the ICT industry remains uncertain. All that can be reported is that three out of four businesses *claim* to take the locale of ownership (either Manitoban and/or Canadian) into consideration when purchasing goods and services to be used in the production process.

The analysis of the second objective relies on significantly better tools and indicators. The forward linkages are nicely captured in the I-F table. Over half of the employment in the industry is generated by sales to various customers in Winnipeg. The I-F table also captures the disaggregated linkages which provide insight into the extent to which the various sub-industry groups produce goods and services for local use. Data on the percentage of goods and services sold to various geographic destinations also serve as useful indicators for the analysis here. The questionnaire was sufficient in gathering the necessary data to compile good analytical tools and indicators to analyze the industry on this objective. And on this objective, the industry is contributing well to CED, as more than half of the industry is engaged in production for use within Winnipeg.

The third objective was analyzed using data on the locale of ownership, size of business, and employee and community involvement in business decisions. The locale of ownership indicator is a useful measure, and no obvious limitations are inherent in the question structure. However, the very high percentage of locally-owned businesses in the ICT industry captured by the survey may be biased upwards due to the exclusion of some of the key players in the industry from the sample survey. For example, both MTS and IBM—two driving forces in Winnipeg’s ICT industry—are not locally owned. But, because these businesses did not choose to participate in the study, the survey is not reflective of these two non-locally owned businesses in the industry. It has already been observed that the survey is more representative of smaller businesses than of larger businesses. Thus, given that the size of business is a predictor of locale of ownership—that is, smaller firms are more likely to be locally-owned—it is reasonable to assume that the locale of ownership indicator is biased upwards. The extent to which this indicator is biased is unknown however. This limitation of the locale of ownership indicator could be minimized as the non-response error is minimized for the entire data set.

The extent to which community members participate in decision making is measured using three separate indicators. Whether businesses in the ICT industry directly involve community members, who are not employed in the industry, in the decision making process is the choice indicator for this part of the analysis. It was found that very few businesses involve community members on matters regarding business expansion or development. The indicators of employee involvement in decision making and employee ownership are more limited for the analysis. The extent to which employee involvement actually affects the outcomes of business decisions is unknown. Further, this indicator rests on the assumption that employees participating in decision

making in the business are representative of the other members in the community, and take these concerns to their employers. This is somewhat misleading, as employees will have a vested interest in the growth and development of the business that employs them, or that they partially own, which may overpower other interests they may share with fellow members of the community who are not employed in the business. Thus, the employee ownership and involvement in decision making indicators are only rough indicators of the extent to which community members are involved in business decisions of the ICT industry.

Thus, on this third objective the ICT industry certainly aligns with the objective for local ownership, in terms of the high proportion of business owners living in Winnipeg. The extent to which the owners of these privately owned businesses are concerned with the various goals and needs of the community besides profit maximization of the business is uncertain, however. Community consultation regarding business decisions for growth and development is minimal. Yet, more than two thirds of businesses report that they involve employees (most of who are local Winnipeggers) in business decisions and more than one third are partially owned by employees. But, neither the actual representation of community interests nor the weight given to these interests is known. Further questions regarding these aspects of what is meant by employee involvement in business decisions would be very valuable to provide further depth to the analysis here.

Analysis of the fourth objective relies on three strong indicators. The average length of employment and the origin of labour are useful and unbiased indicators of measuring the extent to which the industry provides long term employment for local residents. Wage data collected by the survey are slightly less useful for analyzing the

extent to which the industry is providing good employment (i.e. at above average wages). Business respondents needed only to select the average annual paid to full-time employees from a list of salary ranges. Thus, the analysis is limited to reporting wages in terms of the proportion of businesses paying their employees an average annual salary within a certain range, rather than being able to report the average salary earned by full-time employees in the industry. The indicator used is less concise as it relies on the aggregation of an average. Further, the analysis could be broadened had the questionnaire included questions regarding salaries paid to employees by highest level of schooling. This would have allowed further analysis on the types of jobs in the ICT industry (i.e. administrative versus highly specialized technical jobs). The proportion of these various jobs held by persons of typically marginalized groups would also be an interesting avenue for further insight into the extent to which the industry contributes to long term employment of local residents.

Given the results of the analysis on this fourth objective, the ICT industry works well to provide long term employment for local Winnipeggers. The wage indicator is not as strong, but is certainly indicative that the industry pays employees wages that are at least average relative to the high proportion of employees holding a University degree.

The indicators used to analyze the industry's contribution to the fifth objective of local skill and knowledge development are also somewhat limited. The data collected on businesses' participation in work youth employment programs and offering of training programs do not indicate the extent to which businesses are involved in these activities. Businesses offering one day of formal training to new employees are not distinguished from those offering two weeks; and those subsidizing University courses are not distinguished from those allowing employees to attend a one-day workshop on company

time. Thus, businesses' actual commitment to local skill and knowledge development remains relatively uncertain. Certainly there is some commitment to developing the skills and knowledge of employees.

The data used to analyze the extent to which the industry contributes to local skill and knowledge development of other members in the community are even less valuable. Certainly numerous businesses are involved in various capacities within the community, but the extent to which these involvements actually contribute to meeting the needs of Winnipeggers—that is, the goal of CED—is unknown. It would be useful to supplement the data collected by the survey with qualitative data on businesses' motives and rationale for participating in various capacities within the community, as well as the extent to which this participation serves to develop local skill and knowledge.

The indicators used in the analysis of the sixth objective severely limit the study's capability in measuring the extent to which the ICT industry is committed to re-investing profits locally. The primary indicator used is formed using data collected on businesses' internal capital investments in the last five years. Certainly this is one aspect of local re-investment of profits. However, an income-expenditure analysis of the industry or of a sampling of the industry would be an invaluable tool in determining the actual impact the ICT industry has on Winnipeg, in terms of recirculation of income. Such an analysis would require businesses in the industry to open their record books up for close examination. Thus, the indicator used only scratches the surface in identifying businesses' local re-investment of profits.

Data on businesses' policies on re-investing profits into the community provide further insights into the alignment of the industry with this objective, but it is also limited in its usefulness. Respondents were asked to describe the nature of their formal

policy on re-investing profits locally, and most of the businesses listed a few of their priorities to financially invest in the local community. Yet, only a handful specified a certain percentage of profits earmarked for such purposes. What is meant by re-investing profits locally may also be held under question. Does support of local charitable organizations have the same impact on the economy as does an investment into local education, or local sourcing? Given the limitations of the indicators used for this part of the analysis, very little can really be said about the industry's contribution to *re-investing profits locally*.

The usefulness of the indicators used to analyze the industry's contributions to the physical environment is also restricted. Given the choice between declaring that the decision making process of choosing suppliers either does or does not involve consideration of the ecological sensitivity of the potential supplier, 13 percent of businesses chose the desirable response for CED. A small proportion of businesses self-declared themselves as being concerned about ecological sensitivity, even though this would be the socially desirable response. This low proportion of businesses selecting the socially desirable response relative to those selecting the socially desirable response for local sourcing indicates that the self-selection error may not be as high as first speculated in the latter indicator. This indicator of ecological sensitivity may be subject to some degree of self-selection error, but not significantly. What businesses understood ecological sensitivity to mean may skew the interpretation of this indicator. Further, as noted for the local sourcing indicator previously, the weighting placed on ecological sensitive suppliers in decision making is unknown. Given these considerations, this indicator is not incredibly meaningful.

Analysis of the physical environment also includes indicators on businesses' direct involvement in building healthy, safe, and attractive neighbourhoods. Although some misunderstanding as to what is meant by "participation in a neighbourhood clean up program" or "participation in a neighbourhood safety program" is likely, these indicators are likely not subject to significant bias, and are meaningful for the analysis. The specific nature of business involvement in these activities would have added further insight into the analysis. The data that was obtained, however, clearly indicate that the ICT industry is not significantly contributing to the objective of building a vibrant and sustainable environment in Winnipeg. Of course, the study could benefit from an in depth analysis of the industry's direct impact on the physical environment as a result of the actual production process. A detailed account of the resources used, the wastes disposed of, and the overall impact on the physical environment would provide substantially more meaningful insight into the industry than the indicators used in this study. However, such research is beyond this scope of this study.

The employee benefits indicators used to analyze the industry's contributions to health and well-being are very meaningful. Based on these indicators, the industry's contributions to employee well-being are mixed. Again additional data on the rationale behind offering employees these various benefits may provide further insight into the contribution made by the industry to this eighth objective.

The usefulness of the self-employment indicator used for the second part of this analysis may be limited. It is thought that perhaps self-employment contributes to health and well-being, as self-employed individuals are able to feel in control of their schedule, take pride in their own accomplishments, and enjoy the profits accrued from the business. However, self-employed individuals may also be under more stress, work

more hours, and be less certain of a steady income or of long term employment. Thus, the extent to which the number of self-employed persons indicates any contributions to or detractions from CED is unclear. That said though, CED theory is very much built on the assumption that small scale is profitable and fruitful (i.e., smaller businesses contribute better to the CED objectives than do larger ones). This indicator of self-employed persons is thus open for discussion. The results of the analysis show that the ICT industry is composed of the same proportion of self-employed persons as is the entire Winnipeg labour force.

The employment ratios of groups who are typically marginalized in the labour market serve as very useful and meaningful indicators of the ICT industry's contributions to human dignity. Using Census data to provide benchmarks for comparisons, it is found that the industry is doing a very poor job of hiring marginalized individuals. The data capture this unfortunate characteristic of the industry very well.

Given the limitations of the indicators and tools used throughout the analysis, it is difficult to draw any wide sweeping conclusions about the ICT industry's contributions to CED. Certainly, no attempt will be made to claim that the ICT industry is, or is not contributing to CED. As identified above, the results of the analysis indicate that the industry contributes better in some areas than in others. As expected, the industry contributes more to the aspects of CED that are more in line with profit maximization than with those that may be less profitable. The above examination of the tools and indicators used in the analysis also exposes many of the limitations of the study and identifies some questions for further research.

One particularly unfortunate limitation of the study is that the data collected for this research included sales flows for the ICT industry only. Thus, construction of an I-F

table of the entire Winnipeg economy was not possible. As a result, the backward linkages to measure the industry's use of local goods and services were not able to be constructed. The construction of such a table would also provide valuable insights of the economic linkages between all industries in Winnipeg. But the data requirements to construct such an elaborate table of all industries far exceeded both the resources and the scope of the study. In hindsight, the survey could have been designed in such a way as to break up "sales to other local businesses" into more detailed sales flows to specific industries, which would have provided more detail in the forward linkages of the ICT industry. The survey could have also included questions regarding purchasing, in addition to the questions on sales flows. However, the convention for constructing I-F tables is to use 'rows-only' data (i.e. sales flows) to reduce the data requirements of the input-output table—which uses both purchasing and sales flows. The additional information these questions would have provided was sacrificed to minimize the effort required for respondents to complete the questionnaire. However, if a future study would have the resources available, it would certainly be an interesting project to embark on the task of completing an input-output table for the industry.

An alternative methodology that may be adopted in a future study of Winnipeg's ICT industry's contributions to CED, or as a continuation of this one, may employ case studies. In depth examinations of a handful of businesses in the industry would provide a much more detailed analysis of a small sampling of the industry, and would be able to answer many of the questions that remain unanswered here. A similar questionnaire as is used in the research here may provide the starting point for the data collection process. Launching from these responses, the researcher may conduct a series of informal interviews with the spokesperson(s) of the selected businesses. These

interviews may include the questions arising out of the discussion above regarding the aspects of the industry's contributions to CED that were not captured by the questionnaire. Questions for further insights into the industry may include:

- (a) How does your business make a conscious effort to contribute to the various objectives of CED?
- (b) Why does your business make these conscious efforts?
- (c) How, if at all, have your contributions to CED changed in the last five years?
- (d) What goals, besides profit maximization, are incorporated into your business?
- (e) How important is it to the business that your business is locally owned? Would your business relocate if it were more profitable to do so?
- (f) What are your businesses' goals for growth and development? How would these goals impact the local community?
- (g) What incentives would need to be offered in order for your business to contribute better to some of the less profitable CED objectives?
- (h) How does the local government assist your business in achieving these goals? What could be done better?
- (i) What does your business believe to be its most valuable contributions to the local community?
- (j) How does your business believe it could better contribute to the local community?

The case studies may also include close examinations of the businesses' financial statements to gather data on sales, purchasing, exports, wages, and distribution of profits to provide valuable quantitative measures of the businesses' contributions to CED. An I-F table of the individual business may be constructed to provide a detailed account of the linkages between the business and other industries and markets within the region. Access to financial statements would allow the researcher to complete an income-expenditure analysis of the business to better capture the actual impact of the selected business on the community, in terms of income re-circulation. Using this methodology would produce highly detailed snapshots of the industry's contributions to CED in Winnipeg. This would certainly be a valuable and interesting further study.

This analysis has really only scratched the surface, and leaves many questions for further research. The nature of the study did not allow for anything to be said about

causation. What is the causation between the industry's participation in contributing to the CED objectives and the economic success of the industry itself? Does one come at the expense of the other, or do the two go hand in hand? A second area of study that would be of interest to research is the application of the analytical framework on other Winnipeg industries, or on ICT industries in other Canadian cities. These similar analyses would be highly valuable to compare contributions to CED across industries.

Thirdly, it would be interesting to compare the contributions of the ICT industry in Winnipeg over time. Would the industry be made up of more large firms and fewer small firms after ten years of industry growth? Would the industry contribute more to building and maintaining a safe and healthy physical environment? As the industry grows, will the percentage of goods and services sold to markets outside of Winnipeg dramatically increase? Further testing of the CED hypothesis regarding the correlation, and even the causation between the type of business and its contributions to the objectives of CED would also be an interesting further study.

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Appendix A: A Review of Analytical Techniques

The nature and scope of regional economic changes resulting from both public and private sector investment initiatives have long been of interest to regional planners, various levels of government bodies, private business, communities, and individuals in communities. What is the impact on a region from an investment increase within a particular industry? Which industries in the region are more likely to benefit from changes in final demand? Answering these types of questions inspired the creation of the tools of regional economic analysis. The three main analytical tools—economic base multipliers, income-expenditure, and input-output analysis—will be reviewed here. The primary purpose of this appendix is to review these three analytical tools, discuss their advantages and limitations, and briefly introduce one important modification to input-output analysis. This literature review of analytical tools for regional analysis serves as the foundation from which the relevant tools may be extracted for analysis of the contributions of a particular industry to its local regional economy.

Economic Base Model

The underlying foundation of the economic base model is that exports are the only component of gross regional product that is significant for analysis of regional economic growth. Using this conceptual framework, the economy is divided into two sectors: the basic sector (which is essentially the export sector) and the services, or non-basic sector (the non-export sector). This can be represented mathematically as

$$Y_T = Y_B + Y_S$$

where Y_T is the total level of economic activity in the region, Y_B is the level of regional economic activity in the basic sector, and Y_S is the level of regional economic activity in the services sector.

All economic activities whose ultimate market lies outside of the region are included within the base sector, and all activities for local consumption fall within the services sector. The base sector includes direct export sales, as well as indirect export sales. If firm A sells its entire output locally to firm B who exports its entire production outside the region, then firm A is indirectly part of the base sector because its 'ultimate market' is outside the region. Thus, ultimate markets are used to distinguish between basic and non-basic sectors.

Since the basic sector is the primary engine of growth in a region, multipliers are constructed to capture the effects on the services sector given a change in the basic sector. The value of multiplier k is written as:

$$k = \frac{Y_T}{Y_B};$$

where k is the proportion of total economic activity in the region, Y_T , to economic activity in the basic sector of the region, Y_B . In order to derive the constant proportional multiplier, it must be assumed that the marginal propensity to consume is equal to the average propensity to consume (Nourse, 1968: 161). This assumption implies that the proportion of service activity to basic activity remains constant, and does not change with different levels of total regional income, over the period of analysis (Nourse, 1968: 161 and Davis, 1990: 10).

The economic base multiplier captures both the direct effect (employment in the basic sector) and the indirect effect (employment in the service sector) given an external change in the demand for basic sector goods and services. By construction, an increase

in basic employment must produce an increase in service sector employment in proportion to hold the basic: non-basic ratio constant. If this ratio is, say, 2:1 then, if two additional persons are hired in the basic sector, one additional person must be hired in the services sector (Hewings, 1977: 19). Employment is the choice unit of measurement for regional analyses. Employment is often the focus of public policy, and the concept of a job is easily understood. Data on employment are also more readily available than other possible units of measurements, such as income or value added (Davis, 1990:14). The effects of labour productivity and how employment is defined may affect analyses using employment as the unit of measurement (Davis, 1990:14).

The multiplier is able to capture the respending process that occurs as the result of export expansion within the region. For example, an increase in the demand for furniture by a wholesaler outside of the region will increase not only the wage bill of the local furniture manufacturer (the direct effect), but all the local firms which supply it (the lumber mill and the chemical plant) (Davis, 1990: 9-10). A portion of these wages will be spent on locally supplied goods and services, which will in turn increase the incomes of the suppliers of these local commodities, who will in turn spend a portion of their incomes on other locally supplied goods and services (ibid., 10-11). And so on. The presence of leakages (taxes, savings, non-local expenditures), however, will eventually drive the process of re-spending to an end. The more leakages in the economy, the smaller the economic base multiplier is, and the smaller is the impact of export expansion on the total activity in the region.

Advantages of the model. Economic base multipliers are simple indicators of the region's proportion of economic activity in the basic sector. The simplicity of the model in dividing the regional economy into two sectors (basic and non-basic) requires

significantly less data than some of the other analytical tools that are used in more detailed analyses of regional economies (Kenny, 1981, 103-4). Economic base multipliers are also easy to calculate and thus the costs to calculating them are low (ibid., 104). The simplicity of economic base multipliers allows for researchers to easily calculate the proportion of economic activity in the export sector. Economic base multipliers are useful little tools to provide simple indicators of the region's export activity.

Limitations of the model. As a tool for regional development analysis and policy-making the economic base model is not without its limitations. It unrealistically assumes that the export sector is homogenous and so the model will have difficulty where diversities among export sectors exist (Davis, 1990: 11-12). H. O. Nourse (1968: 162) argues that the economic base multiplier is only useful for short-run analysis of the impact of the base sector, since in the long-run the variables held constant in the model may change—the parameter, k , in particular. It is assumed that the marginal propensity to spend is equal to the average propensity to spend, but the marginal propensity to spend locally tends to increase as the region's population and income increases. The economic base model is not usable as a tool for multi-regional analyses because the model implicitly assumes that the marginal propensities to import are identical across all other regions (Richardson, 1969, 251). The single region model also neglects the full account of interregional feedback effects due to trade linkages across regions (Richardson, 1969, 252 and Davis, 1990, 12). Perhaps the most obvious debilitating assumption is that of assuming the export sector is the only engine of economic growth in a region.

There are also numerous practical difficulties with the use of economic base model. The most obvious measures of economic activity are income, physical production, sales, or value added. However, regional data for income and production sales of particular sectors are not always available; and employment data are often used as substitute measures (Davis, 1990: 14). Employment is thought to be a good proxy for economic activity in a region, but it also has its disadvantages: ambiguity in the definition of what constitutes a job; and difficulty in dealing with changes in productivity, property income, or differences in wages across and within sectors (Davis, 1990: 14; Nourse, 1968: 162). Further, because the economy is presumed to be initially at rest (Davis, 1990: 13), the economic base model is a comparative static model limited to simply predicting the end result, but not how or when this end will be worked out. Finally, the data used to construct the multipliers are often survey data that suffers from respondents' possible confusion between intermediate purchasers and ultimate markets, which may skew responses, or the interpretation of responses.

Income-Expenditure Analysis

Of primary interest in the Keynesian multiplier model or income-expenditure (I-E) model is the tracking of the social surplus. How much social surplus is produced? And how is it distributed? In particular, we are interested in the size and distribution of the social surplus to analyze the impact specific firms, or industries have on the regions in which they are located. The size of the social surplus may be calculated either by using conventional economic data to compute value added less the wage bill or by summing the specific components of surplus value recorded on a conventional accounting sheet (Gunn and Gunn, 1991: 23). Investigating the distribution of the surplus is a little more

complicated. Does the surplus stay within the region, or does it leave? A firm may accumulate much social surplus, but if it leaves the region it will have little impact on the other firms and individuals in the region. The class distribution of the surplus within the community is also of concern. Who benefits from the increased social surplus in the region? What proportion of the surplus is spent, saved, or invested locally? The I-E model attempts to answer these questions (Gunn and Gunn, 1991, 23).

Gunn and Gunn (1991) trace the social surplus of a hypothetical McDonald's restaurant using estimates based on national data and other knowledge of the particular franchise in order to evaluate the impact of its investment on a region. They estimate the social surplus produced by McDonald's by adding the components of the social surplus: total cost of sales, advertising, utilities, rent, property and other taxes, property insurance, interest payments, and profits (*ibid.*, 28-34). The distribution of the social surplus is divided between the proportion that stays within the region and the proportion that leaks out of the region. The distribution of the social surplus among four classes (capitalist, petty bourgeoisie, professional managerial, and the working class) is also included in the table to estimate the distributional impact of a McDonald's franchise (*ibid.*, 35-36). Gunn and Gunn's simple estimates of the leakages of a specific firm may be easily modified to estimate the leakages of an aggregation of firms, or particular industries in a region.

The I-E approach is more commonly described in terms of a small regional system, rather than an analysis of a specific firm. However, the I-E model may be easily modified to analyze the impacts of a particular firm or group of firms. The model may be formally set up using Keynesian notation for an open regional economy with a government such that local income Y is defined as:

$$Y = C + I + G + X - M .$$

Income after taxes, known as disposable income Y_d is defined as:

$$Y_d = Y - tY .$$

Consumption C and imports M are linear functions of disposable income such that:

$$C = c_0 + c_1 Y_d ;$$

$$M = m_0 + m_1 Y_d .$$

Substituting the above identities into the first equation for Y and rearranging yields the regional income multiplier k

$$k = \frac{1}{1 - (1 - t)(c_1 - m_1)}$$

The multiplier is inversely dependent on the leakages in the economy, namely the tax rate t , the marginal propensity to import m_1 , and the marginal propensity to save $(1 - c_1)$ (Davis, 1990: 32).

Advantages of the model. Unlike the economic base model, the I-E model is not constricted to one primary engine of growth, and thus the impact of the expansion in any final demand sector may be analyzed (Davis, 1990: 40). Fiscal operations of local governments may be explicitly treated within the I-E model to undertake impact studies of changes in government spending or taxation (ibid., 41). The model is also able to accommodate differing consumption patterns across individuals in the region which improves the accuracy of the estimates (ibid., 40-41). Another advantage of I-E is that its elaborate detail of the economic structure itself provides a more valuable description of the economy than does the economic base model (ibid., 41).

Limitations of the model. The model assumes that the tax rate, and the marginal propensities to import and consume are constant over the period of analysis, but

evidence would suggest that these coefficients are dependent on the level of income. The coefficients are also assumed to be constant across rounds of expenditures, which implies that the marginal propensity to consume is universal among residents. It is also assumed that there are no capacity constraints on the producing sectors, but this highly simplifies the more general reality of unemployment in most regions. The model also assumes that inter-regional feedback is negligible. I-E also requires significant amounts of sensitive financial records from firms, and thus the data requirements for making this tool operational is very high.

Input-Output Analysis

The development of the Input-Output (I-O) model is usually attributed to Wassily Leontief (Davis, 1990: 53 and Gunn and Gunn, 1991: 45). This static model may be used to describe and analyze the interdependence of economic systems as "large as an entire nation or even the entire world economic system, or as small as the economy of a metropolitan area or even a single enterprise" (Leontief, 1986: 19). Because the model essentially captures the still life macro picture in terms of the economy's micro linkages, it may be considered as a general equilibrium approach to economics (Davis, 1990: 53; Gunn and Gunn, 1991: 45). Because of its versatility in level of detail or aggregation, it has become a popular tool for both national and regional economic analysis. The number of sectors into which the economy is divided depends on the particular economic system, the purpose of the analysis, and the type of data available (or the amount of funding available to gather data).

Table A.1 shows an I-O table of an open three sector economy: an agricultural sector, a manufacturing sector, and a services sector. Household consumption C ,

investments I , government purchases G , and exports X are components of final demand. The sales and purchasing flows within the interindustry matrix (which excludes the final demand sectors) are known as the intermediate sales (or intermediate demand) since the sold products undergo further processing within the region (Davis, 1990: 55; Hewings, 1977: 41).

Table A.1 Open Economy Industry Transactions Table (\$ million)

					Final Demand				
<i>into</i>					C	I	G	X	Total
<i>from</i>	Agriculture	Manufacturing	Services						
Agriculture	10	5	5		10	5	10	25	70
Manufacturing	20	30	25		5	5	5	10	100
Services	5	10	10		35	5	10	5	80
Imports	5	15	5						
Value Added	30	40	35						
Total	70	100	80						

Source: Davis (1993: 54).

Reading across say, the third row, \$5 million services are sold as intermediate inputs to agriculture, \$10 million services are used by manufacturing, and another \$10 million are used within the services sector for further production of services. Further along the row the allocation of the sale of services to the four final demand sectors is shown. Down the columns of the endogenous industry sectors, we can read the allocation of purchases of each sector from the three local sectors. Down the column of, say, manufacturing, we read that the manufacturing sector requires an additional \$15 million worth of imports and \$40 million of value added to produce \$100 million worth of manufactured goods in the given period. Each sector in the interindustry matrix is both a

buyer and a seller. Summing across each of the three sector rows yields total sales, and summing down each industry sector column yields total costs plus profits. Profits are included as a component of value added, along with wages and salaries to labour and returns to investments (Davis, 1990: 55). The double-entry bookkeeping system reveals the fabric of the economy that is woven together by the flow of trade among all sectors (Leontief, 1986: 22).

The model is also able to predict the effects of changes in final demand for the output of any sector. To show the process of the feedback effects throughout the economy given a change in final demand, a second table model must be constructed. This table of direct input coefficients, or what Leontief (1986) named the structural matrix, is constructed using the data from the transactions table. The technical coefficients are derived by dividing the intermediate sector entries of each column in the transactions matrix by the corresponding total input figure of that column (Miernyk and Sears, 1974: 12; Davis, 1990: 56; Hewings, 1977: 38). "The quantity of the output of sector i absorbed by sector j per unit of its total output j is described by the symbol a_{ij} and is called the *input coefficient* of product of sector i into sector j " (Leontief, 1986, 22), such that:

$$a_{ij} = \frac{x_{ij}}{x_j} .$$

Using the data from Table A.1, the coefficients down the services column, for example, are calculated as $5/80 = 0.0625$, $25/80 = 0.3125$, and $10/80 = 0.125$. The coefficients represent the proportion of direct purchases by each of the row sectors for producing one dollar of output of the column sector (MacMillan, 1975: 62). All the resulting coefficients derived from Table A.1 are entered into the table of direct input coefficients, as shown in Table A.2 below.

Table A.2 Direct Input Coefficients (per dollar of total output)

	Agriculture	Manufacturing	Services
Agriculture	.14	.05	.06
Manufacture	.29	.30	.31
Services	.07	.10	.12

Source: Davis (1990: 57).

The summation of the coefficients down any given column in Table A.2 may be thought of as a 'recipe' to yield one dollar of output for that particular column sector (Davis, 1990: 57 and Leontief, 1986: 30). Reading down the second column, we read that in order to yield one dollar of manufacturing output, \$0.05 agricultural products, \$0.30 manufactured goods, and \$0.10 services are purchased by the manufacturing sector as intermediate purchases. An increase in the demand for, say, manufactured goods will require proportional increases in the purchases of inputs from the three input sectors to increase the manufacturing output. Assume that the demand for manufactured products doubled from \$1 million to \$2 million worth of goods. Before the increase in demand, the manufacturing sector was purchasing $\$1 \text{ million} * 0.05 = \$50,000$ from the agriculture sector. After the increase in demand, the manufacturing sector will increase its purchases from agriculture to $0.05 * \$2 \text{ million} = \$100,000$. This is known as the direct effect of changes in final demand.

But the effect of the manufacturing sector demanding more inputs from the three sectors is essentially an increase in demand for each of these sectors simultaneously. Thus, continuing with the example above, the agriculture sector will in turn demand more inputs from the manufacturing sector to meet the increased demand of the manufacturing sector. This will in turn increase purchases from the input sectors to meet these secondary purchases. The I-O model is able to trace out these rounds of

indirect effects through the iterative process. As the rounds of spending are traced further back, the effects become weaker because of the leakages in the economy. The process to compute the total effects (direct plus indirect effects) of changes in final demand is easily completed by a computer-generated matrix inversion technique (Davis, 1990: 58).¹⁹

The induced effects of an increase in final demand may also be calculated within the I-O model. Induced effects are those effects due to the increased demand for labour, as well as other capital goods, given expansion in an industry to meet the increased final demand for its output. Increasing the wage bill in the region increases personal income in the region which induces consumer demand in the region to increase. The secondary round of spending would further induce an increase in consumer demand, as it too is characterized by a mix of increased capital and labour. Thus the region expands to an even greater extent due to induced effects of increases in consumer demand triggered by the industry's expansion. The induced requirement coefficient is calculated by closing the input-output transactions table with respect to households (i.e. making the household sector endogenous as both a row and a column) (Kenny, 1981: 45-46; Davis, 1990: 59-61). Induced effects of government expenditures may also be included using the same methodology (Gunn and Gunn, 1991: 49).

Advantages of the model. Because the model is capable of capturing the complex linkages of an entire nation, it can be used as a descriptive device of national income accounting for a wide range of economic structures and sizes. The relationship between the level of industry output and the amount of inputs into the production of that output

¹⁹ For the algebraic derivation of the total effects coefficients see Leontief (1985: 23-27).

is captured in I-O analysis. Sales to a particular industry depend on the level of output of the industry in question, such that all the entries in the matrix are dependent upon each other (Leontief, 1986: 11). The primary improvement of the I-O model over the economic base model is its ability to deal with sources of growth and decline other than solely exports (Davis, 1991: 63). The I-O model also benefits from a greater level of detail than either the economic base or the I-E model.

Limitations of the model. I-O analysis suffers from many of the same limiting static assumptions as the other regional models reviewed previously. Although I-O distinguishes between producing sectors and exogenous final demand sectors, I-O analysis also assumes sector homogeneity (Davis, 1990: 66). It also assumes linearity in the production function and thus cannot incorporate diseconomies of scale (Kenny, 1981: 51 and Davis, 1990: 66). Because the model is assumed to be in stationary equilibrium, the requirement coefficients may be limited in their predictive capability if the region under analysis is not initially stationary (Kenny, 1981: 52-53). The absence of resource constraints in the model further limits its applicability to resource-constrained economies (Davis, 1990: 63). It also assumes constant input-output ratios, such that multipliers are not impacted by technological improvements, changes in the level of imports, changes in the classification of data or the structure of the coefficient matrix, changes in relative prices, changes in the population level (Davis, 1990: 63, 65; Kenny, 1981: 54-55). Practically, if the model is constructed using a top-down approach—that is, modifying national I-O coefficients to construct regional ones—the analysis may suffer from problems of “regionalization” of the coefficients” (Davis, 1990: 64). If the model is constructed using a bottom-up approach—that is, using survey data—the analysis may suffer from measurement error (Davis, 1990: 64).

A modification of I-O: Intersectoral Flows Analysis

Although the I-O model is a substantial theoretical improvement over the economic base and the I-E models for most purposes, "the real difficulty lies in translating either approach into an operational one so that meaningful estimates of these interrelationships can be generated at a reasonable cost" (Hansen and Tiebout, 1963: 409). Both sales and purchase data are required for a true I-O analysis. However, most regional studies are data-limited and seek to reduce the amount of data required to complete impact studies. The intersectoral flows (I-F) model is a useful modification to the I-O model which reduces the data requirement by using sales data only.

In 1961, Hansen, Robson and Tiebout developed the I-F, or 'rows' only model as an alternative approach to regional analysis. The primary objective in designing the model was that the necessary data to make it operational could be obtained at a reasonable cost (Miernyk, 1965: 73). Mail-out surveys to a sample of firms of the manufacturing industry were used to gather data on the allocation of sales to its own industry, other industries, specified domestic final demand sectors (households, investment, and local government), and exports (classified by regions of destination) (Nourse, 1968: 163). Firms were not required to provide data on inputs or employment. The rationale behind using allocation of sales data, rather than purchasing data, is that firms are more familiar with the destinations of their products, than they are with the origins of their production inputs, since bundles of inputs are often highly varied and complex (Richardson, 1972: 132; Hansen and Tiebout, 1963: 411). The sales data are then arranged in the form of an I-O table, implicitly assuming that the columns are representative of inputs. This is known as the rows-only technique since the matrix is completed by filling in sales or 'rows' data only (Miernyk, 1965: 74; Clapp, 1977: 81).

The I-F model may also be constructed using employment as the base unit of measurement.

Advantage of the modification. Because this model requires significantly less data to construct the interindustry table, it is inexpensive and simply operated. This is its most obvious advantage. This short-cut approach to I-O analysis is certainly more preferred to estimating regional coefficients based on national input coefficients (Miernyk, 1965: 75).

Limitations of the modification. I-F analysis is a simplified version of I-O analysis, and thus cannot provide as much information as the more complex I-O model (Richardson, 1972: 133). The double-accounting characteristic of the I-O analysis is lost in the rows-only simplification, and consequently I-F analysis may suffer from less accuracy. Sales data are limited in their capability to distinguish between inventory and capital accumulation, which may skew estimates of interindustry flows that are calculated using sales data (Clapp, 1977: 86). These limitations of I-F analysis may, however, be partially corrected for by augmenting rows-only data with secondary data to provide benchmarks, consistency checks, and estimates of leakages (Clapp, 1977: 85-87).

Summary

The analytical tools available for regional economic analysis are widely criticized. All three models suffer from some of the same limiting assumptions—namely linearity in the production function, stationarity of the region, sector homogeneity, absence of resource constraints, and constant coefficients. In particular, the complex structure of regional

economies is not captured in the economic base model due primarily to its reliance on exports as the primary engine of growth. Essentially the lack of detail in the economic base model severely hinders its ability to accommodate for import leakages, and consequently lowers its accuracy even as a simple tool for short-run analysis. Economic base multipliers are however, useful to use as starting points to analyze the extent of the export sector in a region. The I-E model is capable of tracing the social surplus through the various parts of the economy. Consequently it is able to evaluate the impacts of changes in any final demand sector, not just exports.

The descriptive elaboration of the economic structure of the region in the I-O model uniquely allows the underlying transactions of the economy to be traced. It is certainly a theoretical improvement over the first two analytical techniques. However, the main limitation, and it is a debilitating one, is the extensive data required to complete the I-O table. The most popular remedy for the large data requirements of I-O analysis is the utilization of rows-only data for I-F analysis. The trade-off of higher levels of sophistication and accuracy data is at the expense of higher data costs.

Appendix B: A Copy of the Questionnaire

A Survey of Information Technology Industries in Winnipeg within a Community Economic Development Perspective

Your completion of this survey indicates your consent to participate in this study.

The contact information in section A will be used by the researcher for classification purposes only, and will not in any way be disseminated along with your responses to the following questions.

A. Contact Information

- Name of Business:

.....

- Name of respondent completing survey:

.....

- Title (position) of respondent:

.....

- Address and Postal Code of Business:

.....

- Website:

.....

- E-mail:

.....

- Phone:

.....

- Fax:

.....

B. Ownership and Decision Making

1. In what year was the business established?

.....

2. In what year did the current ownership take over (if applicable)?

.....

3. What is the business structure? [Select one only]

- Sole proprietorship
- Partnership
- Corporation (owned by investors)
- Worker cooperative

Consumer cooperative

Other (please specify)

4. Is the business part of a franchise?

yes

no

If yes, in what city is the franchise based?

.....

5. How many entities (or individuals) own the business?

If the business has more than one owner, skip to question 8

6. Does the owner reside within Winnipeg?

yes

no

7. Does the owner live in the local community (within a 5 kilometre radius of the business)?

yes

no

If the business has only one owner, and you answered questions 6 and 7, please skip to question 10.

8. How many of the owners reside within Winnipeg?

.....

9. How many of these owners live in the local community (within a 5 kilometre radius of the business)?

.....

10. Has the business ever taken steps to include the local community in decision making?

yes

no

If yes, please explain.

.....

.....

.....

If your business does not employ any persons, please skip to section C.

11. Do the employees share in the ownership of the business?

yes

no
 If yes, please explain: _____

12. Are employees formally involved in the decision making process regarding the management of the business?
 yes
 no
 If yes, please explain: _____

If your business is not a co-operative, please skip to section C.

13. As a co-operative, how does your business involve members in the decision making process about the business?

C. Purchasing and Type of Business

If the business has multiple outlets, only consider transactions by outlets located in Manitoba.

14. Aside from price and quality, what other criteria does your business use to select its suppliers? [Select all that apply]
 Manitoban-owned
 Canadian-owned
 Ecologically sensitive
 Co-operative business
 Employment policies
 Other (please specify) _____

15. What percentage of total adjusted gross revenue in 2003 was accrued from the sales of?
 a. IT Products _____ %
 b. IT Services _____ %
 c. Other Products and Services _____ %
 If you checked other, please specify: _____

Response choices in questions 16 and 17 are classified according to the North American Industry Classification System (NAICS).

Please ensure that for each question your responses sum to 100%

16. Please indicate the type(s) of manufactured IT goods your business produces, and allocate the percent distribution of each type as a component of total adjusted gross sales of IT goods (gross sales less sales tax) [Select all that apply]
 None [business is an IT service provider only]
 Commercial and Service Industry Machinery _____ %
 Computer and Peripheral Equipment _____ %
 Communications Equipment _____ %
 Audio and Video Equipment _____ %
 Semiconductor and Other Electronic Components _____ %
 Navigational, Measuring, Medical and Control Instruments _____ %
 Communication and Energy Wire and Cable _____ %
 Other (please specify): _____ %
 _____ %

17. Please indicate the type(s) of IT services your business provides, and allocate the percent distribution of each type as a component of total adjusted gross sales of IT services (gross sales less sales tax) [Select all that apply]
 None [business is an IT manufacturer only]
 Software Publishers _____ %
 Cable and Other Program Distribution _____ %
 Telecommunications _____ %
 Other Information Services _____ %
 Data Processing Services _____ %
 Computer Systems Design and Related Services _____ %
 Computer and Communications Equipment and Supplies Wholesaler-Distributors _____ %
 Office and Store Machinery and Equipment Wholesaler-Distributors _____ %
 Office Machinery and Equipment Rental and Leasing _____ %
 Other (please specify): _____ %
 _____ %

D. Distribution of Sales

For the following questions, please ensure that for each question your responses sum to 100%.

If the business has multiple outlets, only consider transactions by outlets located in Manitoba.

18. What was the total adjusted gross revenue (gross sales less sales tax) of the business in the 2003 calendar year? \$

19. In the last year, what percentage of total business revenue accrued from customers in the following regions?

- | | | |
|--|-------|---|
| <input type="checkbox"/> Winnipeg | ..... | % |
| <input type="checkbox"/> Manitoba (excluding Winnipeg) | ..... | % |
| <input type="checkbox"/> Other Canadian provinces | ..... | % |
| <input type="checkbox"/> United States | ..... | % |
| <input type="checkbox"/> Other Countries | ..... | % |

If the entry for 'Other Countries' is non-zero please specify the names of the countries to which your business exports:

.....

20. Allocate the percent distribution of total adjusted gross sales (for 2003) between the following two groups of customers:

- | | | |
|--|-------|---|
| (a) those located within Winnipeg and surrounding area (including sales to the municipal and provincial governments) | ..... | % |
| (b) those located outside of the Winnipeg area (including sales to the federal government) | ..... | % |

21. Take a typical dollar of sales estimated in 20(a) (within the Winnipeg area plus provincial and municipal governments), how would you distribute this dollar of sales among the following groups?

- | | | |
|--|-------|---|
| (a) sales directly to local consumers (i.e. individuals living in Winnipeg) for their own personal use | ..... | % |
| (b) sales to the municipal and provincial governments | ..... | % |
| (c) sales to business establishments in the Winnipeg area (including self-employed persons' purchases for business purposes) | ..... | % |

22. Take a typical dollar of sales estimated in 21(c) (to local business establishments), how would

you distribute this typical dollar of sales among the following industries?

- | | | |
|--|-------|---|
| (a) information technology manufacturing | ..... | % |
| (b) information technology services | ..... | % |
| (c) all other local businesses | ..... | % |

Response choices in questions 23 and 24 are classified according to the North American Industry Classification System (NAICS).

23. Take a typical dollar of sales estimated in 22(a) (to information technology manufacturing), how would you distribute this typical dollar of sales among the following sub-industries?

- | | | |
|--|-------|---|
| (a) Commercial and Service Industry Machinery | ..... | % |
| (b) Computer and Peripheral Equipment | ..... | % |
| (c) Communications Equipment | ..... | % |
| (d) Audio and Video Equipment | ..... | % |
| (e) Semiconductor and Other Electronic Components | ..... | % |
| (f) Navigational, Measuring, Medical and Control Instruments | ..... | % |
| (g) Communication and Energy Wire and Cable | ..... | % |

24. Take a typical dollar of sales estimated in 22(b) (to information technology services), how would you distribute this typical dollar of sales among the following sub-industries?

- | | | |
|--|-------|---|
| (a) Software Publishers | ..... | % |
| (b) Cable and Other Program Distribution | ..... | % |
| (c) Telecommunications | ..... | % |
| (d) Other Information Services | ..... | % |
| (e) Data Processing Services | ..... | % |
| (f) Computer Systems Design and Related Services | ..... | % |
| (g) Computer and Communications Equipment and Supplies Wholesaler-Distributors | ..... | % |
| (h) Office and Store Machinery and Equipment Wholesaler-Distributors | ..... | % |
| (i) Office Machinery and Equipment Rental and Leasing | ..... | % |

E. Employment

For this section, please consider only employed persons. Exclude independent contractors.

If the business has multiple outlets, only consider employment by business outlets in Manitoba.

25 Does your business have any employees?

yes

no

If your business does not employ any persons, skip to section F.

26. How many employees are employed full-time (30 or more hours per week)? _____

27. How many employees are employed part-time (10 to 30 hours per week)? _____

28. How many employees are employed casually (less than 10 hours per week)? _____

29. How many employees are in management positions? _____

30. What percentage of employees are:

Women and/or _____ %

Aboriginal and/or _____ %

Immigrant and/or _____ %

Disabled persons and/or _____ %

Visible minorities _____ %

31. What percentage of management positions are held by:

Women and/or _____ %

Aboriginal and/or _____ %

Immigrant and/or _____ %

Disabled persons and/or _____ %

Visible minorities _____ %

32. What is the average length of time current employees have been employed by your business? (An estimate is acceptable)
_____ months

33. Did your business participate in any youth employment programs in the past year?

yes

no

If yes, please explain: _____

34. What benefits does your business offer its employees, apart from those required by labour laws? [Select all that apply]

Higher than average wages

Flex time

Parental Leave (maternity leave)

Child Care

Training/Educational opportunities

Job Sharing

Other (please specify) _____

35. What is the percent distribution of your employees' education level? [Please ensure responses sum to 100%]

Less than Grade 12 _____ %

High School Diploma _____ %

Some Community College or University _____ %

Community College Certificate/Diploma _____ %

University Undergraduate Degree _____ %

University Graduate Degree _____ %

36. What percentage of employee hiring/recruiting originates in the following locations?

[Please ensure responses sum to 100%]

Winnipeg _____ %

Manitoba (excluding Winnipeg) _____ %

Other Canadian provinces _____ %

Other Countries _____ %

If the entry for 'Other Countries' is non-zero please specify the countries from which your business recruits employees: _____

37. What percentage of employees received their education from either a community college or university in Manitoba? (An estimate is acceptable)

_____ %

Don't know

38. What is the average annual salary of your full-time employees? [Select one only]

Up to \$19,999

\$20,000 - \$29,999

\$30,000 - \$44,999

\$45,000 - \$59,999

\$60,000 - \$74,999

\$75,000 - \$99,999

\$100,000 or more

- 39. What percentage of your employees currently reside within the local community (within a 5 km radius from the business)?
 - _____%
 - Don't know
- 40. Does your business have a formal training program for new employees?
 - yes
 - no

F. Investments

- 41. Within the past five years, in which of the following categories has your business made an internal capital investment of \$1000 or more? [Select all that apply]
 - Purchase of equipment
 - Building renovations
 - Furniture/Fixtures
 - Company vehicles
 - Other (please specify): _____
- 42. Does the business have a policy on reinvesting profits in the local community?
 - yes
 - no

If yes, please describe the policy, or if you have a written policy, please attach a copy: _____
- 43. Aside from purchasing, has your business been involved in any of the following activities to support local community businesses? [Select all that apply]
 - Member of the Community Development Business Association
 - Mentoring other businesses
 - Other (please specify): _____
- 44. Has your business been involved in any of the following activities to promote community development? [Select all that apply]
 - Participation in community events
 - Work placement programs
 - Grants or donations to community groups
 - Neighbourhood clean-up
 - Neighbourhood safety programs
 - Sitting on community boards
 - Other (please specify): _____

- 45. Has your business formally adopted any policy regarding ethical business conduct?
 - yes
 - no

If yes, please describe the policy (or attach a copy), indicate when the policy was adopted, and explain why the business decided to adopt the policy:

Thank you for participating in this survey.

If you wish to receive a copy of the results, please check here:

Please return completed survey in the enclosed postage paid pre-addressed envelope.