

The Pennsylvania State University
The Graduate School
College of Information Sciences and Technology

**AN INVESTIGATION OF CONTEXTUAL FACTORS INFLUENCING THE
DEVELOPMENT OF A SUSTAINABLE KNOWLEDGE ECONOMY**

A Thesis in
Information Sciences and Technology

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of
Doctor of Philosophy

August 2007

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ABSTRACT

In the current world economy, the most technologically advanced economies are knowledge-based. These countries have utilized knowledge as a crucial factor in production. Information and knowledge are directly productive forces in the knowledge economy, and information becomes the critical raw material of processes and organizations. As governments initiate efforts to develop knowledge production processes in a knowledge economy, the means to develop a sustainable knowledge economy becomes relevant.

Three broad veins categorize existing research on the knowledge economy at the macro level. The first looks at theoretical conceptualizations of a secondary information sector that leverages output from the primary information sector for production. The second focuses on specific industries. The third uses innovation as a proxy to study the knowledge economy empirically.

The concept of knowledge work is abstract. However, using innovation as a proxy for the knowledge economy, knowledge work can be defined as work involving creation from internalized information. Sustaining innovation then, is partially based on the concept of continuous learning. Therefore, a sustainable knowledge economy can be empirically studied by its base for continuous learning. Using these concepts, this research has two guiding research questions, (1) What contextual factors facilitate continuous learning for a sustainable knowledge economy? and (2) How do these contextual factors affect the sustainability of a knowledge economy?

In this research, three interpretive case studies were executed to study empirically the contextual factors that implicate continuous learning in three regions – San Joaquin

Valley, in California, U.S.A., Ennis, in Ireland, and Singapore. These interpretive case studies utilize the Influence-Impact Model from Trauth's work (2000) on the information economy in Ireland. The model stresses the important roles played by four contextual factors in the development of an information economy – infrastructure, public policy, economy, and culture. This research employs a theoretical elaboration of this Model to study the development of a sustainable knowledge economy in three regions.

In these case studies, three data collection methods – in-depth interviews, document reviews, and participant observation, were triangulated. The results were comprised of 12 common themes across these three regions. These themes were further abstracted for discussion under the four contextual factors to show their inter-relations with one another. In the discussion, three broad implications involving knowledge work, structure of the economy, and social challenges, constitute layers upon which future researchers can build on for different perspectives and empirical investigations.

In conclusion, this study makes three theoretical contributions. First, it shows the validity of applying the Influence-Impact Model to study the knowledge economy and varied economic contexts. Second, it shows the inter-relations among the four factors of the Influence-Impact Model, thus, justifying an integrated approach in studying the sustainable knowledge economy. Finally, in using this model, this study developed an in-depth understanding of the knowledge economy that captures the abstract and dynamic characteristics of knowledge work. This level of understanding forms an impetus for further empirical approaches to study a knowledge economy. In addition, the findings constitute a guiding framework for policymakers to focus their investigations on various local conditions to develop locally sensitive policies.

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Acknowledgements

I would like to thank Dr. Eileen Trauth for her guidance as my dissertation advisor in helping me complete this dissertation. I am especially grateful to her patience in teaching me how to conduct research as an aspiring scholar as well as how to write in an effective and understandable manner. Her teachings will always be a foundation for my future undertakings.

I also wish to extend my gratitude to my committee members Dr. Steven Sawyer, Dr. Andrea Tapia, and Dr. Christopher Benner, who have been very kind and supportive of my undertakings. They have also provided me with tremendous inputs and suggestions to improve my work.

In addition, I am very grateful to my friends, Todd Kruszka and Sangeetha Malayandi, who proofread my dissertation before I made my final submission. They helped me give this dissertation the final touches it needed to be made public.

Finally, and most importantly, I wish to thank my parents Mr. Soon Seng Yeo and Ms. Christina Foo, for bringing me up with proper values and teaching what it means to live. They have always supported me in whatever I do, and have never failed to encourage me when things went wrong. Without them, I would not be what I am today. They will always be with me in everything that will come my way.

CHAPTER 1. INTRODUCTION

Enhanced capital, labor and technical progress are principle sources of economic growth. Among these, the rate of growth of physical and human capital as well as technical progress have been proven to account significantly for economic growth (Solow, 1957; Kendrick, 1961; Kendrick, 1973; Denison, 1979; Denison, 1985; Jorgenson & Griliches, 1967). In the current world economy, the most technologically advanced economies are knowledge-based countries in the frontline – In these countries, knowledge has become the most crucial factor, among land, tools, and labor, in determining the standard of living (Washington: World Bank, 99) Knowledge is an entity which has a similar status as capital and labor, but differs in essence.

Upon discovery and if made public, knowledge reproduction and distribution incur zero marginal cost. Also, the producers of knowledge experience difficulty in preventing others from having access to it. At the societal level¹, knowledge producers require instruments such as trade secrets protection and patents, copyright, and trademarks to ensure that knowledge is not entirely a public good, thus protecting the interests of the producers (Ministry of Economic Development, 1999).

In this new economy, the demand for knowledge goods, their monetary value, and the salaries of knowledge workers reflect the societal value placed upon knowledge (Drucker, 1993). Income disparities, among others, are increasingly wrought by gaps pertaining to knowledge and innovation capabilities (Rincon & Kadi, 2004).

¹ For purposes of this dissertation, I will refer to the societal level as the macro level and the individual level as the micro level

Accordingly, economic activities in the knowledge economy involve the application of knowledge in the production process. Information technology supports the production and dissemination of both information and knowledge. Hence, knowledge can be based on information technology (IT), which supports the production process. However, there is also non-technology-based knowledge which is indirectly related to information technology. This is discussed in Chapter Two, under Definitions and Operationalizations. The dominant economic activities involve the application of knowledge in the production process.

Taken together, information and knowledge are direct productive forces in an economy. Information becomes one of the critical raw materials of processes and organizations. Economic activities in the knowledge economy are, therefore, supported by sophisticated business networks because of their dependency on information and knowledge. These networks support the transmission of information and knowledge. Business activities are built on a foundation of an electronic networked economy and characterized by flexible business practices, scalability, customization, and innovation (Castells, 2001).

In the context of economies based on high-tech industries, Porat's (1977) definition of the information economy makes a distinction between the information and knowledge economies. The former is called the primary information sector that involves information goods and services that are produced, processed, and distributed. An example is the hardware industry that produces hardware components. The latter is called the secondary sector by which the produced, processed, and distributed information services are consumed to produce value-added products and services. An example is the

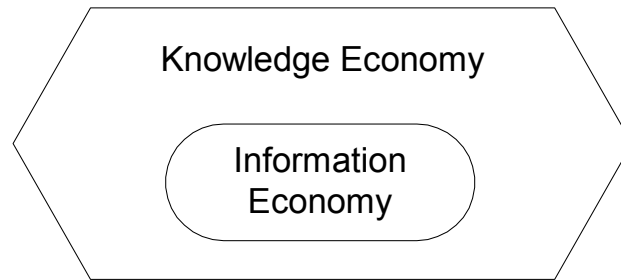
healthcare industry that utilizes the hardware components to develop efficient medical care facilities and services.

The knowledge economy² represents an important economic shift as the dynamics of production change. Just as information plays an important role in the basis of economic well-being and source of employment (Trauth, 2000), knowledge plays a similarly important role in the knowledge economy. Trauth's work (2000) on the information economy in Ireland stresses the important roles played by contextual factors in the development of the information economy. Her interdisciplinary work utilizes theories from various disciplines to show that the influence of four factors – infrastructure, public policy, economy, and culture. The generation of these factors was based on detailed sub-factors discovered through empirical enquiry. Together, these four factors constituted her Influence-Impact Model of the information economy. This model shows in detail the contextual influences and impacts of the information economy in Ireland. It can be applied to other study sites through a generalization from theory to empirical settings (Lee & Baskerville, 2003).

Following the preceding discussion, a graphical rendition of the knowledge economy is given in the following diagram. Similar to Trauth's (2000) work on the information economy, it is useful to apply a similarly rigorous approach to study the contextual development of the knowledge economy through an intensive account of contextual factors, as with the information economy. As governments initiate efforts to develop knowledge production processes, the development of a sustainable knowledge economy becomes a relevant topic.

² For purposes of my dissertation, I shall use the terms “knowledge economy” and “knowledge-based economy” inter-changeably

Figure 1: Graphical Illustration of the Knowledge Economy



This question is applicable to regions that are actively developing a knowledge economy as well as those that are attempting to sustain their knowledge economies. This lays the foundation for my research motivation. Given the relevance of contextual factors in economic development, this research involves a study of contextual factors that are relevant to the development of a sustainable knowledge economy. This aim of this research is to investigate the influence of contextual conditions on the sustainable knowledge economy through an in-depth examination of overarching contextual themes developed from empirical fieldwork.

One way to understand the sustainability of a knowledge economy is to understand the social context, within which the knowledge economy functions. Among many approaches to study an economy, this way involves an in-depth consideration of the dialectical relationships with its environment. Since an economy is dependent on its actors, who in turn interact with and within social institutions, a study of its social context can provide answers to questions about economic sustainability.

In order to develop overarching themes in my dissertation, I applied Trauth's (2000) research method and Influence-Impact Model from her work on the information economy to three study sites at different stages of knowledge economy development. Thus, I am extending her work to the realm of the sustainable knowledge economy. In so doing, this research represents three theoretical contributions – (1) It extends her theory of the information economy to the sustainable knowledge economy in three different regions, (2) It demonstrates the integration within her Model and how the Model can be applied to study other regions, and (3) It provides a way to study the knowledge economy, while capturing the dynamism and abstract quality of knowledge work. In addition, this study makes a policy contribution by suggesting areas in which policymaking can investigate to develop locally fitting policy frameworks.

Organization of Dissertation

This dissertation is divided into six chapters. In this current chapter, the topic was introduced. It explains the relevance of the research problem by discussing the economic shift from the industrial economy to the knowledge economy. The economic shift from the industrial to the post-industrial economy constitutes a relevance of my research to investigate the influence of contextual conditions on the sustainable knowledge economy.

Chapter Two includes a literature review of the knowledge economy to understand the realm of existing research to explain the knowledge economy. There are six sections within this chapter. The first defines the knowledge economy by categorizing the literature into three main veins, and thereafter defines knowledge, knowledge work, and the knowledge economy for this research. The economic shift to the knowledge economy is also mapped to classical and neo-classical economic grand theories that

attempt to explain the transition. Here, the limitations of classical economics in explaining the knowledge economy are reviewed. The second section reviews the literature on sustainability and how it can be applied to study the sustainability of the knowledge economy. The third section reviews the literature on innovation to establish the groundwork for this research, thus explaining how the knowledge economy can be studied empirically through continuous learning. The fourth section discusses the social conceptualization of an economy to establish its social nature. This section also includes a discussion of how a knowledge economy can be studied through an investigation of social factors given its social nature. The fifth section involves a conceptualization of the research problem. The gaps in the literature are discussed to set the stage for the study. The sixth, and final section of Chapter Two, advances two research questions which are used to guide the empirical investigation.

Chapter Three presents the research methodology. Here, the research method of an interpretative case study is discussed. The rationale for this method is also explained in detail. Following this, data collection procedures that were executed, types of data collected and data analysis methods are explained and discussed.

Chapter Four is a discussion of empirical research findings. Here, the raw findings are generalized into 12 overarching themes across the three case study sites. These themes are discussed in terms of their relevance to the development of a sustainable knowledge economy and their respective manifestations in each of the three study sites.

In Chapter Five, the 12 themes are generalized to the theoretical level. They are coded into the four factors of Trauth's (2000) Influence-Impact Model – infrastructure, public policy, economy, and culture. Their theoretical relevance and implications were

discussed using existing literature. Furthermore, three layers of implications – knowledge work, structural challenges, and social challenges are introduced as a conclusion to the chapter to further highlight the integration of these four factors.

In Chapter Six, the concluding chapter, I discuss the three theoretical contributions and contributions to policymaking from this research. I also acknowledge the strengths and limitations, and suggest further research. As a concluding section, I discuss how the research fits the discipline of Information Sciences and Technology.

CHAPTER 2. LITERATURE REVIEW

Defining the Knowledge Economy

Existing Conceptualizations of the Knowledge Economy

The knowledge economy is the problem domain of this research. Trauth (2000, p.5), in her study of the information economy in Ireland, distinguished between the primary and secondary information sectors. Her distinction was based on Porat's (1977) analysis of the American information economy. Her summary of Porat (1977) categorized the information economy into the primary sector – as the producer of “information processing and communication hardware, the software, and services which make it work, and the content” and the secondary as “organizations which process information in the course of accomplishing some other mission such as provision of health care or transportation” (Trauth, 2000, p.5). In the information society then, this primary sector contributes significantly to the Gross Domestic Product (GDP) of the respective region (Porat, 1976).

In this dissertation, I refer to the knowledge economy as what Porat defined as the secondary information sector. Following this definition, the information economy resides within the knowledge economy by providing the necessary technological foundations through the primary information sector to support it. Therefore, literature on both the information and knowledge economies were reviewed.

Bell (1973) defines the knowledge society as a post-industrial society. In a knowledge society, “the sources of innovation are increasingly derivative from research

and development” and “the weight of the society – larger share of employment – is increasingly in the knowledge field” (Bell, 1973, pp. 212). Just as the information economy is the engine for the information society (Trauth, 2000, pp.43-47), the knowledge economy is the engine for the knowledge society. Hence, as explained in Chapter One, the terms “knowledge economy” and “knowledge society” are used interchangeably for the purposes of this research.

Social scientists are careful about using the term knowledge economy because of the wide variations of the concept (Brint, 2001). It is therefore necessary to review existing definitions of knowledge to guide empirical enquiry on the knowledge economy. Knowledge is defined as “a set of organized statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form” (Bell, 1973, p. 175). In this regard, knowledge differs from information because it is value-added information. It can also be transmitted through communication channels but there is a tradeoff between the quantity and quality, termed reach and richness respectively (Evans & Wurster, 2000), or velocity and viscosity (Davenport T. & Prusak L., 1998). These are discussed later in the section under Definitions and Operationalizations. Thus, information forms a fundamental basis for knowledge.

The basic conditions for the knowledge economy are the availability and viability of information systems, innovation systems, institutional regime, and human resources (United Nations Economic Commission for Europe, 2002). The knowledge economy is situated in a competitive global arena, characterized by knowledge diffusion, closely related to the development of information and communication technologies, emphasizes

education and knowledge work, and focuses on knowledge creation and innovation (Drucker, 2004; Godin, 2003; Godin, 2003).

Among more recent conceptualizations, knowledge economies refer to economies whereby the production, dissemination, and application of knowledge are based on the utilization of information technology (IT). This constitutes a significant part of the economy. Value is placed upon the demand for and price of knowledge goods (Drucker, 1993). In its economic structure, there is a gradual shift away from an economy driven by material inputs to an economy in which productive and distributive processes are increasingly oriented around knowledge-based inputs (Stehr, 2002).

The scope of the literature on the knowledge economy can be broadly placed into three categories (Powell & Snellman, 2004) (Brint, 2001). The first focuses on the development of science-based industries and how they facilitate social and economic change. Machlup (1962) used information-centered industries as the central theme of his work. In this approach, researchers studied the role of knowledge as a factor in facilitating production (Basalla, 1988; Lane, 1966; Machlup, 1962; Porat, 1977; Gotzfried, 2004). In a macro sense, these changed modes of production then, lead to social and economic changes, thus giving rise to the knowledge economy. Bell (1973) analyzed the significance of knowledge as a source of innovation (Bell, 1973). As discussed earlier, neo-classical economics and new growth theory can be categorized under this umbrella because both focus on the impact of knowledge as an endogenous factor of production (Romer, 1990; Romer, 1986).

Studies in this vein are theoretical and are useful in providing a theoretical framework for understanding. However, they tend to take a broad definition of the

knowledge economy. Science-based industries include the publishing industry for instance, which is not entirely a knowledge-based industry (Powell & Snellman, 2004). Porat (1977) challenged Machlup's assessment and recommended a value-added approach with primary and secondary sectors (Powell & Snellman, 2004). As explained earlier, the former refers to firms within the information economy, which produce goods and services consumed by firms and the government in the latter. Porat's (1977) distinction then suggests a boundary between the information (primary sector) and the knowledge (secondary sector) economies. However, for purposes of my research, this does not shed light on the means to measure the knowledge economy for analysis.

Research in the second approach resides within the realm of urban economics (Brint, 2001). These studies are similar to those in the first category. They are built on theoretical studies in the first category to focus on specific industries and to draw implications on their degrees of knowledge intensity. They involve the application of theoretical concepts from the first approach to practical implications. Necessarily, these focused industries are related to information technology. Research in this vein focuses on industries that make particular use of scientific and professional knowledge (Brint, 2001). Studies related to the semi-conductor industry, as well as analyses to anticipate and create new market opportunities, develop products ahead of the competition, and to reconfigure production processes rapidly in response to changing production requirements, determine the sustainability of these firms and industries (Angel, 1994).

Although the concept of knowledge is more clearly defined in this approach, the forms of knowledge which deserve emphasis are, however, not agreed upon in the literature (Brint, 2001). One area of emphasis is on the highly trained managers,

engineers, and planners who manage large corporations (Galbraith, 1967). Another area focuses on high technology industries (Benner, 2002) and services such as health, education and government (Bell, 1973). Finally, there is an area of focus on services like finance and accounting (Stanback, 1979). These variations suggest a wide range of conceptualizations of the knowledge economy. Therefore, one major challenge to developing a theory of the knowledge economy is to give considerations to all these emphases, so as to be applicable to various industries that reside in the secondary sector (i.e. the knowledge economy).

The third approach in the knowledge economy focuses on the role of learning and continuous innovation. This is a narrower definition that focuses on the less tangible aspects of human capital such as learning and adaptability (Drucker, 1993; Drucker, 2004). This is a relatively infrequent approach taken by scholars in the field; however there are trends towards this new approach in the scholarly domain of the knowledge economy (Powell & Snellman, 2004). Researchers taking this approach study the social conditions that facilitate or impede knowledge creation and transference (Cowan, David, & Foray, 2000), and, thus, imply the development of the knowledge economy. According to this approach, the knowledge economy operates globally (Godin, 2003). It is characterized by knowledge diffusion, closely related to the development of information and communication technologies, emphasizes education and knowledge work, and focuses on knowledge creation and innovation (Godin, 2003). This approach is premised on the argument that methods for learning and competence building in education and training institutions are primary factors for the knowledge economy (Archibugi & Bengt-Ake, 2001).

Framing the knowledge Economy

Innovation is a concept that deserves special attention in the knowledge economy. It is emphasized directly and indirectly in all three approaches to the knowledge economy, and especially in the third approach which involves the idea of continuous learning. The application of information in science-based industries marks the transition from information to knowledge. The focus on knowledge intensity of specific industries indirectly implies the necessity of innovation to be knowledge-intensive. Since knowledge-intensive firms are more comprehensive and organized in their approach to adapt systematically to new technological applications (Gates, 1995), the ability to innovate constantly becomes a crucial factor to conceptualize the knowledge economy. As Smith (2000) argues, market failure is the result of learning failures. Baark (2005) emphasizes the importance of innovation and its application to market development as well as a study of the knowledge economy. Since market development is dependent on innovation, continuous innovation will lead to a continuous cycle of knowledge creation in a knowledge economy. However, it follows that this cycle is dependent on the ability to obtain new knowledge continuously, as knowledge is cumulative. This continuous learning process becomes a key to the sustainability of a knowledge economy.

The first two approaches to the study of a knowledge economy focus on its development, while the third places considerable focus on how the knowledge economy is sustained. The third approach enables researchers to frame empirical enquiries by focusing on indicators of the knowledge economy in order to study its complex problem domain. Hence, for purposes of this research, the third approach was taken. However, it is important to also consider the development of the knowledge economy through

existing research that took the first two approaches: Studies that have taken the first approach lay the theoretical groundwork while those taking the second approach apply these theoretical concepts to show real-world implications. Research in the third approach has a heavier emphasis on the knowledge economy as a continuously evolving entity rather than a fixed economic configuration. The overall research goal of this dissertation is aimed at theorizing the sustainability of the knowledge economy. Therefore, this research not only acknowledges, but also goes beyond the significance of knowledge as an important factor for economic growth, as well as the knowledge intensity of specific industries. The key focus, therefore, is on how businesses are applying knowledge through knowledge-intensive practices premised on information technology. It is also worthwhile to study how businesses support their operations using knowledge, and how social and economic conditions are facilitating or impeding economic sustainability in the process. Here, the factors for continuous innovation are identified.

To define the knowledge economy, the first step is to identify what knowledge work is and therefore what industries are knowledge-intensive. In any economy, every worker has practical knowledge that is economically valuable. This is correlated with the amount of experience the worker accumulates during the course of his/her work. As such, in any occupation, some workers may perform better than others (Brint, 2001). Following this argument, there is little difference between a professional manager who understands the business needs of the enterprise and a delivery driver who knows the shortcuts. Hence, the distinction between the primary and secondary sectors (Porat, 1977) becomes significant: By effectively applying the output of the primary sector, the secondary sectors become knowledge-intensive. However, the payroll assistant who uses

information and technology, as well as practical experience, is not clearly distinct from the chief technology officer (CTO) of a major corporation, who also uses information and technology to manage IT specialists and information systems for enterprise-wide decision-making. Therefore, it is necessary to take a step further to define knowledge work.

According to Brint (2001), knowledge industries have three characteristics. First, they are characterized by the speed of change. Decision-making is highly dependent on fast-moving events, such as technology change. Second, the environment (or market) is not stable and hence not predictable. Third, the primary service output is not commercialized as a commodity (Brint, 2001). An example of knowledge work then, is the use of both information through technology and information through practical experience for financial consultation – termed reach and richness respectively by Evans and Wurster (Evans & Wurster, 2000). These activities are then termed as knowledge-intensive activities. For purposes of this dissertation, the term “knowledge work” is used for convenience. In addition, the term “knowledge input” refers to the technology-induced information and professional experience required for knowledge work.

From the discussion, we can observe that the knowledge economy is characterized by production and services based on knowledge work (Powell & Snellman, 2004). It refers to economies whereby the production, dissemination, and application of knowledge are based on the utilization of information technology (IT) and this constitutes a significant part of the economy. Value is placed upon the demand for and price of knowledge goods (Drucker 1993). In its economic structure, there is a gradual shift away

from an economy driven by material inputs to an economy in which productive and distributive processes are increasingly oriented around knowledge inputs (Stehr, 2002).

As stated earlier, the fundamental conditions for the knowledge economy are based on the availability and viability of information systems, innovation systems, institutional regimes, and human resources (United Nations Economic Commission for Europe, 2002). To reiterate, the knowledge economy is situated in a competitive global arena, characterized by knowledge diffusion, closely related to the development of information and communication technologies, emphasizes education and knowledge work, and also includes a focus on knowledge creation and innovation (Drucker, 2004; Godin, 2003).

Given the relevance of knowledge as a factor of production in the knowledge economy, the next issue is the means to assessing levels of knowledge for analytical purposes. Measuring knowledge as an economic resource is fundamentally challenging (Brint, 2001). On a straightforward note, the knowledge economy can be measured by the concentration of knowledge industries (industries using knowledge inputs for knowledge work). However, given that the knowledge economy is not a fixed economic configuration and is, instead, an evolving entity, constant innovation is a key characteristic. Thus the ability to learn and adapt to changes becomes a key criterion for economic viability. Economic activities in the knowledge economy are supported by sophisticated and efficient business networks. Business activities are premised on the electronically networked economy and characterized by flexible business practices, scalability, customization, and innovation, grounded on a flexible networked economy (Castells, 2001).

Education, and hence learning, is a factor that contributes to economic growth. Countries with highly educated workers are those with high incomes (International Labour Organization, 2002). One dimension of this concept can be seen as the ability of the knowledge workers, who use information, technology and professional experience, to learn and to adapt. Another dimension of flexibility is attitudes towards learning. The ability to learn and to acquire new knowledge becomes important for knowledge to be developed continuously in a cumulative fashion. Hence, innovation and continuous learning become legitimate proxies to the knowledge economy.

Just as the information economy plays an important role in the basis of economic well-being and source of employment (Trauth, 2000, pp.43-47), the knowledge economy plays a similarly important role. It could potentially contribute to an accelerated pace of economic development because of continuous innovation and effective adaptation to on-going changes. The demand for knowledge goods, their monetary value, and the salaries of knowledge workers reflect the societal value placed upon knowledge (Drucker, 1993). At the same time, income disparities are increasingly wrought by gaps pertaining to knowledge and innovation capabilities (Rincon & Kadi, 2004). Governments and international economic organizations are implementing development initiatives to manage this shift (Aubert & Reiffers, 2003).

Definitions and Operationalizations

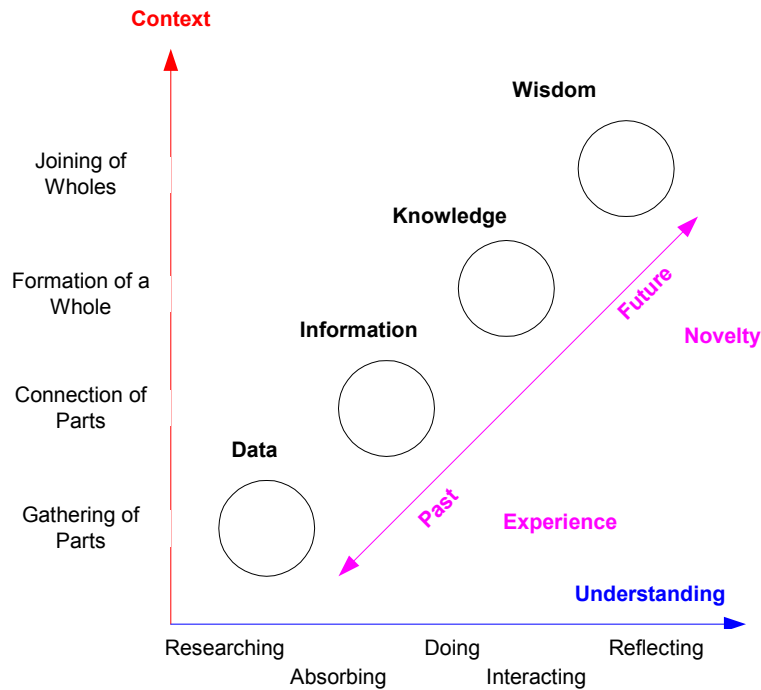
Using innovation as an indicator for the knowledge economy, continuous learning can be an indicator for the sustainable knowledge economy for empirical research, because continuous learning is a basis for innovation. This indicator explains that knowledge work, as a key activity of the knowledge economy, is based on utilizing

knowledge for creation. As explained in Porat's (1977) distinction between the primary and secondary information sectors, the secondary sector as the knowledge sector comprises industries that leverage the output from the primary information sector. However, in the modern economy, all industries in the secondary sector utilize information technologies to different extents – the healthcare and transportation industries were given as examples of the secondary sector by Porat (1977) that utilize information technologies. Similarly, the agriculture industry can also utilize information technologies. Therefore, it is important to define knowledge. To do so, relatively micro level literature was reviewed.

The information hierarchy of data-information-knowledge-wisdom explains the distinctions among the four entities. These are defined as know-nothing, know-what, know-how, and know-why respectively. For purposes of this dissertation, I focus only on data, information, and knowledge. Data are neutral entities that do not provide value. However, upon processing, they can become information, which tells the recipient what an entity is. Further processing moves information up the hierarchy to know-how, whereby the user knows how to apply information to solve a problem (Zeleny, 1987).

In this hierarchy then, the key distinction among data, information, and knowledge is the level of understanding. These entities fall along a continuum rather than distinct boundaries, and is therefore also termed as the *continuum of understanding* (Cleveland, 1982). The following diagram illustrates the information hierarchy or the continuum of understanding hierarchy. The context axis shows the level of connectedness of each of the four entities. The horizontal axis shows the level of understanding, and hence, reflects the value associated with each entity.

Figure 2: Information Hierarchy



Broadly, knowledge can be seen as what an individual knows, and information is what a collective of individual knows (Foskett, 1982). Knowledge is value-added information because it is internalized from information using mental faculties. It is therefore, based on different types of information – facts, concepts, processes, procedures, and principles (Clark & Chopeta, 2004). Facts are defined as specific instances. Concepts are groups of entities that share common characteristics. Processes are activities that describe how things work. Procedures detail steps to perform a task. Principles are guidelines. These five different types of information are termed as artifacts (Clark & Chopeta, 2004).

These artifacts form the basis for declarative knowledge, which is defined as propositions and schemata that enable an individual to represent objects based on their relationships to one another. Declarative knowledge then forms the foundation for

procedural knowledge, which is knowledge to perform tasks to achieve a goal (Clark & Chopeta, 2004).

Knowledge is therefore more contextual than information, and it is harder to disseminate. It requires a context because it includes declarative relationships and procedural activities. However, knowledge can also be conceptualized as tacit and explicit: Explicit knowledge is knowledge that can be articulated and transmitted. The modes of transmission can be formal language statements, mathematical expressions, specifications, or manuals. Tacit knowledge on the other hand, includes the technical dimension (expertise) and cognitive dimension (mental models). Tacit knowledge cannot be easily transmitted through formal language without losing some of its value (Polyani, 1967). There are four modes of knowledge creation and conversion between explicit and tacit knowledge (Nonaka & Takeuchi, 1995). These processes are summarized in the table below.

Table 1: Tacit and Explicit Knowledge

	To Tacit Knowledge	To Explicit Knowledge
From Tacit Knowledge	Socialization	Externalization
From Explicit knowledge	Internalization	Combination

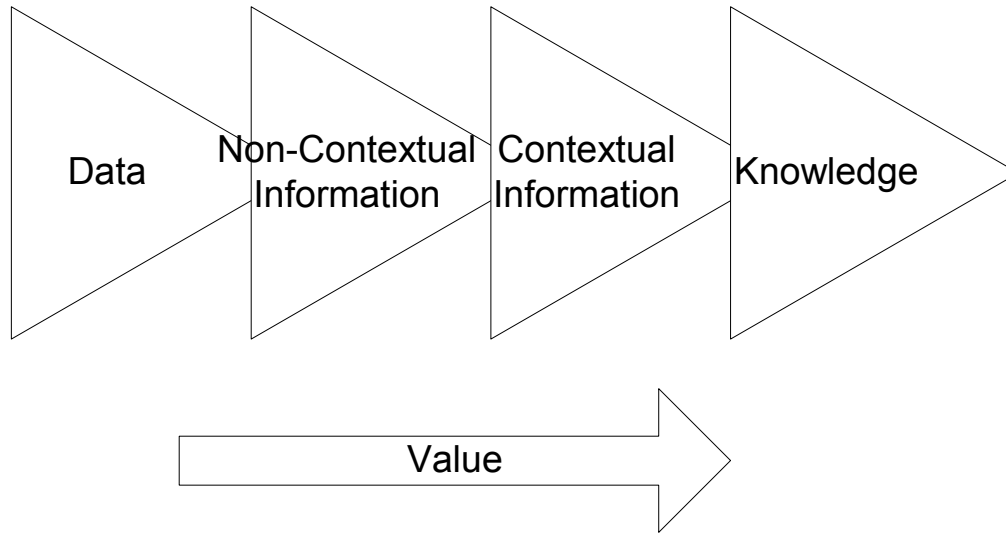
Socialization transforms tacit knowledge to other tacit knowledge. It involves the sharing of experiences to create tacit knowledge. An apprenticeship is an example of a socialization process. Internalization transforms explicit knowledge to tacit knowledge. It comprises the addition of a layer of understanding from explicit knowledge. Thus, it forms tacit knowledge. Externalization transforms tacit knowledge to explicit knowledge.

It involves the expression of tacit knowledge through formalized language. This transforms tacit knowledge to explicit knowledge, and thus loses some of its value. Combination processes involve systematic communication, such as a formal training program to transform explicit knowledge to other explicit knowledge.

Although Nonaka and Takeuchi (1995) used the term explicit knowledge, it can be termed as information, according to the information hierarchy. Explicit knowledge, or information, can be readily transmitted, processed by information technologies. However, in the continuum of the information hierarchy, additional value to information transforms it to knowledge. Hence, information along this continuum can be seen as non-contextual and contextual information.

According to Davenport and Prusak (1998), velocity refers to the speed at which information and knowledge are transferred within an organization (Davenport & Prusak, 1998). Viscosity refers to the richness of that information or knowledge transferred. In the transmission of information or knowledge, viscosity is traded off for velocity, and vice versa. Applying this to the notion of contextual and non-contextual information then, contextual information has more value, or viscosity, than non-contextual information. It is therefore, harder to transmit than non-contextual information. The information hierarchy can be re-conceptualized as in the following diagram.

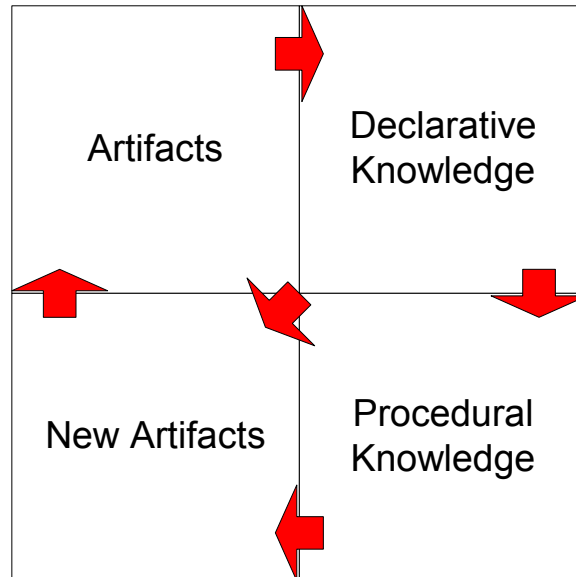
Figure 3: Newly Conceptualized Information Hierarchy



The knowledge economy is a dynamic entity. It comprises knowledge work, which can be operationalized as creation based on knowledge. Therefore, the use of innovation as a proxy for the knowledge economy is reasonable. Along the information hierarchy, knowledge is internalized and developed, which in turn, is used to create.

The following diagram illustrates the creation process in knowledge work (Clark & Chopeta, 2004). From artifacts, declarative knowledge is created, which in turn, creates procedural knowledge. Based on both types of knowledge, new artifacts are created, which in turn, become artifacts for new knowledge. This process highlights the dynamism of knowledge work – what is a creation today is no longer a creation tomorrow because it is no longer new. However, it can be codified and transmitted, thus losing its viscosity, to others who internalize it and create new knowledge.

Figure 4: The Knowledge Creation Process



This conceptualization of knowledge work can occur at both the macro and micro levels – the idea of research and development at the macro level is similar in principle to apprenticeship at the micro level because they both involve creation based on knowledge. Using this definition then, knowledge work can be defined without static representations in specific industries and can be seen as dynamic, as in the knowledge economy.

Theorizing the Economic Shift to the Knowledge Economy

Advanced industrial nations in the 1970s experienced a fundamental economic change from one based on manufacturing to one that is service-oriented and driven. Since this transition, the new economy has been termed as the post-industrial economy (Powell & Snellman, 2004; Bell, 1973; Block, 1990). Underlying this economic change is the increased industrial dependency on information and knowledge for production, which represents an even more important facet of this transition. As Powell and Snellman (2004) argue, websites like Amazon.com that engage in electronic commerce include value-

added services on their websites that monitor tastes to make recommendations to consumers (Powell & Snellman, 2004). These services are provided through the use of highly sophisticated information technologies and, more importantly, application of the knowledge of the business to customer relationship management.

As stated in Chapter One, in the current world economy, the most technologically advanced economies are knowledge-based countries with an evolutionary economic orientation: In these countries, knowledge has become the most crucial factor, among land, tools, and labor, in determining the standard of living (Washington: World Bank, 1999). To reiterate, knowledge is an entity that has a similar status as capital and labor but differs in essence. Upon discovery and if made public, knowledge reproduction and distribution can potentially incur zero marginal cost. Also, the producers of knowledge experience difficulty in preventing others from having access to it. Consequently, knowledge producers require instruments such as trade secrets protection and patents, copyright, and trademarks to ensure that knowledge is not entirely a public good, thus protecting the interests of the producers (Ministry of Economic Development, 1999).

In this new economy, classical economics becomes much less applicable (Free World Academy, 2005). According to classical economic models, labor and capital, as factors of production determine economic growth. Pertaining to labor, an individual consumes to produce an equal amount of food in any given period. This implies that exploitation of labor is the key to progress – by lowering the amount of food consumed yet maintaining the output. Capital, in the form of tools and machines, have upper limits of output in any given period. In addition, tools and machines require labor to be produced, as well as production time. Taken together, economic growth comes to a

standstill when “the marginal value of goods produced equals the cost of labor and capital used to produce them” (Free World Academy, 2005). Therefore, a central argument in classical economics is the Law of Diminishing Returns, in which investments have diminishing returns over time (Ministry of Economic Development, 1999).

However, return on investments can be potentially increased with the introduction of information and communication technologies. This explains why “developed countries can sustain growth and why developing economies, even those with unlimited labor and ample capital, cannot attain growth” (Romer, 1990; Romer, 1986). (Castells, 2000) argued that:

“...a significant proportion of the mysterious productivity slowdowns result from a growing inadequacy of economic statistics to capture movements of the new informational economy, precisely because of the broad scope of its transformation under the impact of information technology and related organizational change.”

(Castells, 2000, p.89).

In neo-classical economics, labor and capital are still recognized as endogenous factors of production. However, knowledge, productivity, education, and intellectual capital, although significant factors, are conceptualized as exogenous factors that are not within the economic system (Ministry of Economic Development, 1999). In this case, labor is not merely physical labor, but rather the ideas that reside within human labor. As a more applicable theory, the New Growth Theory posits that increased investments in human capital, knowledge, and fixed capital play important endogenous roles in economic development (Hulten, 2000). In this theory, capital includes “investments in

knowledge, research and development of products, and human capital” (Economics at About.Com -- Your Portal to the World of Economics, 2005).

New Growth Theory resulted from scholarly efforts to address the causes of long-term growth, which traditional economic models could not explain (Ministry of Economic Development, 1999). In this theory, ideas and creativity are determinants of economic growth because they integrate concepts of labor and capital. As a result, ideas and creativity increase the output, and hence productivity, of goods produced through labor and capital. Creativity constitutes an artificial resource base and tends towards abundance because it benefits the law of increasing returns (Free World Academy, 2005). In this economy, the production and consumption of information goods and services are not as limited by labor and capital as in an industrial economy because of the possibility of replication (Mosco, 1989).

In this line of argument, increasing rather than diminishing returns on technological investments can be achieved with the introduction and integration of new technologies (Ministry of Economic Development, 1999). As such, economic growth is only limited by a lack of motivation to innovate (Free World Academy, 2005). Technology then, including its knowledge base, is an inherent component of an economic system. Knowledge therefore, ascends to become a third endogenous factor of production in the advanced economies of the world (Romer, 1990; Romer, 1986).

Economic Sustainability and the Knowledge Economy

Historically, sustainability is a concept that has been applied to understand and to assess environmental systems. Despite its primary use in natural science disciplines, it is also possible to apply the concept of sustainability to the economy (Beckley, 2000). It is

however important to distinguish between sustainability and productivity. Labor productivity can be defined as the output per unit worker in particular industries or the economy as a whole (Wong, Yeo, & DeVol, 2006). Labor productivity can be a proxy for general productivity because employment can be seen as a primary input in an economy. However, productivity alone does not imply sustainability. As the following paragraphs show in detail, sustainability in general involves non-declining assets while meeting future needs. An example is the introduction of machines to labor-intensive industries. It was shown empirically that while productivity increased as a result of machinery, unemployment increased (Menzies, 1996). In other words, the machines took over the work of workers, and more importantly, a single machine could replace several workers for mechanical work. In other words, while productivity increased, the increased unemployment could lead to lowered sustainability in view of potential social problems that may result. Hence, in this study, productivity was not used as a proxy for sustainability.

Similar to the knowledge economy, economic sustainability is another concept that is difficult to define. This uncertainty is possibly due to the wide range of economic, environmental, and social conditions in various local areas that result in enormous diversity of living conditions and environments. These conditions imply the need to account for multiple factors and address multiple levels of analyses to constitute a rigorous assessment. Therefore, applying a narrow definition may not capture this diversity (Bell & Morse, 1999). However, using a definition that accounts for this multitude of conditions may not be practically feasible.

According to the World Commission on Environment and Development (WCED) of UN cities, sustainable development refers to development that fulfils two criteria. First, it must meet present needs. Second, in so doing, it allows future generations to meet their needs without compromise (Bartelmus, 1994). In other words, present assets must not be traded off to meet the needs of the future. The end result must be positive in all regards. This definition appears to address the needs of our complex economic systems. However, following the definition closely, implementing this definition of sustainability to practical studies on public policy appears to be difficult to achieve (Beckley, 2000). It also makes it hard to ascertain and analyze. This is due to the necessity of considering all economic conditions in order to ascertain the degree of compromise.

For purposes of analyses and practical implementations, a common definition of sustainability is the non-declining well-being of a representative attribute in society (Pezzey, 1992). This can refer to employment, education or any economic statistic. Sustainability, that is the non-declining well-being of this same attribute, involves consistent or increased satisfaction or utility of goods and services over time (Adamowicz, 2001). With economic systems, the challenge is to measure well-being, analyze the distribution of well-being, and ensure that well-being is not declining.

This flexible definition may account for the multitude of economic conditions and yet allow feasibility for analysis and practical implementation. It allows the use of relevant indicators and thus enables researchers to monitor these indicators over time. However, the non-declining attribute is still not clearly specified. In addition, the difficulty of addressing the need to account for the multitude of economic conditions is still apparent. At this point, instead of strictly defining the boundaries of a working

definition of sustainability, I looked at the kinds of sustainability that were used for analysis.

There are two kinds of sustainability. Strong sustainability necessitates the maintenance of every type of capital. These types of capital can be natural, physical, social, or biological. The condition of sustainability requires that the levels of these capital types must be non-decreasing over time. Therefore there can be no substitution across capital types in the production process. In contrast, weak sustainability provides allowance for substitution and progress between these capital types, so long as the value of the overall wealth is maintained over time. Weak sustainability is thus more realistic to achieve (Bartelmus, 1994).

The definition of weak sustainability is also more appropriate for policy-making, because accounting for the sustainability of every possible capital type is nearly impossible. There must be tradeoffs between these various components in the economy (Acutt & Mason, 1998). This dissertation is aimed at making theoretical contributions to the literature on the knowledge economy. However the domain of application resides within economic policy. Since policies require considerations to be given to practical implementations, weak sustainability was adopted as the type of sustainability for purposes of this research.

There is an important facet of sustainability, which is the ability to manage the implications of technological advancement. In other words, the implications of the knowledge economy (including the information economy) have to be addressed in order for an economy to sustain its growth. Economic indicators are commonly used in economic research to measure sustainability. But economic indicators may not be very

useful because they do not go beyond description to explain and to account for the intangible economic asset of knowledge.

This dissertation is focused on the social context of economic development. Thus, it involves analyses of why factors are important, rather than presenting a broad view on a common measurement for significant factors. Given the impossibility of acknowledging the multitude of economic conditions for sustainability, relevant factors were discussed in detail, rather than identifying all possible factors as in an econometrics model. This qualitative approach is explained in Chapter Three on Research Methodology.

Since innovation is used as an indicator of knowledge, sustainability becomes the well-being of innovation. The aim of weak sustainability then, is to ensure the other aspects of well-being of the economy through constant innovation in economic production. To understand the development of a sustainable knowledge economy, the key is to situate the continuous learning within social contexts to understand how innovation can be grown and maintained, and thus sustain the overall wealth of the economy. This sustenance becomes the key to economic growth through knowledge-based production in the developing or developed knowledge economy.

The literature review so far has established the legitimacy of using innovation as a proxy to define the knowledge economy. It has also justified the approach to the study of the social context of innovation for economic sustainability, with respect to the knowledge economy. The next section turns to the concept of innovation with respect to economic sustainability.

Innovation and the Knowledge Economy

This section explains the significance of innovation in the knowledge economy. The objective here is to elaborate the justification of using innovation as a proxy for the knowledge economy. This is done because of the loose definitions of the knowledge economy and economic sustainability as argued in the previous two sections. In so doing, innovation was used to frame and to direct the empirical inquiry. It was also used as an anchor to understand and to analyze the primary and secondary data. These are explained in more detail in the following chapters on Research Methodology and Research Findings.

Following the literature on the knowledge economy, the concept of innovation as applied to a segment of the economy defines knowledge work. However, knowledge work can occur in all professions and all segments of the economy. At this point, it is important to acknowledge that the scope of the knowledge economy is not reduced to just professionals and high tech businesses. Within these limits, the following paragraphs review the literature on innovation and its significance in the sustainable knowledge economy.

As a primary source of wealth creation (Kim & Mauborgne, 1999), innovation can be defined as the creation and use of a revolutionary entity, procedure, or service (Ki, 2002). Among activities included in the definition of innovation are scientific, technical, and market research; product, process, or service development; and manufacturing and marketing in order to support diffusion and application of invention (Office of Technology Assessment, 1995).

The role of human capital has been acknowledged as an integral part of regional development and the geographic concentration of innovation (Ullman, 1958). Areas with

a high concentration of educated and technical workers are termed as high tech centers. These workers contribute ideas and are engaged in innovative activities. These centers, therefore, play a key role in processes related to production and diffusion of innovation (Ki, 2002).

According to the National Science Foundation (NSF) of America, innovation is measured by the employment of scientists, engineers and technicians, as well as research and development activities (NSF 1988). This definition allows researchers to have a clear understanding of the concept of innovation at the macro level, because it captures the concentration of activities closely related to creation. However, it does not explain the roots of innovation or the means by which innovation can be achieved, and especially sustainable innovation.

Rosegrant and Lampe (1992) noted that policies and governments play important roles that affect the contexts within which innovation occurs (Rosegrant & Lampe, 1992). The prominent discourses in this interplay of political institutions and knowledge involve university research contracts, laboratories, and various research and development contracts.

My review of the literature suggests that the quality of life has a strong relationship with the locations of high tech firms. This is important because high tech firms are a key source of innovation in the new economy today. As argued, businesses increasingly rely on information technologies for their sustained growth. This is based on innovative uses of information technology. Thus, the concentration of high tech firms becomes an indicator for innovative activities.

It must be noted that quality of life by itself, is not an independent factor that leads to the development of a high tech industry. However, it is one foundation upon which the high tech industry can be developed upon. Quality of life plays an important role in attracting and retaining the labor force for the high tech industry, and frequently supports high tech entrepreneurship and therefore innovation (Ki, 2002).

One may argue that such attractions are applicable across the board in all industries. However, relative to non-high tech workers, high tech workers exhibit a higher level of geographic mobility (Herzog, Schlottmann, & Johnson, 1986). Given their higher mobility, they have more choices regarding occupation selection. Thus they have more room to consider employment conditions beyond the job scope than non-high tech workers.

Gottlieb (1995) argued that these highly skilled workers prefer to work at locations with more amenities (Gottlieb, 1995). Therefore, they move towards these locations for jobs. These amenities are region specific. And they serve as important factors to attract and to retain highly skilled labor (Arora, Florida, Gates, & Kamlet, 2000). Using modeling techniques, Roback (1982) modeled the relationship between amenities and economic data to explain that regions with high amenities have high land costs and relatively lower wage rates. This means that firms demanding highly skilled labor (hence innovation) with limited geographical constraints such as firms in the high tech industry will tend to be located in regions that are rich in amenities.

Florida's (2002b) creative capital theory posits that metropolitan areas have the ability to offer work and lifestyle amenities for the labor force in the creative class. The creative class is defined as the class of people employed in science and engineering,

research and development, technology-based industries, arts, music, culture, design, or knowledge-oriented professions. Workers in these industries account for almost 50 percent of wage income earned in the U.S. and amount to approximately one third of the total labor force (Florida, 2002b). Florida (2002b) emphasizes the expansive role of culture, the limitless potential of humanity, and the importance of unleashing that potential to spur societal growth.

Using both business climate theories and quality of life theories, Florida (2002) demonstrated that economic development is substantially driven by the creative sector. In other words, innovative economic production is a driving factor for economic development. Indeed, U.S. regions with higher proportions of the creative sectors are growing faster than others with less proportions (Florida, 2002b).

To identify these regions, Florida (2002b) analyzed metropolitan regions using his Creative Capital Theory. According to his findings, metropolitan areas have abundant opportunities for the creative class of people for both work and lifestyle. This means that the amenities related to work and quality of life, which are tangentially related, constitute attractive options for these workers. As such, a wide range of economic production activities occur in metropolitan regions. Human creativity and technological innovation experience advantages in these metropolitan regions. The high concentration of these economic production activities leads to new production processes (Desrochers, 2001), thus yielding the innovation process. This process, when continued, then becomes a sustainable process, and thus constitutes the sustainable knowledge economy, where ideas and innovation are valued.

As such, economic activities churning intellectual innovation are highly concentrated in metropolitan regions (Audretsch & Feldman, 1996). Workers in these regions come from a wide variety of backgrounds. Firms and industries here are also broadly diverse (Quigley, 1998). This diversity fuels the innovation process and spin ideas into wealth (Jacobs, 1969). Again, the continued process becomes a sustainable one, and thus constitutes the knowledge economy. While new ideas are repeatedly developed through the economic production process in metropolitan regions (Jacobs, 1969), at the same time, the importance of human capital cannot be ignored, since ideas originate from people. Indeed, the implications of which are inherent to the creation of new ideas. These in turn facilitate and support economic growth (Lucas, 1988).

However, generating innovation and turning ideas into wealth is not an end in itself. Importantly, the sustainability of an economy depends on the continuous economic production process of turning ideas into wealth and not the state of creating wealth. Therefore, the role played by institutions and industries in metropolitan regions is not merely generating innovations through developing state of the art technologies. The key is to develop a continuous learning and innovative process – learning opportunities for actors in the economy (Glaeser, 1997).

According to Gault (2005), established indicators of knowledge creation, such as research and development activities and intellectual property commercialization, are static indicators that cannot capture the dynamism involved in the knowledge economy (Gault, 2005). As such, these measures may not be suitable in defining knowledge work explicitly for empirical research. Although they capture the concept of innovation, they

are restricted to the output of innovation or knowledge work, which is creation based on knowledge.

Hence, the importance of learning cannot be ignored. It forms the basis for innovation. Research and development activities (at the macro level) and individual apprenticeship (at the individual level) both involve learning and are aimed at innovation. Technological innovation creates benefits that reduce costs. A corresponding value innovation is essential to realize the potential of the technological innovation. It must be noted however, that both technological and value innovation are tightly inter-related. Value innovation involves leveraging technological innovation for economic benefits (Dillon, Lee, & Matheson, 2005). This continued process of value innovation based on continued learning then, becomes the key to sustainability.

Highly urbanized metropolitan regions³ provide a higher, and necessarily faster, rate of human interactions (Glaeser, 1997). This becomes crucial in my selection of research study sites, which I explain in my chapter on Research Methodology.

The advent of information technologies also fuels this process. These interactions create new opportunities for continuous learning. This key process becomes crucial to the long term sustainability of the knowledge economy (Glaeser, 1997). In addition, metropolitan regions are also inhabited with knowledge institutions such as tertiary educational institutions, public research institutes, as well as knowledge and technology transfer centers. In these institutions and centers, continuous effective learning, and hence innovation, are active (Ki, 2002).

³ Metropolitan regions may not necessarily be highly urbanized regions. Based on the metropolitan statistical regions (MSAs) as per defined by the Bureau of Labor Statistics in the U.S., every city belongs to a larger area of analysis called an MSA. These are termed as metro regions conventionally but are not necessarily urbanized regions.

This section provided an overview of the importance of innovation to the knowledge economy. To re-state, innovation can be legitimately used as a proxy to define the knowledge economy. With this concept of innovation in mind, the boundaries of this research within innovation enable an understanding of how innovation can be achieved and sustained. Thus, the preceding sections in this chapter point to an investigation of how innovation is fostered in order to understand how the knowledge economy can be developed and sustained.

The Social Knowledge Economy

Socio-Cultural Conceptualization of an Economy

Conventional economic models assume that modern markets are autonomous, self-sufficient institutions that are independent of cultural and social factors. These assumptions are objected to by sociologists with a fundamental view that the economy cannot be explained solely by rational choice (Zelizer, 1988; Lie, 1977). Following the sociological school of thought, there is yet another legitimate way to study an economy, including a knowledge economy. This study of the knowledge economy takes an approach that looks at the contextual conditions rather than independent endogenous factors as studied in economic modeling.

Researchers who take this social approach study the economy as it exists within social and cultural institutions (Swedberg, 2005). Research in this approach seeks to uncover the influence of culture, among other related factors such as social relations and political power, on the economy. Within the approach are two major approaches that are discussed in the paragraphs that follow.

The first is a structural or networks approach. Researchers taking this approach focus on the study of social relations among actors within an economy. The idea is that social relations among economic actors determine their economic action and thus implicate the shape of the economy they reside in. Although established as a legitimate approach, critiques of these studies have argued that they tend to be static and neglect the meaning as well as the larger political and institutional landscape (Smith-Doerr & Powell, 2005; Brint, 1992; Brint, 1992). It can be argued that economic action is more than the result of social relationships among actors.

According to Emibayer and Goodwin (1994), research taking the structuralist approach utilizes a broad strategy to investigate social structures. These studies are aimed at developing perspectives rather than predictions (Emibayer & Goodwin, 1994), and they do not employ statistical methods as well as distinctive laws. As a characteristic of this approach, the analysis of networks does not “explain human behavior or social processes solely in terms of the categorical attributes of the actors, whether individual or collective” (Emibayer & Goodwin, 1994). To explain various outcomes, researchers look at patterns of interpersonal connections. Hence, these studies identify relational structures as patterns of relations that connect actors, rather than categories of social structures such as socioeconomic status, gender, or race. In this approach, economic action is embedded in a network of social relations (Granovetter, 1985). Economic behavior is thus neither impersonal nor anonymous transactions, but rather, influenced by the pattern of social ties that connect economic actors – individuals, businesses, institutions or the government. Subsequently this idea of embeddedness was expanded to include various social contexts,

such as culture and more abstract and macro level institutions (Zukin & DiMaggio, 1990; Carruthers & Uzzi, 2000)

The second approach is a cultural approach. Research taking this approach examines the set of meanings associated with markets and how these meanings influence the exchange of goods and services in an economy (Zelizer, 1988; Swedberg, 1991; Swedberg, 1991). Studies in this vein are inclined to reduce markets in an economy to “a set of abstract meanings that excludes material, institutional and social reality of economic life” (Zelizer, 1988).

Studies in the culturalist approach examine historical and institutional constitutions of markets through the individuals’ actions and organizations within institutional environments. The underlying assumption is that institutional contexts constitute and constrain the interests and actions of economic actors. At the same time, their actions may also create, maintain, or change the institutions within their institutional contexts. For example, Abolafia (1996) investigated how individual behaviors were performed within the context of social relationships, cultural idioms, and also institutions these economic actors continuously create. As Abolafia (1996) argued, “economic actors, in the process of interaction, construct a world of norms, scripts, and strategies that shapes their future action” (Abolafia, 1996: 8).

Depending on the approach taken, studies have different goals. Those taking the structuralist approach seek to demonstrate the effects of patterns of social relationships on particular types of economic behavior or outcomes. In contrast, those taking the culturalist approach are predominantly interested in examining historical, institutional, interactional or political construction of specific markets so as to explain the

characteristics of specific economies. Since these two goals are different, the two approaches are thus incommensurable.

However, although these approaches deal with different research goals, they can be integrated to the study of a knowledge economy. A theoretical synthesis of both approaches involves effectively combining formal network concepts in the structuralist approach with thick descriptions and cultural meanings in the culturalist approach, so as to come up with relationships among various entities in a social context.

White's (1992) work incorporated theories of cultural symbols and discourses into his social theory to argue that social networks are also phenomenological realities. This can be exemplified by his argument that "(a) social network is a network of meanings" (White, 1992: 65-7). A fundamental problem in integrating both approaches involves an under-theorization of the market, which is the result of a conceptual dichotomy between markets and its society that social theorists of the economy do not transcend, despite arguments about the embedded nature of economies (Krippner, 2001). According to Krippner (2001), scholarly research that attempts to embed the social network approach are lacking in cultural content and meaning (Krippner, 2001). On the other hand, certain culturalist approaches examine the market solely as a set of meanings, for example, the symbolic meanings of consumer goods (Zelizer, 1988). Although such approaches examine markets, it can be argued that they sometimes examine only the peripheral meanings that are detached from activities that occur between sellers and buyers in actual markets.

According to Zukin and DiMaggio (1990), there are four types of embeddedness when considering economic action conceptualized within its social context. The first is

structural, which involves a study of the relational quality of network ties. The second is cognitive, which covers scripts and schemas that direct economic logic. The third is cultural, which includes shared beliefs and values that shape economic goals. Finally, political embeddedness covers institutional constraints that limit economic power and incentives (Zukin & DiMaggio, 1990).

Carruthers and Uzzi made a distinction between micro-embeddedness and macro-embeddedness (Carruthers & Uzzi, 2000). The former applies to the dialectics between social relationships and networks and the larger economy. The latter involves an investigation of large-scale social institutions such as organizations, state, law, gender relations etc, and how they influence and are influenced by economic action (Carruthers & Uzzi, 2000).

In view of this embeddedness, Krippner (2001) and Block (2003) argue that the economy is always social in view of its embedded markets. They oppose the idea of an economy that is independent of its social context. Instead, they suggest that rational behaviors have dialectical relationships with social institutions, as conventionally conceptualized by economists. Rational behaviors are thus not merely intrinsic propensities constrained by these institutions. Hence, it follows that the economy (including its social networks) and its social contexts (various cultural meanings involved in its economic makeup) become embedded within its social context.

While some themes are inherently social in nature, others may not be. For instance, the theme of human capital development can be studied in several ways. A labor studies researcher may look at employment numbers by high tech industry over time, and simulate the number of jobs created in each high tech industry with industrial changes,

using the Regional Input-Output Modeling (RIMS) modeling technique from the Bureau of Economic Analysis. The modeling technique enables researchers to calculate the multiplier effect of certain industries so as to stimulate the impact of certain industries on the regional economy.

For purposes of this research, human capital is interpreted with a social orientation – it focuses on the cultural factors that influence a region’s attempt to develop adequate human capital (or “talent” in Florida’s terms) for the sustainable knowledge economy. Also, this dissertation looks at the connections among different sectors and how they affect the labor force of the economy.

To re-iterate, this approach looks at the social relationships among its actors and the cultural factors that influence the development of innovation. This is not to say that the social interpretation replaces the other interpretations. It merely represents one legitimate approach to studying human capital development.

Socio-Cultural Conceptualization of a Knowledge Economy

The information society is conceptualized in various ways. It represents the third wave of societal transformation in which theories of economics change to include information products and services as commodities (Toffler, 1989). The transformation began in the 1970s, when companies could not maintain viability without communication technologies. Hence, this led to computerization and the demand for information services (Schiller, 1999).

Castells (2000) made an argument about the economic significance of information generation, processing, transmission and use in an economy based on knowledge (Castells, 2000). In his argument, he used the term informational society instead of

knowledge economy or society. The technology of knowledge generation, information processing, and symbol communication form the grounds of productivity in the information society (Castells, 1996). To Castells (1996), all the major trends of change constituting the new economy are related to technology as a fundamental basis of the economy. Departing from prior economic orientations, information and knowledge become endogenous productive factors where information, and also, knowledge, are the crucial raw materials supporting social processes and organizations (Castells, 1996).

As discussed earlier, this economy represents a transformation that departs from its preceding post-industrial society (Masuda, 2004) with a large emphasis on technology as its economic base. According to Dyson, Gilder, Keyworth and Toffler (Dyson, Gilder, Keyworth, & Toffler, 2004) the information society is de-massified with a high emphasis on personalization, which was brought about by modern technologies. Castells (2000) argued in his theory of the information society that there are two factors that led to de-massification:

(1) The restructuring of work creates individualized workers who demand individualized cultural products; and

(2) the revolution of information and communication technologies provide a wider range of choices to cultural consumers (Garnham, 2004). This stands in contrast to the standardization and mass production in the industrial era.

Despite the large emphasis placed on information and communication technologies, it has been argued that the information society represents an extension of established industrial relations rather than a new era by itself (Hamelink, 1986; Mosco, 1989; Lyon, 1988). However the economics of information and technologies do not

satisfy the assumptions of the Law of Diminishing Returns, as argued earlier, which brought the emergence and relevance of neo-classical economics. In addition, Castells' argument appears to retain the notion of human agency when he pointed out the importance of policy responses, social movements and cultural resistance (Garnham, 2004). In other words, it is more important to examine social relationships rather than technology per se in attempting to understand the information society (Robins & Webster, 2004).

According to the non-technology-deterministic position, technology is not the sole determinant of the information society. Rather, because people control technology, they form the basis of an information society (Winner, 2004).

“From the perspective of economic agents, productivity is not a goal in itself. Neither is investing in technology for the sake of technological innovation. Firms and nations are actual agents of economic growth. They do not seek technology for the sake of technology or productivity enhancement for the betterment of humankind. They behave in a given historical context, within the rules of an economic system (informational capitalism...), which will ultimately reward or penalize their conduct. Thus firms will be motivated not by productivity, but by profitability, and growth of value of their stocks, for which productivity and technology may be important means, but certainly not the only ones. And political institutions, being shaped by a broader set of values and interests, will be oriented, in the economic realm, towards maximizing the competitiveness

of their constituent economies. Profitability and competitiveness are the actual determinants of technological innovation and productivity growth"

(Castells, 2000, p.94)

These arguments suggest the significance of contextual factors in the functioning of an information society. Therefore, an investigation on the knowledge economy involves the players in the economy, rather than the information technologies per se. Before looking at the knowledge economy, it is useful to turn to the conceptualization of the information economy, which is embedded within the knowledge economy as discussed earlier. The information economy is also perceived as the primary sector that is embedded within the secondary sector (i.e. the knowledge economy) as discussed earlier.

An information economy involves both a primary information sector of workers and information work as well as the technological infrastructure (Trauth, 2000). Trauth (2000) argued that technological infrastructure resides within the societal context to influence the development of the information economy of Ireland. Her argument combines the arguments of information society scholars to suggest the importance of both technology and the social factors to the information society. It is therefore reasonable to conceptualize the information society as dependent on both technology and social relationships.

To understand the debate between technology determinists and their critiques discussed in the previous paragraphs, Giddens' (1984) structuration theory proposes that human agency and social determinism are dualistically related. The structuralist tradition focuses on societal constraints that restrict human agency. On the other hand, phenomenological and hermeneutic traditions focus on human agency in response to

societal constraints (Giddens, 1984). The theory of structuration attempts to close this theoretical dichotomy by positing that social discourses are neither completely socially (i.e. structurally) determined nor completely based on human agency. The legitimacy of this argument was echoed by Rose (1999) who argued that these two extremes in the dichotomy are mutually dependent, rather than independent and mutually exclusive. As such, social structures constitute the possibility for human agency, and are simultaneously the end product of these activities. They create potential for human activities but also limit them (Giddens, 1984).

The knowledge economy creates a wide range of possibilities for information services and knowledge work. However, these services and work shape the knowledge economy at the same time. In Trauth's (2000) research on the rise of the information economy in Ireland, the information economy was the result of the societal context of social discourses (i.e. human agency at a macro level). Also, the information economy impacts the societal context by creating possibilities and new dynamics for social discourses. The social networks of economic actors and cultural institutions shape the knowledge economy, and are implicated by relations in the knowledge economy in turn.

Taking this dualist position, the information society is based on the viability of technological infrastructure. At the same time, there are social relations that determine the power discrepancy – some regions are more poised to take advantage of this sector than others. Information economy development efforts may succeed or fail depending on both technology and social relationships. In other words, information products and services become yet another commodity based on established social and industrial relations (Mosco, 1989), but cannot do without technological infrastructures. It is

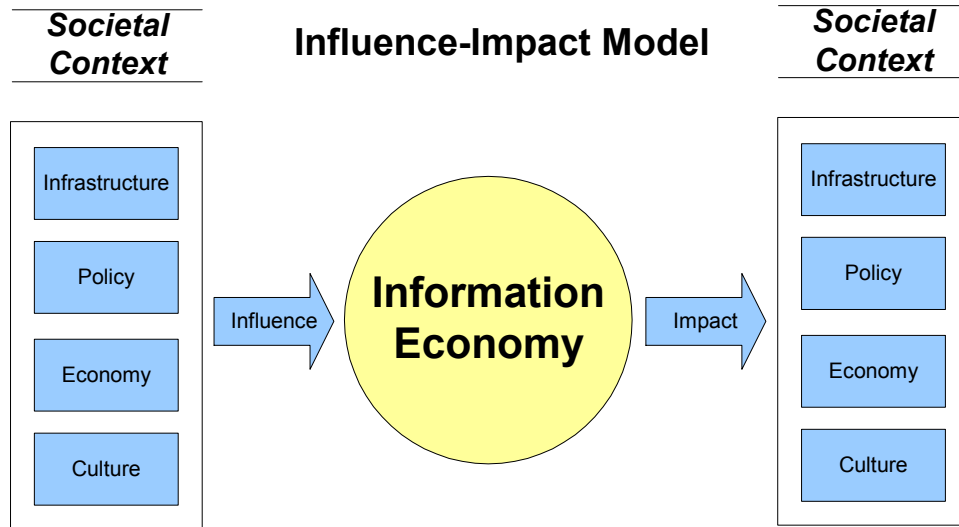
therefore, worthwhile to assume this integrated position in order to study information and knowledge economies, so as to understand their dynamics.

Theoretical Framework

The aim of this research is to understand the contextual conditions that influence the development of a sustainable knowledge economy. These contextual conditions refer to the identification of factors and the means to which they influence the sustainability of a knowledge economy. To address this focus, a social approach based on a socio-cultural conceptualization of the knowledge economy is suitable because it supports an understanding of the contextual conditions of a sustainable knowledge economy, thereby allowing me to investigate, identify and analyze the factors.

Just as Popper (1959) argued that observations are guided by theoretical frameworks, the Influence-Impact Model, developed by Trauth (2000), served as an underlying theoretical framework to guide this research, because it adopts a similar approach to understand the contextual conditions of an economy. As depicted in the following figure, the Model shows that four factors – infrastructure, public policy, economy, and culture influence the development of an information economy. Subsequently, the information economy exerts an impact on four areas of the societal context – infrastructure, public policy, economy, and culture.

Figure 5: Influence Impact Model (Trauth, 2000)

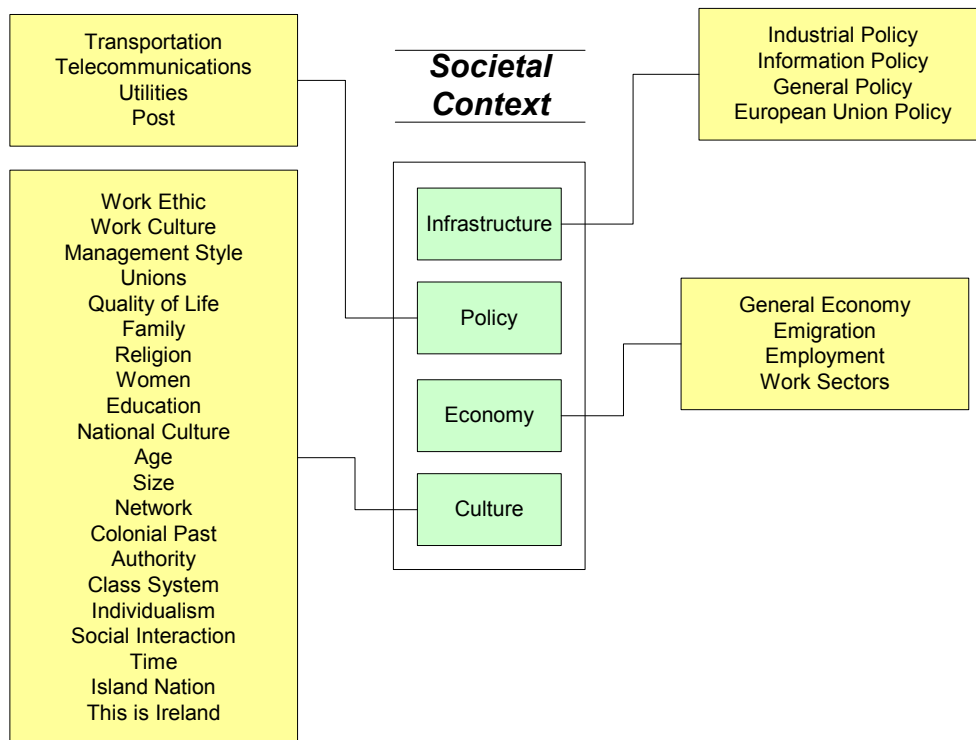


Trauth (2000) developed the four factors from her empirical findings. These four factors were socio-cultural factors that were influencing the development of the Irish information economy as well as their societal impacts. Her study was grounded theory because she did not have pre-defined aspects of the Irish culture to study (Trauth, 2000, p. 375). Grounded theory is a research method that allows the researcher to develop theories from empirical data. A key characteristic of this method is that the researcher has no pre-defined categories of factors to study in a case setting (Klein & Myers, 2001). Using this approach, she immersed herself in Ireland over an extended period of time to collect interview, documentary, and observational data for analysis. The results of this effort led to the Influence-Impact Model as shown in Figure 5, which explains the factors that influence the development and the societal impacts of the Irish information economy.

These findings comprised main categories, which were further broken down into sub-categories. For example, work ethic was a sub-category of work life, which was

further generalized to culture. The following diagram shows the breakdown of these factors into categories. In Trauth’s (2000) Model, these categories were further broken down into sub-categories, For example, work ethic, as a category under culture, was broken down into four sub-categories – productivity issues, type of work suited for, motivation for staying at and liking work, and the importance of work in one’s life (Trauth, 2000. p. 387).

Figure 6: Breakdown of the Influence-Impact Model



For example, work ethic, as a sub-category of culture, was a factor that influenced the development of the Irish information economy. In Trauth’s (2000) study, she found that when basic financial needs were satisfied, motivation in the workplace for some IT workers came from job satisfaction. This applied to experienced specialists who had “begun to see beyond mere career considerations to finding enjoyment inside the

workplace...” (Trauth, 2000, p.211). These forms of enjoyment refer to diversions from work, the friendly work environment, and orientation around the family, amidst a sense of achievement. As a result, these workers continued to work in the Irish IT sector and contribute to its economy.

As another example, this work environment is related to the easy-going lifestyle among the Irish, which she found to be a distinct characteristic of the Irish information sector workplace (Trauth, 2000, p.145). Based on Trauth’s (2000) findings, Irish IT workers were more interactive and maintained strong interpersonal relationships with one another. This led to increased communication and interactions among IT workers in Ireland. Managers were therefore less authoritarian and inter-worker relationships were strengthened. In the long term, problem solving could become more efficient as a result of better interpersonal relationships (Trauth, 2000, p.166).

Taken together, this Model explains the role played by the societal context in the development of an information economy. The societal context in this case, refers to the contextual conditions in this research. The model defines the societal context as what factors and how they influence the development of an information economy. Trauth’s (1996) paper focused on the impact of the Irish IT sector on its economy and culture, and how these lessons can be generalized to broader issues that apply to countries and regions experiencing a similar economic development path. In her chapter, she explained that the societal context and the information economy interact in two ways (Trauth, 1996). The Influence-Impact model depicts how factors in the societal context influence the development of an information economy. As the second interaction, the information economy exerts an impact on the societal context (Trauth, 1996). Further, the interactions

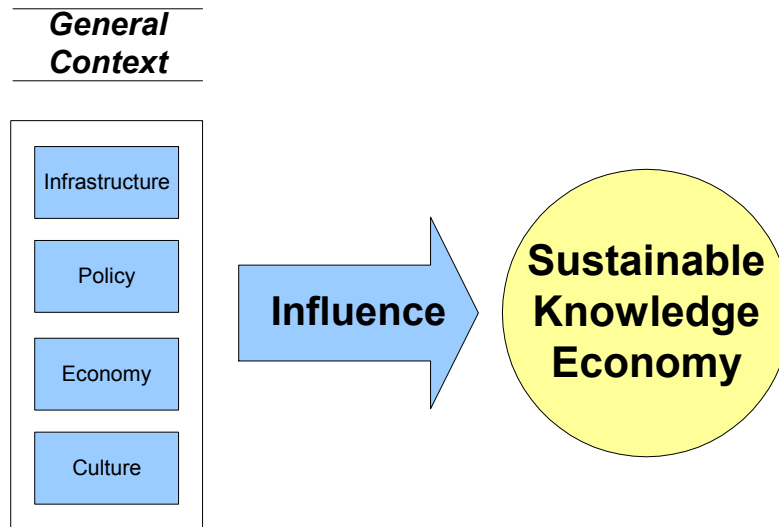
do not occur sequentially. Rather, they are dialectical because the interactions are simultaneous (Trauth, 2000). Trauth's (1996) work shows that empirical significance of factors in a region can be generalized and applied to understand the information of another region with similar experiences. In a similar fashion, her work enabled me to leverage her findings to guide my study of the knowledge economy.

Trauth's (2000) research method to understand the influence of the societal context on the information economy was empirical and qualitative. During her data collection, she lived and worked in Ireland to understand the story behind macro level statistics that describe the society. She combined in-depth interviews, document analysis, and observations to collect her data on how Ireland's culture, history, and society influenced its development. Her choice of an ethnographic method allowed her to document first hand accounts of the Irish society.

In addition, Trauth (2000) employed an interpretive approach to develop a critical understanding of the complexities involved in the research topic. She adopted a self-reflexive position to document how she progressed and arrived at her conclusions. Using open coding, she developed sub-factors that were subsequently categorized under each of the four factors of the Influence-Impact Model. These sub-factors were inducted from her interviews, observations, and documents analyzed.

Similar to Trauth's (1996) use of the Model, the focus of this research is on the role of the societal context (contextual conditions) on the sustainable knowledge economy of a region. The following diagram illustrates the adaptation of the Influence-Impact Model to investigate the influence of contextual conditions – infrastructure, public policy, economy, and culture on the development of a sustainable knowledge economy.

Figure 7: Adaptation of Influence-Impact Model for the Knowledge Economy



Using a similar method as Trauth's (2000), I relied mostly on semi-structured interviews to collect the majority of the data in this study. In addition, I triangulated these interview data with reviews of relevant documents and ethnographic observation. These data collection methods are discussed in detail in Chapter Three on Research Methodology.

Conceptualization of the Research Problem

According to Golden-Biddle and Locke, a research problem is conceptualized based on three theoretical gaps upon which existing literature is evaluated against – as being incomplete, inadequate, and finally, incommensurate (Golden-Biddle & Locke, 1997). By incomplete, the authors mean that the literature does not sufficiently discuss a specific area relevant to the problem domain. By inadequate, the literature does not include alternative explanations or perspectives to a research problem. And finally, by incommensurate, the authors refer to literature on a particular research problem as completely incorrect.

The preceding discussion lends to the conclusion that the literature on the knowledge economy does not appear to have focused explicitly on sustainability. This may at least partially explain the difficulty to define sustainability and innovation. In addition, the knowledge economy, as established earlier, is a fairly new concept whereby even the scholars do not have consensus on its definition, which resulted in various ways of interpretation. In general, it also does not appear to involve the breath and depth of contextual factors such as those captured by Trauth's (2000) research on the information economy. Although these gaps warrant further empirical enquiry, her research problem is substantially different from mine. Rather than conceptualizing this research on the knowledge economy as filling the gaps, it is more appropriate to use Golden-Biddle and Locke's (1997) principle of theoretical gaps as applied theoretical differences to extend Trauth's (2000) research on the information economy to the sustainable knowledge economy.

Trauth's (2000) research on the Irish information economy was ethnographic. It was a descriptive, analytical and retrospective effort that provided a thick descriptive account and in-depth analytical understanding on the development of information economies, and in particular, the information economy in Ireland. Her research was aimed at the primary information sector and how it was developed as a result of influential contextual factors. It was also retrospective in the sense that she traced the historical and contemporary factors that led to then current Ireland's development. As a summary, Figure 2 illustrates graphically, the theoretical differences between my research and Trauth's (2000) research.

This study of the sustainable knowledge economy is different from Trauth's (2000) study of the information economy, although her research was used extensively as a guide. Based on these differences, there are three dimensions of the theoretical differences – focus of understanding, number of study sites, research orientation. Along these lines, a similar inter-disciplinary⁴ approach was adopted to understand the development of a sustainable knowledge economy, using her Influence-Impact model and research methodology as a guide.

In this research, I applied her focus of understanding from the development of an information economy to the sustainable knowledge economy. The links between the information economy and the knowledge economy as established in the literature review justify this extension as illustrated in this figure.

In terms of study sites, Trauth's (2000) study was focused on Ireland. Instead of focusing on a single study site, I focus on three study sites simultaneously – San Joaquin Valley (in California, U.S.A.), Ennis (in Ireland), and Singapore⁵. The relevance of these study sites are explained in Chapter Three.

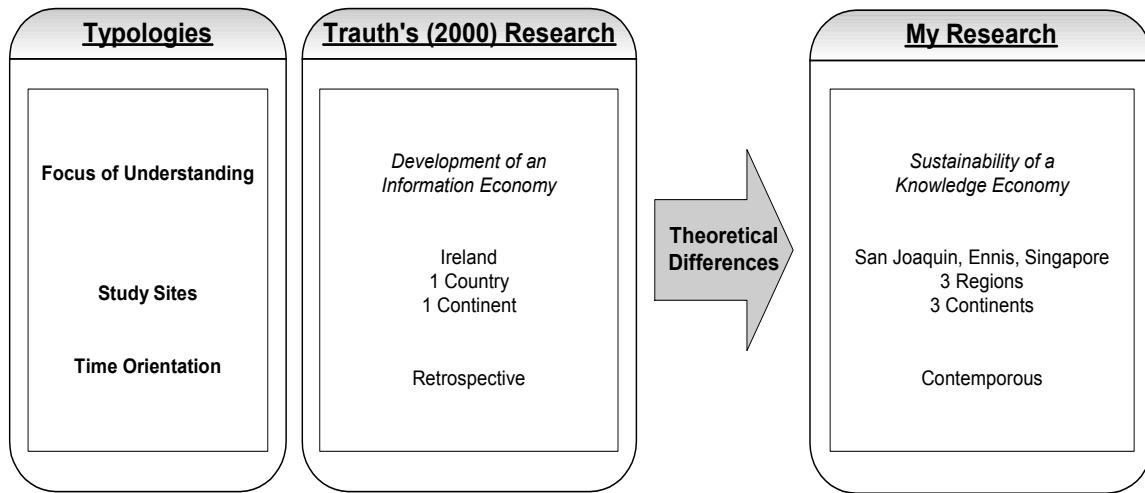
My research is contemporaneous, as opposed to Trauth's (2000) retrospective orientation. Authorities are quickly developing initiatives to manage the economic shift. The concept of a knowledge economy is a fairly new one relative to the information economy. The on-going nature of initiatives in this regard pertaining to all three regions leads to a contemporaneous approach. However, this dissertation is aimed at making theoretical contributions rather than policy recommendations. These contributions are

⁴ This approach is inter-disciplinary because it invokes the literature on information science, social theories, economics, cultural studies, and public policy to establish the foundation and analysis.

⁵ Singapore is a country. But it is only the size of a region at about 647.5 sq. km. (About Inc., 2005).

discussed in detail in Chapter Six. As explained, this research involves an investigation of contemporary knowledge economy development initiatives. This on-going nature is thus different from a retrospective approach.

Figure 8: Theoretical Differences



The World Bank developed a framework to depict development efforts towards a knowledge economy. This framework includes the economic and institutional regime, human resources, innovation, and telecommunications and information infrastructure as key factors (Aubert & Reiffers, 2003). In addition, Aubert and Reiffers (2003) argued that the highest authorities play the role of supporting these development efforts through a guiding vision.

This framework, although articulated in a different way from Trauth's (2000) Influence-Impact model, is captured in the essence of Trauth's (2000) Influence-Impact Model to argue that economic and institutional regime (economy and public policy), human resources (infrastructure), innovation (economy and culture), telecommunications and information infrastructure (infrastructure), and the guiding vision (public policy) are key factors in the development of a knowledge economy. This inter-disciplinary approach

further justifies the application of Trauth's (2000) Influence-Impact model of the information economy to the knowledge economy to serve as a guide for empirical enquiries and analyses in this study.

Contextual factors may not be analyzed in isolation. For instance, human infrastructure – labor, educational institutions, and employment, are closely related to cultural capacities, attitudes towards education and employment, educational policies, and demand for labor. Therefore it becomes important to discuss the findings in the context of other factors. At the same time, there may be other factors that are not captured within this adaptation. Therefore, an iterative approach is necessary in this research to account for findings that may arise from the data collection. This approach is explained in more detail in the following paragraphs.

Guiding Research Questions

In the preceding discussion, the research problem and research objectives were discussed and established. The knowledge economy was defined through a review of relevant literature. Based on these, the following research questions were advanced to guide empirical enquiry and investigate of the influence of contextual conditions on the sustainable knowledge economy:

- RQ1 What contextual factors facilitate continuous learning and innovation for a sustainable knowledge economy?
- RQ2 How do these contextual factors affect the sustainability of a knowledge economy?

The evidence gathered to resolve these research questions will provide a more comprehensive picture of the development of a sustainable knowledge economy.

Through an iterative research process, the extended research program can be adapted to various research agendas on the knowledge economy.

CHAPTER 3. RESEARCH METHODOLOGY

There were two guiding research questions in this study. These were:

RQ1 What contextual factors facilitate continuous learning for a sustainable knowledge economy?

RQ2 How do these contextual factors affect continuous learning for a sustainable a knowledge economy?

The nature of these research questions influenced the research method chosen for the study. In the following section, I discuss my rationale for choosing a qualitative method for the study to provide answers to these guiding research questions.

Choice of a Qualitative Method

A qualitative method with an interpretative lens of enquiry was adopted in this dissertation. The reason for choosing a qualitative method was based on the five criteria developed by Trauth (2001): theoretical lens, degree of uncertainty, the research problem, the researcher's skills, and academic politics. The following sections discuss these criteria in relation to the specific qualitative approach chosen, the data collection methods and the means to which the data were constructed into a meaningful theoretical articulation of the sustainable knowledge economy.

Following the preceding discussion, continuous innovation and continuous learning are the two key concepts that constitute the targeted observed behaviors to be understood in this dissertation. Continuous learning forms the basis for continuous innovation, which is used as a proxy for the sustainable knowledge economy. These two

concepts are set against the development of a sustainable knowledge economy. The means to which these concepts were investigated are discussed in this chapter.

The research method employed in this dissertation was primarily qualitative and interpretive. It follows the constructivist ontological tradition whereby findings were interpreted within their contexts, instead of generalizing across all possible contexts. Because of this hermeneutic nature (Giddens, 1984), the subjects and research have influence on the findings of the study. Therefore, along with my findings, I include footnotes of my first hand accounts during the data collection phase.

Sections 3.1.1 to 3.1.5 involve a discussion of the choice of qualitative methods based on the criteria developed by Trauth (2001). These five criteria supported the use of a qualitative method in this research. The five criteria are: the researcher's theoretical lens, the degree of uncertainty surrounding the phenomenon, the research problem, researcher skills, and finally, political requirements (Trauth, 2001). These are discussed in turn in the following sections.

The Researcher's Theoretical Lens

In this research, the interpretive lens of enquiry and analysis was adopted. Interpretive research is based on the basic assumption that human knowledge is obtained through social constructions. These constructions include cultural artifacts such as language, consciousness, shared meanings, and documents (Klein & Myers, 2001). The underlying assumption is that meanings are created as people interact with one another in their respective contexts. Thus, the goal of interpretive research is to understand the contextual complexities involved in these interactions (Trauth, 2001).

The interpretive lens follows Lantour's argument that "science in action is a controversial and contested social process of fact construction" (Walsham, 1995a, p.377). The generation of themes through this lens, then, requires a more in-depth look at the underlying contextual conditions (Walsham, 1995a). For instance, the debate between information society theorists on technological determinism versus human agency cannot be resolved using statistical analyses alone. This debate requires a more critical look at the dynamics of societies and how technology and social relations implicate the information economy.

Studies on the knowledge economy by economic development agencies such as the United Nations Economic Commission for Europe tend to use descriptive statistics to describe the state of the knowledge economy. An example is the series of country readiness reports on European countries, for instance, the report on the Ukraine in 2003 (United Nations Economic Commission for Europe, 2003). These reports use indicators such as the number of computers in households to determine the status of a knowledge economy.

However, these figures show only a uni-dimensional picture. For instance, having a computer does not necessarily mean using it for information services production. To study the development of a sustainable knowledge economy, it is necessary to go a step beyond to identify and understand how various factors come into effect. Trauth's (2000) study of Ireland's information economy was oriented in the interpretive vein. Similarly, her intention was to uncover the story behind the statistics for an in-depth understanding of the forces that influenced the development of the information sector and its societal impact.

There are two lines of philosophical thinking in interpretive research. First, it considers an individual's intentional use of the language and methods for making sense of it; and second, it focuses on subjective consciousness through phenomenology and hermeneutics (Klein & Myers, 2001). Interpretive research is aimed at building social theories on social phenomena. In this vein, typical interpretive research methods include interpretive experiments, language analysis, in-depth case studies, ethnographies, action research and grounded theory (Klein & Myers, 2001).

In this research, secondary statistics were used to describe the state of IT infrastructure and the economy. These statistics include technology and economic indicators, which were obtained from public and private documents, as well as websites such as the Bureau of Labor Statistics (<http://www.bls.gov>) and subscribed databases from Economy.com (<http://www.economy.com>). However, the thrust of this research is bottom-up. It seeks to understand *how* continuous learning and innovation are facilitated and not *how much* learning and innovation are created. Hence, understanding how the economic actors in each region behave and react to the social phenomena around them become keys to understanding the research problem. Their actions and attitudes were interpreted against the backdrop of continuous learning and innovation, which represent the sustainable knowledge economy for the purposes of this research.

Trauth's (2000) interpretive research method served as a guide to go beyond the statistics in order to understand the implications of the contextual factors, which were depicted by the statistics. Interpretive research in information systems research can be applied to advance understanding of information systems. This involves the application and adaptation of philosophical and social theories to information systems research areas.

In addition, these philosophical and social concepts and methods can be employed to frame empirical enquiry (Klein & Myers, 2001). The data collection and analysis were guided by Trauth's (2000) Influence-Impact model, which resulted from a grounded study. It was also developed through the interpretive lens of enquiry, as well as various relevant philosophical and social concepts.

Degree of Uncertainty Surrounding the Phenomenon

Following the researcher's theoretical lens, a primary reason for adopting a qualitative method is the complexities surrounding the research phenomenon. One can argue that the social context of any phenomenon is comprised of different facets of interpretation. For instance, education (including programs, policies) is related to education facilities (infrastructure), attitudes towards learning (cultural factor), and workforce training initiatives (policy). This uncertainty does not lend itself to hypothesis testing.

By taking a social lens, this research takes an integrative view of factors to account for these complexities, extending the Influence-Impact Model through a development of new theoretical insights. This elaboration involves broadening the focus from information to knowledge, and from theorizing the establishment to the sustainability of a knowledge economy. This integrative view allows the researcher to analyze the findings from multiple angles, thus accounting for the different facets of interpretation.

As shown in the preceding chapter, the notion of the knowledge economy, along with related concepts like sustainability and innovation are difficult concepts to capture and investigate quantitatively. The lack of a universal approach to these concepts leads to

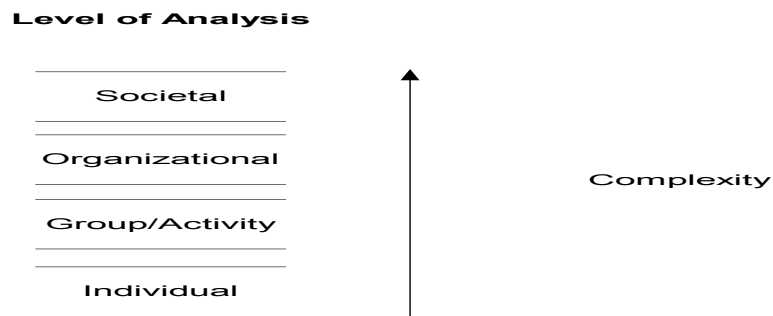
a high level of uncertainty in the research problem. Hence a qualitative method that allows the researcher to take a broad approach so as to understand the problem becomes more appropriate than a quantitative approach with pre-defined and independent variables to study. Here, the interpretive approach focuses on the range of complexities in the human environment as setting changes in an on-going fashion (Kaplan & Maxwell, 1994). The analysis in this research required me to keep my mind open to perspectives that I may not have encountered prior to the data collection. This allowed me to interpret the same finding from multiple angles.

The Research Problem

According to Trauth (2001), the goal of a research study determines its research method. Therefore, the research problem is one of the five criteria that affect the research method chosen.

Research phenomena can be constructed into different levels of analyses: individual, group, and organizational, societal (Walsham, 2000). Each of these levels is relevant in information systems research (Korpela, Mursu, & Soriyan, 2001). Using this typology, this research problem resides at the societal level of analysis as opposed to lower levels like individual, group, and organizational. These levels of analysis and their corresponding degrees of complexity are illustrated in Figure 5.

Figure 9: Levels of Analysis and Abstraction (Walsham, 1995)



The societal level comprises individuals, social groups, and organizations. Therefore, as a unit of analysis, the society becomes additionally complex because the research has to take into consideration the roles of individuals, social groups, and organizations within the unit. Thus, the relationships become more complex and pre-defining the static relationships to be studied becomes more difficult. Using the same example of education as discussed earlier, an analysis of an educational institution (organizational level) involves more individuals than just individual students in a classroom (individual level). The former, as a result, becomes a more complex problem space than the latter.

Furthermore, the societal level comprises multi-faceted contextual issues and involves human beings, thus, an open-ended approach becomes more appropriate to understand how things come to the way they are. Instead of aggregating independent and isolated statistical measurements at an individual level and extrapolating it to the societal level, as in a quantitative positivist study, I attempted to go beyond these to understand how continuous learning and innovation come about or can come about by interpreting inter-dependent individual actors and phenomena within their social contexts.

Here, the qualitative approach allows the researcher to take an open-ended approach to study the underlying meanings behind these relationships in-depth, in order to draw conclusions. For the purposes of this dissertation, the goal was to understand the factors that affect the sustainability of a knowledge economy. Under the criterion of the research problem, the choice of a qualitative method was determined by the complexity involved at the societal level of analysis, coupled with the need to understand phenomena, rather than to construct causal relationships between a priori defined variables.

The Researcher's Skills

The fourth criterion for adopting qualitative methods is the researcher's skills (Trauth, 2001). As discussed above, the research problem is complex and involves complex relationships among human actors and institutions. Based on the arguments put forth so far, while qualitative methods appear to be more appropriate to address the research phenomenon, the quality of the research ultimately depends on the extent to which the researcher can deal with these abstractions and complex realities. What is important to recognize is that the researcher is a knowledge worker too (Schultz, 2000). And thus, the ability to recognize the researcher's role in the research process is fundamental to a qualitative research.

As a researcher trained in quantitative methods, dealing with these complex realities was a challenge in the beginning. However, through prior research experience and graduate level education, I was increasingly accustomed to continuous queries in order to get to the root of the issues discussed. In addition to experience and skills acquired, I became increasingly familiar with the study sites in the process. These further enhanced my abilities to carry out qualitative research independently.

In addition, throughout my experience as a quantitative researcher, I learned the difference between doing the right thing and doing things right. The former involves a straightforward rigid execution and interpretation of statistics, while the latter involves executing the most appropriate statistical tests and then logically reasoning the results. A good example is a resultant significant positive correlation between a person's height and his or her mathematical abilities. Although statistically, the relationship concludes that the taller a person is, the higher his or her mathematical abilities are. However logically, this does not make sense. A more acceptable interpretation is that height correlates positively with age, and age correlates positively with the number of years of education, which in turn correlates with his or her mathematical abilities. In addition, before actually executing the statistical test to test the hypothesized relationship between height and mathematical abilities, the researcher must do the right thing by measuring the two possible intervening variables: age and number of years of education. At this crucial juncture, I began to understand the role of interpretation in social research.

The help from key informants also enabled me to focus on relevant issues and to open myself to new issues and problems. Because of the closer relationship between the researcher and the subject (interviewee), I began to understand a great deal more of the research problem than I had planned to investigate by virtue of the interviewee's expertise. These are discussed further in Chapter Six, as I recount my learning process as a researcher.

Academic Politics

The School of Information Sciences and Technology, where I seek to obtain my doctoral degree, is a setting that supports both quantitative and qualitative research

methods. As graduate students, we were required to undergo training in both methods as part of our graduate degree requirements. Therefore, the use of either or both methods in my dissertation research was acceptable.

The preceding discussion on the rationale for my choice of research methods points to the appropriateness of a qualitative method for the study, and in particular an interpretive research method. From the discussion of my research skills, I explained that I was trained in quantitative research methods prior to my admission to the doctoral program. Therefore, I would require additional guidance in this research.

Under the tutelage of a leading academic in interpretive qualitative methods in information science, harnessing my acquired interpretive skills and applying them to the research problem was very useful to me. I was then placed in an advantageous position to execute the study with the appropriate choice of research method.

The Case Study Method

A case study is a qualitative research method that represents an in-depth approach to a single research problem. This method is ideal when a holistic, in-depth enquiry is essential (Feagin, Orum, & Sjoberg, 1991). It is most conventionally executed to analyze problems where the goal of a research is to uncover how or why various phenomena occur, or can occur, as well as to focus on the dynamics of a single setting (Yin, 1989). In contrast to quantitative methods, case studies are designed to include details from the perspectives of the participants in the study through the employment of multiple sources of data. Thus they have been employed in various kinds of research and especially in sociology-related research (Tellis, 1997b).

Case studies are often used because the phenomena studied are highly complex and bounded to their contexts (Yin, 1994). In these cases, other methods are not suitable because phenomena in this category are sensitive to their contexts. These, therefore, require a more holistic approach, and the research must triangulate different types of evidence using different methods (Ragin, 1999).

This research takes a case-oriented approach, as opposed to a variable-oriented approach. According to Ragin, the variable-oriented approach is primarily focused on assessing relationships between various aspects of cases or phenomena across a large sample of observations (Ragin, 1999). The goal of this approach is to identify and specify general patterns that are significantly true beyond chance for a population. The case-oriented approach, on the other hand, involves understanding a small number of cases, which are theoretically important in various ways (Eckstein, 1975; Ragin, 1987).

As argued earlier in Section 3.1, the researcher's theoretical lens, the degree of uncertainty surrounding the phenomenon, the research problem, the researcher's skills, and academic politics, show the need for a qualitative method in this study. Yin's (1994) advocacy of the case study method is premised on its ability to conduct analysis based on the context of the problem domain. In other words, instead of reducing the complexities of the research problem to independent measurable quantities, this method allows the complexities to remain in their own contexts and analyzed accordingly. It empowers the researcher to engage with the research subjects and construct interpretations of observed behaviors, and hence, develop contextual conclusions. The researcher can make links from different factors identified at various different levels: individual, group, organizational, or societal.

In this research, I attempted to identify and analyze factors that contribute to the sustainability of a knowledge economy. To understand how these factors contribute to sustainability, I needed to understand how they are inter-related. In addition, given the uncertainties of the social contexts, it was necessary to study factors within their contexts, rather than measure them independently. For instance, using the same example of education, I needed to see how education was provided and encouraged: what was the public's receptivity, the expert opinions on projected outcomes, issues and challenges, as well as how education plays a role in other facets, such as employment. Therefore, a case study appears to be a legitimate research method for this research on the sustainable knowledge economy.

This method has been subject to criticisms that its dependence on a single case limits its ability to provide generalizations (Tellis, 1997a). However, according to Lee and Baskerville (2003), generalizations of case study findings are applicable to theory and not to populations. This generalization can be done regardless of whether the findings originate from an isolated case or several cases (Lee & Baskerville, 2003). In this mode of generalization, the Influence-Impact Model provides a high level systematic way of conceptualizing observed behavior. By using inductive reasoning to generalize from findings to theory, the parts of observed behavior can be situated theoretically to understand their relevance. Case study findings, however, are based on empirical evidence, and facilitate hypotheses formation and subsequent generation of novel theories (Eisenhardt, 1989). These findings can be processed through analytical generalization to the theoretical level. This is termed as Level-2 inference, which differs from a Level-1 inference, or statistical generalizability (Yin, 1994). The latter is a sample-based

generalization that allows the researcher to make an inference from sample data to a population. This does not reflect the quality of a case study.

Nonetheless, multiple cases increase the robustness of the theory. This is because the results are strengthened through replication (Yin, 1994). In addition, case studies must be guided by clear objectives and a basic standard instrument to allow generalizations across multiple cases (Yin, 1989). Under these guidelines, the case study method allows the researcher to draw more general theoretical conclusions. The case study method enabled me to extend Trauth's (2000) Influence-Impact Model and make theoretical contributions. These contributions are discussed in Chapter Five, where the findings are interpreted thematically and theoretically.

Interpretive Case Study

Although the case study is a suitable method for this research, it tends to be outward looking and may not necessarily include the reflexive component on the part of the researcher. This component is an important part of qualitative and interpretive research methods to account for the relationship between the researcher and subjects, especially since the researcher is an instrument in this process (Schultz, 2001). This is discussed in Evaluation Criteria.

Like case studies, ethnographies are another qualitative research method. Ethnography involves a long period of immersion (sometimes years). It is a branch from anthropology, and was subsequently adapted to sociological studies, to provide thick and scientific descriptions of cultures. Ethnographic studies seek to unravel tacit knowledge pertaining to cultural facets among participants in the study site through a self-reflexive

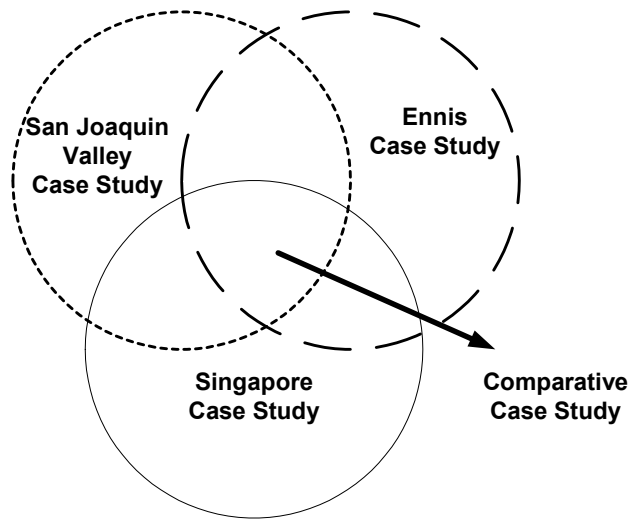
approach. Case studies on the other hand, are aimed at interpreting phenomena through detailed investigation of the phenomena within their contexts (Cohen, 2003).

Therefore, in order to conduct three case studies⁶ concurrently with consideration given to the tacit knowledge in each case, an interpretive case study was used in this study. This method was previously proposed by Walsham (1995a) in information systems research. In this method, ethnography was used as a building block, making it an interpretive case study. Detailed investigation, as in the ethnographic method, was done by using primary observation and taking an insider perspective through field immersion. In this way, the tacit nature of the data presented was obtained. Furthermore, similar to ethnography, field notes and event logging were done to make me aware of my interpretation throughout the data collection and analysis.

There are idiosyncratic characteristics of each region that differ from the other two. Therefore, in addition to comparative case studies, single case studies of each region were included. A graphical description of the research design is given in the following diagram. Each circle represents single interpretive case studies. The comparison among them is denoted by the overlap of the three single cases. In this way, each region was covered in depth for comparison.

⁶ A total of three case study sites were used for this research. These are discussed in Section 3.3.1 – Site Selection

Figure 10: Research Design



Ethnographic methods such as the confessional tale and multiple perspectives were integrated in interpretive case studies. These are discussed in further detail in the subsequent subsection in Data Collection. For purposes of this research, comparative interpretive case studies were conducted and integrated into the analysis and theory development.

This development answers calls for more theory-building in information systems research (Sahay & Walsham, 1995). According to Sahay and Walsham, research in this vein can further develop or refine theory, and bridge the gap between theory and practice (Sahay & Walsham, 1995).

In line with the ethnographic bent in these case studies, the findings first involve a description of factors and the research problem in each of the study sites as they exist within their contexts. Here, the contexts were categorized into themes and then described. This is in line with the descriptive method employed by ethnographic researchers like Wax (1971), whose works come from an anthropological tradition and makes no general

statement. However, a step was taken beyond this approach by providing multiple viewpoints from the interviewees, individual observations, and documents. Following this, the interpretive lens was adopted to interpret the factors and contexts, thus providing detailed and critical conclusions. This interpretive approach is in line with ethnographers such as Hollingshead (1949), whose background reflects a sociological tradition.

The need to compare across all three study sites further justified the use of interpretive case studies instead of pure case studies or ethnographies in per se. This allowed me to conduct all three studies during the same period. In addition, my research on the sustainable knowledge economy was theme-focused. Themes are issues that were brought up and were common across the different sites with abstraction. In other words, the similar themes may not be manifested in the same way in all three sites, but have similar roles to play in regards to the sustainable knowledge economy.

This method is aimed at theory elaboration (Vaughan, 1992), an approach that draws upon and extends Trauth's (2000) work on the information economy in Ireland to the sustainable knowledge economy in three regions. Theory elaboration is suitable when prior research serves as a foundation for new studies and yet enables the researcher to expand the existing theoretical framework (Holzinger, Medcof, & Dunham, 2006; Lee, Mitchell, & Sablynski, 1999). Therefore, in case studies, theory elaboration can allow a researcher to apply an existing theory to different settings and make theoretical contributions based on similarities and differences in different cases (Kennedy, 2005).

Theory elaboration is based on the assumption that observations do not begin without a prior theoretical frame (Popper, 1959). In interpretive research, this is important because the researcher is an instrument of the research (Patton, 2001). My

interactions with subjects and observations of their behavior are instrumental to my understanding of the research problem. Therefore, according to Vaughan (1992), in theory elaboration, the researcher can first use a theoretical framework to collect inductive data, and subsequently, evaluate the data collected against the sensitizing concepts of the theoretical framework applied. In this way, Vaughan (1992, p.176) explained that the researcher can "...use(s) theories, models and concepts as sensitizing devices, rather than translating them into formalized propositions that are tested."

Similar to Kitchener and Harrington, the theory elaboration in this study was executed in three major steps (Kitchener & Harrington, 2004). First, the Influence-Impact Model was applied to develop sensitizing concepts. These concepts are the four factors in the Model: infrastructure, public policy, economy, and culture. Next, three study sites – San Joaquin Valley in California, Ennis in Ireland, and Singapore – were selected based on their different stages of economic development. This was explained in my choice of case study sites. Finally, the three case studies were executed to investigate these concepts through an interpretive lens. The results retained the theoretical essence of the Influence-Impact Model and also provided theoretical insights and expansions. These theoretical contributions are discussed in Chapter Six.

Data Collection

A combination of three methods was used to collect the data: semi-structured in-depth interviews, document review, and participant observation. The interview questions were initially based on the Influence-Impact model with innovation as a key idea. The reason for this is to extend the model to the sustainable knowledge economy. In Appendix A, there are two renditions of the interview guide – the first of which was my

original interview guide, and the second of which is the final evolved guide. The first interview guide in Appendix A was adapted and developed from Trauth's (2000) research in Ireland and my preliminary fieldwork in San Joaquin in 2003. It was executed in my fieldwork in Ennis and Singapore, respectively. The second interview guide in Appendix A was the evolved version, which was based largely on my experience in Ireland in June 2005, as well as subsequent trips to San Joaquin Valley in the same year.

For this dissertation, the data collection periods for each site were spread out from 2004 to 2005. These are described as follows:

San Joaquin – May-November (2005)

Ennis – June (2005) and September-October (2005)

Singapore – December (2004) and on going (2005).

In total, I spent about three months in San Joaquin Valley, two months in Ennis, and one month in Singapore. However, I compensated for the lack of time spent in Ennis and Singapore by conducting online and telephone interviews. For San Joaquin Valley, I spent about six weeks there in 2003 on a project related to the information economy in the region. The fieldwork provided me with initial insights about the region's economic and social characteristics. This was followed by 10 individual trips in 2005. For Ennis, I lived there temporarily during the period shown above. For the case of Singapore, I spent about one month there in 2004. Subsequently, because of possible international travel restrictions, I conducted interviews by phone and online. I also lived in Singapore for 25 years and was educated there. The first-hand experience over the period helped me understand its social and economic contexts.

As with other qualitative research, the interview questions were fairly open-ended to allow the possibility of factors that are not defined within the Influence-Impact model. These allowed the subjects to chat about their views and express things in a more unrestricted fashion.

The following sub-sections describe data collection methods and the implementation of these methods (i.e. process of implementation). The data in this study are primarily qualitative. However, they also include secondary quantitative data, which have been explained earlier and are elaborated in the following sub-sections.

Site Selection

There were three regions used as study sites in this study – San Joaquin Valley in California, Ennis in West Ireland, and Singapore. These regions are markedly different in terms of their social, political, and economic make-up.

Located in the North American continent, San Joaquin Valley is a region targeted by the state of California's development efforts to position it as a technology-based economy. At present, agriculture is a dominant industry (Kirch Foundation, 2005). Thus, the region is an agriculture-based economy, with other industries such as manufacturing, amidst its efforts to develop a knowledge-based economy.

Located in Europe, Ennis is a region within a country that is a leapfrogged economy: Ireland developed its economy from an agriculture-based one to an information economy (Trauth, 1999). In the process, Ireland skipped the industrial economy to arrive at an information economy. Using the country's experience, Ennis is attempting to leverage the achievements to build and sustain its knowledge economy. It is currently

known as an information age town and deemed as an exemplary case of a small town having developed its technology base and is attempting to sustain its growth.

Located in Asia, Singapore is a modern economy with no rural regions. It has well-established and well-developed information and knowledge services sectors. Singapore is attempting to sustain its competitiveness amidst intensified global competition, particularly in Asia.

These three regions are in different continents and are at different stages of development with the common goal of developing a sustainable knowledge economy. Furthermore, they are markedly different in their social and cultural make-up. Comparing these three regions will give insights on how common factors influence the development of a sustainable knowledge economy and how they manifest in each unique region.

Interviews

Sampling

The sampling method for the interviewees was purposive. This sampling method was aimed at obtaining an emic (insider) understanding of the research problem (Kvasny, 2000). This emic perspective is characteristic of interpretive research and therefore differs from the etic (outsider) perspective in positivist research (Fitzgerald & Howcroft, 1998). This allowed me to explore the factors within the research problem in-depth and take a critical, rather than superficial, view of the data. This exploratory approach is also another characteristic of interpretive research that differs from positivist research (Fitzgerald & Howcroft, 1998).

The aim of the sample is to provide me with data for the interview questions. As such, it must comprise people who are useful in this regard (Mason, 2002). According to Mason, this sample of research subjects must be able to represent the wider population of the study (Mason, 2002).

In this purposive sampling approach, research subjects were selected through deliberation. In addition to being willing to be interviewed, the criteria for selection were based on their knowledge and experience, and the ability to self-reflex and articulate their personal experiences (Kvasny, 2000). As I explain in the next sub-section, I began with a list of key informants, who were my preliminary list of interviewees. However, within this list, I gauged their suitability to further narrow down my list.

This sampling method stands in contrast to stratified random sampling in quantitative research. Although representative sampling can be employed in qualitative research, stratified sampling is more common in quantitative research (Mason, 2002). Furthermore, for purposes of this study, ensuring that the subjects can effectively illustrate the phenomenon is important. According to Mason, an illustration from strategically sampled demographics can be useful in generating useful and illuminating data (Mason, 2002).

Key Informants

The choice of the demographics of people who fall into the sample is a strategic one. According to Mason, the relationship between this selected sample and the universe cannot be coincidental or random (Mason, 2002). Hence, the purposive sampling allowed me to select subjects who could provide useful and meaningful data for the phenomenon.

Using this method, my key informants fell into one of three categories. First, there were academics and researchers, who have an interest in economic development of the region. These are researchers who have researched extensively on the information and knowledge economy. They are also people who are familiar with the respective study site.

Second, there were businesses and professionals, who participate in the economy. These comprise people who are in the position of making decisions for their organizations. Their occupations or primary economic activity are also closely related to the information and knowledge initiatives in the respective study sites.

Finally, there were managers of non-government organizations (NGOs), incubators and other development organizations. These are people who make decisions that affect the regional economy directly. They also represent their respective organizations in initiating efforts for regional development.

These key informants have a stake in the research phenomenon and have considerable experience and understanding of the overall subject matter. Hence their opinions are strategic, and they are in a position to make decisions.

In addition, I conducted opportunistic interviews with residents in each region. These interviews were informal interviews, which were conducted to help me live like a local resident and gain an insider's perspective of each region. These opportunistic informants are those who experience the effects of the regional economy directly. As an example, they can be long-term residents of the region. They were interviewed because of their in-depth familiarity with the regional economy and culture.

Together, these constitute two layers of interviewees in this research. My breakdown of key informants for the three sites is given in the following table. The total

number of respondents in this purposive sample was small. In a qualitative research, the size of a strategically purposive sample needs to be sufficiently large to generate useful data (Mason, 2002). In this case, the sample provided 12 common themes across three regions.

Table 2: Summary of Sample of Respondents

Study Site	Academics and Researchers	Business Owners and Professionals	Key Members of Development Organizations
San Joaquin Valley	2	3	7
Ennis, Ireland	3	9	2
Singapore	2	8	3
Total	7	20	12

Originally, I intended to have a similar representation of each category of interviewees in each study site. However, through my learning experience in the field, I found that the three different regions were different in sizes and were also different in cultural make-up.

Through the course of the fieldwork, there were different dominant groups that emerged from each study site. As such, there was an unequal numeric representation of interviewee types across all three sites. These are discussed in the following paragraphs.

In San Joaquin Valley, researchers tended to be affiliated with economic development or for-profit organizations. Teachers were found to be more distant from the cultural contexts (as discussed in Chapter Four), and business owners and professionals were less concerned about the economy than their immediate profits. Hence, perspectives from key members of development organizations are more crucial for purposes of this research.

In Ennis, due to the small geographic size, there are less economic development organizations compared to San Joaquin Valley. In addition, business owners experienced the most impact as a result of the recent IT initiatives. Hence they form the dominant group of interviewees. Academics and researchers are also important because they constitute expert opinion.

In Singapore, business owners and professionals have had first-hand experience of the economy. Although perspectives from academics and members of economic development organizations are important, they constitute a smaller role compared to the private sector.

In each of my three study sites, I was introduced to a list of key informants as interviewees. From these key informants, other interviewees were obtained either through their introduction or recommendation. This referral or snowballing process has been used by ethnographers such as Kvasny (2000).

In addition, my job as an analyst at the Milken Institute enabled me to be introduced to their contacts, and these contacts became my key informants in San Joaquin Valley. As explained, the Milken Institute at Santa Monica, California had provided me with a list of key informants. In addition, my preliminary research in a projected related to the information economy in San Joaquin Valley during the summer of 2003 resulted in an extended list of interviewees. Using the Institute's contacts, my current list of key informants was extended. In addition, I had access to data banks that were not publicly available for free. During my initial data collection phase in the summer of 2003, I established some key contacts in San Joaquin Valley. I used those interviewees as a starting point to obtain other interviewees.

In the case of Ennis, my academic advisor, who has extensive contacts there, introduced me to key informants. Among these informants, the National University of Ireland at Galway was a key contact. In addition, my academic advisor, Professor Trauth, introduced me to other key interviewees from Ennis and Limerick. Similarly, I obtained other interviewees in my data collection process based on these key contacts.

In the case of Singapore, I based my key interviewees on my contacts that I had established in my 25 years' residence in Singapore. I am a Singaporean by origin and I have lived there for more than 25 years. My network of contacts was established primarily during my Bachelor's and Master's degree programs as well as my brief working experience here. In addition, I had collected preliminary data from some key informants in the winter of 2004. Some of these interviewees were sampled based on the proceedings of the International Conference on Knowledge Management, held in Singapore in December 2004. Some further interviews were conducted by phone between the summer and autumn of 2005.

Interview Questions

In the data collection process, I conducted semi-structured interviews based on the interview guide as shown in Appendix A. I interviewed them at their office premises or through attending formal seminars relevant to the development of a knowledge economy. The interviews were based on Trauth's (2000) Influence-Impact model, which served as a guide and framework. In asking the questions, I ensured that I did not wish to impose my views on the subjects, in order to elicit their responses.

On average, the length of each interview was approximately one hour each. Thus it was important to have logistics support and key informants to ensure that the

purposively sampled interviewees were willing to complete the interviews, especially since these interviews had no perceived direct economic benefit to them in the short term.

During the interview process, as much as I would have liked to record all my interviews, many were inhibited by the formality involved.⁷ As such, paper transcriptions were used.

I found this to work very well as I engaged my interviewees with in-depth conversations without inhibition. I was more collaborative than neutral during the interviews, and I reminded myself constantly of this.⁸ I wanted to ensure that they did not become defensive about their positions and so I attempted to chat with them as a friend by establishing rapport early on in the interview. I was also quick to jot down the key points, which were interpreted as quickly as possible after the interviews were completed, but definitely within the same day, so that my impressions were still fresh. In this way, I could also bring forward the currency of my observations.

Document Review

In this research, I used secondary statistics that capture the economy of the regions in order to triangulate findings from my interviews. Descriptive economic data were also used to describe the regional economies of the study sites, where appropriate.

⁷ Permission to conduct research on human subjects was obtained from the Pennsylvania State University. In order to ensure anonymity, identities of the research subjects were not disclosed.

⁸ In the study sites, many interviewees had their respective political agendas. Based on my experience in these sites, interviewees were likely to be defensive about the initiatives and achievements of their organizations. They were also likely to criticize opposing organizations. In order to create an uninhibited environment, I spoke with them as someone ignorant of the contexts and agreeing slightly with them so that they feel more uninhibited to express their views and expert opinion.

Through publicly available and privately⁹ obtained documents, I reviewed the economic development initiatives of each region. These reviews showed more factual information that may not have been brought up from interviews and observations. In this way, I was able to distinguish the actual initiatives from the way they were experienced and the way they were implemented.

Documents that are related to the economic initiatives in these three regions were analyzed. These documents were obtained through interviewees' recommendations and directions as well as my individual research. In particular, public statistical data and documents that describe and explain economic development and relevant initiatives in the regions in my data were included for analysis. Documents were also obtained from interviewees in view of their expertise on various relevant subject matters. In addition, they directed me to various informative sources for other useful documents.

In addition, there were some sites that were useful in understanding the decision-making process and relevant government organizations pertaining to public policies. For instance, in San Joaquin's case, it is useful to look at the White House's homepage (<http://www.whitehouse.gov/government>) for information related to the decision-making bodies in San Joaquin Valley. The web page offers links that provide information on specific states and decision-making bodies. Furthermore, secondary data from the United States of America's census bureau (<http://www.census.gov>) will provide some key economic indicators that are relevant to the knowledge economy.

Finally, I developed a habit of reading local newspapers and various mass media to gain a better understanding of each context. Particularly for Ennis and San Joaquin,

⁹ Privately obtained documents include documents that are not circulated in public. For instance, in the case of San Joaquin Valley, the details of the information infrastructure were explained described in a private document obtained from a research subject.

these documents helped me familiarize myself with the local culture, people, and history. Some of these documents were used to add support to my findings in Chapter Four. In total, I reviewed approximately 300 documents for the three study sites in the study. These document data constituted a critical component of my analysis because they provided further support for my findings. Therefore, they were included in Chapter Four as I presented my findings. Although these data are secondary, they served as useful backdrops to situate and frame the in-depth interviews. They also helped me be more observant about anomalies in the data. This was important because data collection from all three sites were conducted at the same time.

Participant Observation

According to Marshall (1998), participant observation is an ethnographic technique that allows the researcher to gain an intimate familiarity with a cultural setting, focusing on an area of study. This involves immersing oneself in the field and collecting personal first-hand accounts of phenomena (Marshall, 1998). During my field immersion from 2004 to 2006, I observed and interpreted observed behaviors for analysis, because there could have been nuances and details that might have been omitted or misrepresented in documents and informants' responses. In line with the interpretive epistemology, I took an in-depth look at these data by adopting the interpretive lens as discussed earlier, so as to obtain an in-depth understanding of the phenomenon from multiple perspectives.

Similar to qualitative studies that employ in-depth data collection methods, breakdown resolutions or the hermeneutic circle were employed to determine when the interviewing in each of my study sites reached a conclusion. Breakdowns are anomalies

that researchers encounter in the process of data collection and analysis. Breakdown resolutions is a technique which is in line with the iterative research process to resolve anomalies (Trauth, 2000, p.395). This technique involves a critical evaluation of these anomalies until the breakdowns are consistent, which allows the data collection to reach a conclusion before proceeding further in future research directions. In other words, the analysis and data collection occurred simultaneously.

In Trauth and Jessup (2000), this hermeneutic circle was employed as an interpretive analysis, and it was contrasted with a positivist analysis on the same research phenomenon. The results showed that the interpretive analysis uncovered deep and rich information that were not obvious in the positivist analysis. The hermeneutic circle, therefore, allows the researcher to uncover in-depth and rich data.

The demands of ethnographic fieldwork on the research require the researcher to document first hand accounts of various facets of the study site(s). The facets include the environment in general, problems encountered, background, and social relations among many others. These accounts are meant to be shared with others who have an interest in the research problem. Fieldwork can therefore be seen as a means to an end (Van Maanen, 1988).

To document my experiences in the field as a confessional tale¹⁰, I made field notes throughout the process, and especially during the data collection process. These notes included my observations and opportunistic ideas, which I gathered through the course of my research. They served as useful data in the hermeneutic circle as part of my

¹⁰ The confessional tale presents the research as an instrument in the research process, thus allowing his/her actions and decisions to be open for criticisms (Van Maanen, 1988). This method was previously employed by Schultz (2000) in an ethnography about knowledge work, where she proposed the use of self-revealing accounts.

data analysis. Many details were tacit and therefore embedded within the cultural context. As such, I provided footnotes that comprised my observations in order to explain my interpretations where appropriate.

My field notes were comprised of notes, a diary, and a log. The notes are writings based on my personal observations. The notes include both content of my field experiences and theory. For instance, I wrote down my first impressions of attitudes towards foreigners among the local residents I met. I then verified these with further observations and interviews, and re-worked my initial impressions. In this way, I sought to have an understanding of the region. These notes include my interview data as well as my observations of the interviewees as they answered my questions. These notes also included my impressions of phenomena which I observed in the sites. For instance, after every interview, I documented how these data supported or refuted my earlier conceptions. This step required tremendous discipline but was a crucial one. According to Macleod, this step can potentially minimize the risk of extended periods of analysis due to time lost in recounting experiences between the fieldwork and the beginning of the actual writing process (Macleod, 1987).

In addition, I kept a diary, which includes details of me as the researcher and the research method I employed. From my very first day in the field, I documented my experiences as honestly as I could. This document is a personal and private account of my first-hand encounters and feelings. Although it would not be made public, it served me well for self-reflexivity as I re-counted my experiences in the study sites.¹¹ Self-

¹¹ As a budding scholar using ethnographic methods, it is important for me to reflex on how I learned in the research process. Much of my learning was obtained from my experiences in the field and how I reacted to those experiences. These experiences of learning by doing become my accumulated knowledge. Although not every bit of my learning is directly related to my doctoral dissertation, every bit is very influential and

reflexivity played an important role in this study because of the ethnographic element in an interpretive case study. According to Schultz (2001), this is a justified approach. The diary also helped me be aware of my role in the data collection as I interpreted my findings. In Chapter Five, I explain how this diary served as a tool in my learning experience as a budding scholar in the field.

In the collection of ethnographic data, it was important to explain and evaluate how the data was obtained given the researcher's role (Van Maanen, 1988). Throughout the fieldwork, my interpretations changed, as with many other ethnographers in the field. Thus, it was important for me, as the researcher, to recount my own experiences and evaluate how my interpretations changed (if at all) with time (Wolf, 1992). These conclusions are based on empirical findings and reflexive interpretations. As argued earlier, they are therefore, generalizable to theory.

It was therefore, important for me to explain in detail how I arrived at the conclusions. In this way, I was able to understand my own interpretations and situate myself within the study sites, and therefore, critique my own analysis. This approach, along with a basic and standard protocol and goal as prescribed by Yin (1989), provided more authenticity to my conclusions and thus, provided further grounds for generalization. Field researchers are their own worst critiques in ethnography (Sanjek, 1990). Therefore, this self-critique process was important to avoid the pitfalls of my interpretation. The last section comprises a discussion of the evaluation criteria used in this dissertation.

Finally, I developed a log as part of my field notes. The log was useful in documenting my own time management. It included appointments of how I spent my

therefore significant to my future undertakings as a scholar engaged in a lifelong process of continuous learning.

time in the field. In general, it shows how a field researcher spends his/her time versus how he/she plans to spend his/her time. This serves as a guide to the field researcher on planning the data collection (Kvasny, 2000). I employed this technique to monitor how my own productivity. This was useful in evaluating my achievements during my period of field immersion. As a budding scholar, it was important to use my data collection as part of my learning process. This would prevent me from making the same mistakes when I re-enter the field for another study. Since I had three study sites, I used my log in one site to derive lessons learned for my subsequent study site. This process proved to be very beneficial in my data collection, as I became more observant and more aware. I document my experiences in Chapter Six.

I used my experiences in living in these regions to draw an assessment based on interpretation. I was careful to be self-reflexive about my interpretations so as to account as much as possible my subjectivities involved in the process.

Coding and Analysis

In my coding and analysis of the data, I reviewed my head notes and field notes. My head notes are my preconceived ideas of the research problem in each study site (Wolf, 1992). These changed through the course of my data collection. However, these changes between my head notes and field notes were important in determining how I compiled and coded my data to field notes. In the spirit of ethnographic research, I situated myself within the research problem and reviewed my intellectual growth as a scholar through the entire process.

In view of this interpretative research methodology, I had to understand not only the development of the sustainable knowledge economy in the three study sites and the

theory generalization of the sustainable knowledge economy, but also how I arrived at the conclusions that I drew through my learning process. As explained, I adopted a self-reflexive approach similar to Trauth's (2000) in the spirit of a confessionist tale (Van Maanen, 1988). The aim of this approach was not to develop universal conclusions. Rather, the aim is to have an authenticate account of my conclusions (Trauth, 2000) by showing how I arrived at my conclusions and giving readers confidence in my results (Van Maanen, 1988).

Following my interview guide in Appendix A, my coding categories were as primarily guided by Trauth's (2000) research on the information economy. I began by looking at the concept of innovation and used the four categorical factors to code my data. These themes were the result of the four categorical factors in Trauth's (2000) Influence-Impact Model: infrastructure, public policy, economy, and culture. In addition, I included an open category in consideration of possible findings that did not fit into the four categorical factors. In this process, I identified overarching themes that contributed to the sustainable knowledge economy in my study sites. This is explained in greater detail in Chapter Five, which discusses the second level of abstraction. More importantly, through the analysis, I explain how they contribute to the sustainable knowledge economy and their dialectical relationships with other facets of the societal context within each region and abstracted across all three regions.

Given the interpretive nature of my research, coding was based on key concepts rather than key words. These concepts surfaced through the data obtained from interviews, observations and documents. From the data, an initial coding process was executed to identify concepts that are relevant to innovation for the knowledge economy.

Subsequently, these were verified through further data collection. Here, the initial concepts identified were further coded into broader categories and analyzed if they fit into the four factors: infrastructure, public policy, economy, and culture. Comparisons were also drawn across the three case studies. The results of which led to 12 common concepts across the three cases. These were termed as common themes, which are discussed in Chapter Four.

This approach of coding based on key concepts is similar to Trauth's (2000) approach to study the development of the information economy in Ireland, where social class, for instance, was coded as allusions to social class rather than the physical words. Since our research fall into similar veins, I adopted this established analytical approach for the coding process. This process constitutes a generalization from a theory to a setting, whereby an established theory is applied to different contexts (Lee & Baskerville, 2003). The theory-based coding enabled me to understand and interpret the findings based on the Influence-Impact Model.

The hermeneutic circle was employed in the coding process. The hermeneutic circle involves the dialectical relationship between the interpretation of the whole and the parts. By going back and forth, an in-depth understanding is achieved about the phenomena studied (Gadamer, 1976). To do this, I employed an iterative approach to go back and forth from the themes and interviewee responses in order to develop my understanding. In this way, I ensured that my conclusions were authentic and had thematic unity. The anomalies were addressed through member checking and further enquiry.

As explained, three data collection methods – in-depth interviews, participant observations, and document review of public documents and statistical data – were employed. As such, I triangulated my findings among the three types of data. I validated conclusions drawn from one method to another. In this way, I drew a richer and more in-depth understanding of the sustainable knowledge economy, through an elaboration of Trauth's (2000) theory. In addition, I conducted member checking exercises to avoid drawing conclusions through preconceived ideas, or head notes. As a confessionist tale (Van Maanen, 1988), I was aware of how I arrived at my interpretations.

Evaluative Criteria

In a qualitative design, the researcher serves as an instrument in the research – the researcher interprets observed behaviors based on assumptions and worldviews (Patton, 2001). This is consistent with the interpretive lens adopted in this research. Since the meanings that human beings create are part and parcel of observed behavior, the researcher's interpretation then, also forms part of these observed behaviors (Lee & Baskerville, 2003).

Therefore, it is important to evaluate the validity of the study. According to Golden-Biddle and Locke (1993), and Walsham and Sahay (1999), there are three criteria that can be used in the analysis to evaluate the transcription of the data to the conclusions. These three criteria are authenticity, plausibility, and criticality, and have been established by leading researchers for ethnographic research (Golden-Biddle & Locke, 1993).

This process serves two purposes – First, it enables the researcher to have a better understanding of the research problem. Second, it allows readers and the researcher to

understand how the conclusions were induced and derived. Together, these lay the foundation for further research.

To achieve authenticity, I ensured that thick descriptions were used to describe the findings in Chapter Four. This process ensures readers that the researcher was indeed immersed in the field to collect the data.

To ensure plausibility, I performed member checking to double check my conclusions with the interviewees and others who are familiar with the research study sites. In addition, I triangulated my findings using data from secondary sources as well as observations. These were done to ensure that I addressed the issues adequately and my interpretations were legitimate.

Ensuring criticality is more complex. Similar to other ethnographic work, this research involved interpreting huge amounts of data obtained through field immersion. There was on-going engagement with the participants in the field. However, to do this effectively, the researcher needs to be aware of being inside and outside of the field throughout the interpretation. According to Golden-Biddle and Locke (1993), and advocated by Walshan and Sahay (1999), criticality has a different status from the other two criteria because in interpretive research, authenticity and plausibility are essential but criticality is not.

Nevertheless, I attempted to achieve criticality by applying Golden-Biddle and Locke's (1993) methods to achieve criticality – by creating new possibilities for examination. In Chapter Five, I discuss how my findings within the four factors were relevant to the development of a sustainable knowledge economy. In the process, I

discuss issues and challenges in terms of how the factors are inter-related with one another. These in turn, form an impetus for further examination and research.

In addition to the evaluation criteria, I performed self-reflexive exercises regularly throughout the data collection and analysis stages to challenge my initial assumptions. These were done through my confessions in my field notes and journal. Given the approach taken by interpretive research, there is a concern about the researcher's own subjectivity. Therefore, it is important that interpretive researchers are mindful of their individual ideologies. Also, the interpretive researcher must question the social origins of the phenomena investigated (Kvasny, 2000). In other words, the data do not play a superficial role. Rather they should be interpreted within their respective contexts and analyzed with keen intellectual critique.

Reflexivity amounts to an important consideration in an interpretive research (Lincoln, 1995). The self-reflexive approach, in accordance to Trauth's (2000) interpretive lens, was adopted in this study. In a similar vein, an evaluation of interpretations was carried out, and in the process, the analytical process involved re-orienting the focus and introducing relevant alternations as the data were being collected in all three study sites. This is in line with the iterative research process as discussed earlier.

This self-reflexive approach is manifested in the form of the confessional tales technique of fieldwork writing. This technique represents the field researcher's experiences in the field, including his/her presence, rapport and contact with the interviewees, and how he/she learned to live within the study site (Van Maanen, 1988).

Reflexivity is important in this research because the researcher is an instrument in the research process (Schultz, 2001). In this way, readers would be ensured of the transparency necessary to establish the authenticity involved in this study (Schultz, 2000). Readers can then assess the credibility of the researcher's interpretation through the researcher's self-conscious interpretations (Schultz, 2001). Self-reflexivity contributed greatly to the evaluation of my learning process throughout the research.

CHAPTER 4. FINDINGS

In this chapter, I¹² discuss the common themes across all three regions that are related to sustainability of the knowledge economy. As I discuss these overarching themes for each region, I interlace my interview findings with data from other sources where appropriate – public documents, personal observations and publicly available statistics. The structure of this chapter is organized around the four factors in the Influence-Impact model – infrastructure, public policy, economy, and culture, since the study was guided by this model and constitutes an elaboration of it to the sustainable knowledge economy.

Before discussing the findings in this fashion, Section 4.1 presents an overview of all three regions in terms of their economic, political, and cultural make-up. These three regions were selected for cross-region analysis because of their markedly different economic, political, and cultural contexts, as well as their different stages of economic development. Singapore is an advanced knowledge economy, Ennis is attempting to replicate Ireland's success with the development of its information, and San Joaquin is actively channeling development efforts to develop its agriculture-based economy to a knowledge economy.

The first region, San Joaquin Valley, is geographically located in Central California. Its dominant industry is agriculture. In its population breakdown, 53 percent are of white origin, 34 percent are Hispanic, eight percent Asian/Pacific Islander, four

¹² I chose to write in the first person in this chapter. This allows me to express my findings in a personal way, given that the data were collected during my immersion in the field. Especially since there were observational data involved, this approach appears to be most appropriate to give a clear and thick description of the themes.

percent African American, and one percent native American (Cowan, 2005). As explained in Chapter Three, it is also a region targeted by the Californian Government for high-tech development. Ennis, located in western Ireland, is a small town that was selected as a town for the Information Age Town Project in 1996, and spanned five years from 1997 to 2002. It was deemed as the largest community technology project in the world (eircom, 2000). Through the course and completion of the project, Ennis grew from a traditional town to one that was still small, but growing, town. Ennis is located at a geographic center of neighboring industrial areas, such as Shannon, Limerick, and Galway. Singapore is a small country in Southeast Asia. It grew from a small fishing village in the 1800s to a bustling port upon becoming a British colony. Having obtained its independence from British colonial rule in 1965, it is an information technology hub in the 21st century, actively attempting to sustain its growth amidst global competition.

Common themes were found across these regions to be relevant to the sustainability of a knowledge economy. As an interpretive study, this chapter discusses *how* they are manifested and are important to their respective regional development. Since innovation is used as a proxy for the knowledge economy in this research, the following section, Section 4.2, comprises a discussion of the state of innovation creation in all three regions. The discussion in these two sections laid a foundation, upon which the themes (findings) were interpreted for purposes of this dissertation.

The themes, discussed as findings, in this chapter are common across all three regions. The discussion of these twelve themes was structured in accordance to the Influence-Impact Model. A summary of how they were categorized is given in the following table.

Table 3: Organization of Themes According to the Influence-Impact Model

Influence-Impact Model	Themes (Findings)
Infrastructure	Industrial Infrastructure Information Infrastructures Human Capital Development
Public Policy	Regional Economic Leadership Economic Development Strategies
Economy	Up-Skilling Isomorphism
Culture	General Drivers Social Inclusion Diversity Learning Contexts Social Tension

In the course of my data collection and analysis, I found that these themes were manifested in different ways in each region, but were common because they were found to relate to the sustainability of a knowledge economy. These themes were induced through my data collection methods – interviews, observations, as well as public and private documents. As explained in Chapter Three, these findings from San Joaquin Valley were obtained in two phases – During my preliminary field trip in the summer of 2003, which served as a precursor to my follow up data collection periods, and seven separate trips in 2005, because of my physical residency in Los Angeles, which is a three-

hour drive away from the center of San Joaquin Valley. Findings from Ennis were obtained through two separate field trips in the summer and fall of 2005. As for Singapore, I grew up there and collected data during my home visits in the summer and winter of 2004 and subsequently over the phone in 2005.

In all three regions, initial findings were based on key informants, whom I interviewed using an evolving interview guide developed from Trauth's (2000) factors from Influence-Impact Model. Following that, these findings were examined and interpreted further, and investigated through follow-up interviews, observations, and document reviews. The next section provides an overview of each of the three regions. This includes a brief history, and their social and economic profiles. The subsequent sections present the 12 themes under the four factors of the Influence-Impact Model.

Regional Overview

The following three sub-sections provide an overview of the three regions in this study. The areas covered in each region include a brief historical overview, economic situation, and their respective political orientations.

The regional overviews also include key universities in each region. Universities constitute an important node in the process of innovation creation (DeVol & Bedroussian, 2006). One of the ways in which they play this important role is their ability to draw human capital – they attract faculty, researchers, students to their education and R&D programs, as well as entrepreneurs and firms to locate their operations nearby (Florida, Gates, Knudsen, & Stolarik, 2006). Using Pittsburgh as an example, the proximity of Carnegie Mellon University and the University of Pittsburgh in the city influenced Google's decision to build an office in Pittsburgh to leverage the available human capital

and research excellence (Wong et al., 2006). In all three regions, there are top universities that play this major role not only through their research and development, but also through their educational programs to produce the human capital needed to fuel the knowledge economy. The key to sustainability then, is to continuously produce this high quality human capital, termed talent by Florida (2002) and develop patents to be commercialized.

San Joaquin Valley

San Joaquin Valley is located in central California. The Valley is mostly flat and broad, and is bounded by the Sierra Nevada foothills on the east and the Diablo and Coast Ranges on the west (California Environmental Resources Evaluation Systems, 2003). There are nine counties in the Valley: Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, and Tulare, with Merced city in the north and Bakersfield city in the south. Fresno city in Fresno County lies in the center of the Valley, and is considered the center of economic activity within the Valley.

San Joaquin Valley was discovered in 1808 when a Spanish Army Lieutenant named Gabriel Moraga traveled to the region on his way to San Jose to find more sites for new Spanish Missions. The Lieutenant gave the region the name San Joaquin originated from Saint Joachim, the father of Mary, the Virgin mother of Jesus Christ (Virtual Lodi California, 2003).

The agriculture industry began in 1847 when the first grapes were grown in Lodi, and it blossomed in 1855. Importantly, the successes were not dampened to a large extent by the Great Flood in 1862. Subsequently, other crops like potatoes and tomatoes were added (Virtual Lodi California, 2003).

In 1869, growth in the region was propelled by the construction of railroads as a key transportation infrastructure. This was even further enhanced by the construction of the Interstate Freeway Number 5 in 1979. The Stockton telephone company was established in 1881 to enable telecommunications linkages. In addition, the first local newspaper – the Stockton Record, was set up in 1895 (Virtual Lodi California, 2003).

In 2000, the unemployment rates in the nine counties in San Joaquin Valley were on average about twice the California state average between 1996 and 2000 (Milken Institute, 2002). According to Cowan (2005), many counties in the Valley did not succeed in reducing their unemployment rates towards the end of the 1990s. At the same time, California prospered as a State. Between 1980 and 2005, the population growth rates in the Valley were higher than the Californian and U.S. averages. Poverty rates were also higher than California and the U.S. in 2000. Six metropolitan statistical areas (MSAs) in the Valley ranked among the bottom 20 percent of all MSAs in the U.S. in terms of per capital income (Cowan, 2005).

In terms of education, the first public schools in San Joaquin Valley were established in 1850. Today, California State University in Fresno (CSUF), University of California at Merced (UC Merced), and San Joaquin Valley College stand out in the San Joaquin Valley as the top colleges within the Valley (San Joaquin Valley History, 2003).

The CSUF offers a curriculum of the Industrial Technology Program as a discipline associated with implementing, operating, and continuously improving systems of machines, materials, and processes, as well as financial, human, and energy resources (California State University Website, 2003). The discipline emphasizes the integration of technological management knowledge with leadership skills. Graduates are trained to

help manufacturing/processing industries achieve desired goals efficiently and with appropriate concern for the environment, ethics, quality, and human diversity (California State University Website, 2003).

The mission of the program is to develop the managerial and technical knowledge of individuals by transferring and sharing the most recent technology and practices through cooperative efforts with industry, government, and other educational institutions. The program encourages research and problem-solving, and provides services to the public, business, and industrial sectors (California State University Website, 2003).

The University of California at Merced (UC Merced) was established in September 2005 as the 10th university in the University of California system. It is a research university aimed at student-centered learning. There are currently three schools – The School of Engineering, School of Natural Sciences, and the School of Social Sciences, Humanities, and the Arts. It is still a small and growing university, with a student population of 1,200 as of January 2007 (University of California at Merced (UC Merced), 2007).

The San Joaquin Valley College is an accredited private junior college in the region. It offers degree and certificate programs in business, medical and technical disciplines (San Joaquin Valley College, 2007). At present, it is the only tertiary education institution in San Joaquin Valley offering programs related to medical fields. These are the associated degree program in Medical Office Administration and certificate programs in Medical Assisting and Medical Office Administration (San Joaquin Valley College, 2007). However, there has been talk about plans to establish a medical school at UC Merced.

Ennis

Ennis, which is a short form in Irish for “Long Rowing Meadow Island,” is a small town in Western Ireland in County Clare. Based on statistics from the central Statistics Office of Ireland, Ennis had a population of 20,000 people in 2006 (Brinkhoff, 2006). This is a small growth from 18,000 in 2002 (Clare County Library, 2006b). Ennis is located at the center of roads that lead to major cities such as Limerick, and Galway, as well as the newly developed town of Shannon. Leveraging its strategic geographic location, it was an important town in western Ireland (Shannon Region, 2006).

Ireland was first established as a civilization in the 4th century B.C., when the Celts arrived to assimilate the native inhabitants. In the 12th century, the Pope, awarded Henry II of England all of Ireland and acknowledged him as the Lord of Ireland (Pearson Education, 2007). In 1801, the Act of Union was enacted by the English to officially integrate Ireland under British rule (Dinan, 1987).

Ireland was established as a free state in 1922, after resistance through the War of Independence in 1921 against the British (Trauth, 2000, p.27). However, six counties in Northern Ireland remained under British rule (Pearson Education, 2007). Ireland became a republic in 1949 when it withdrew from the Commonwealth and established its own sovereignty. In 1973, the Ireland joined the European Economic Community and became a part of the European Union as we know today. The First Programme for Economic Expansion in the Republic of Ireland went from 1958 to 1963. It encouraged foreign investment and prosperity was achieved decades later as its information economy grew. Ireland then became one of the most technologically advanced countries in Europe. With

this rapid development and its Celtic historical roots, Ireland came to be known as the Celtic Tiger (Pearson Education, 2007).

In the 1920s, Ireland's economy was largely agrarian (Trauth, 2000, p.26). According to Trauth (2000), one strategy that fueled the growth of Ireland's information economy from its agrarian base, was the decision by Irish policymakers to attract foreign industries in pharmaceuticals, chemicals, and electronics, that is, manufacture of computer hardware. These were high growth industries that were independent of natural resources which were scarce in the country (Trauth, 2000, p.32).

Subsequently, the information technology industry grew in the 1970s and "significantly expanded in the 1980s" (Trauth, 2000, p.32). Through the decade, policy changes were executed to facilitate other information sector work such as software development and information services. This development marked Ireland's development from a "traditional agrarian to (a) state-of-the-art information econom(y)" (Trauth, 2001, p.74).

The development of Ennis dates back to 1240 when the Franciscan Order of the Catholic Church was established by Donnchadh Caribreach O'Brien (Go Ireland, 2006). With its religious roots, it served an inflow of students who sought to study theological studies from the Friars at the local Abbey. The inward migration worked to the town's advantage. Ennis subsequently grew as a market town because of its geographical connectivity to Galway and Limerick. When County Clare was under Queen Elizabeth I of the English rule, Ennis was chosen as Clare's capital because of its central position (Clare County Library, 2006a). The town began to hold fairs and markets in 1610, from

which it grew to a market town with manufacturing and distribution activities (Clare County Library, 2006a).

Ennis is located near the Shannon International Airport. In the 1950s, every passenger plane that flew between the U.S. and Europe had to stop at Shannon Airport for refueling (McInerney, 2003; Shannon Airport, 2007). Shannon International Airport also had the first duty-free shop in the world to cater to transiting passengers in 1947 (Shannon Airport, 2007). With these developments, Shannon International Airport became a gateway for transatlantic flights. Shannon Development (formerly Shannon Free Airport Development Company) was also established in 1959 to become Ireland's only regional economic development organization. Its efforts were focused on economic development and tourism in western Ireland (Shannon Development, 2006b). Shannon Development played an active role in fostering industrial growth through businesses and incubators in western Ireland. Large development projects such as the Shannon Industrial Estate brought growth to the region, including old towns such as Ennis (Dinan, 1987).

Based on the 1996 census, Ennis was among the deprived areas with high rates of unemployment in Ireland. Related problems in Ennis included drug addiction, skills deficiencies, homelessness and endemic crime (Southern and Eastern Regional Assembly, 2006). However, after the Information Age Town project started in 1997, it was markedly different. In 1999, almost a third of residents surveyed in a skills survey had a third-level qualification (tertiary education). The unemployment rate was 4.3 percent in 2000, which was equal to the national average then (eircom, 2000).

Ireland became known as a Celtic Tiger after it leapfrogged from an agrarian economy to an information economy (Trauth, 1999; Trauth, 2001). The Celtic Tiger is a

term that refers to the strong economy that came as a result of several factors such as the country's investments in telecommunications and education (McInerney, 2003). However, according to McInerney (2003), prior to the Information Age Town Project, the Celtic Tiger did not directly lead to the development of an information sector in Ennis, compared to the rest of Ireland, despite the country's overall rapid growth in its information economy.

When Ennis was selected in 1997, among several Irish towns, to participate in the Information Age Town Project, it received \$25 million to build the necessary infrastructure so as to become an Information Age town (McInerney, 2003; eircom, 2000). The project enabled businesses, schools, and the local government to use information technology for their operations (McInerney, 2003).

The project can be seen as a major development initiative for Ennis. It educated the population on the advantages of utilizing information technologies, as well as helped develop an understanding of their activities (McQuillan, 2000). Although the town is still a medieval-looking town with businesses run by local residents (McInerney, 2003), the project helped lay the foundations for knowledge work.

In general, Ireland recognizes the importance of a culture of innovation in science and technology, which is pivotal to the knowledge economy. The government thus, established Science Foundation Ireland as a key node to achieve this goal with a €2.5 billion investment in Research, Technology Development and Innovation (RTDI), which is part of its National Development Plan (NDP 2000-2006) (Science Foundation Ireland, 2006). Culturally, education is seen as an important facet. As of 2006, 91 percent of secondary schools in Ireland participated in the free education scheme, which is aimed at

providing technical education (Education Ireland, 2006). Many key informants remarked at the importance of educating the young and making sure that their skill sets are on par with today's economy.

Ennis is served by Limerick and Galway to fulfill its higher education needs. The key universities are the National University of Ireland at Galway, and the University of Limerick. In addition, there are two key institutes of technology – the Galway Institute of Technology and the Limerick Institute of Technology. These establishments of higher education are geographically close to Ennis and are easily accessible by bus and train. They are about an hour's commute from Ennis. The proximity of Ennis to the key universities and Shannon Development form a basis for industrial clusters where faculty members can develop research links and collaborations with the industries.

The focus on engineering and technology at the Limerick Institute of Technology and the Galway Institute of Technology can enable Ennis to play an important role in the information economy of Ireland. The National University of Ireland at Galway also has a high regard for research and development. It places a high priority on technology transfer through its development of research institutes such as the Regenerative Medicine Institute (RMI) and the Digital Enterprise Research Institute (DERI) (National University of Ireland at Galway , 2007). Similarly, the University of Limerick leads Lero, a research partnership of the academia and industry to address challenges that have implications on the software industry in Ireland and beyond. This partnership advances engineering research for innovative software solutions (Lero, 2007).

Singapore

Singapore was a fishing village before it was founded by the British East India Company in 1819 (Lam, 2007). Its name originated from Singapura, which means *Island of the Lion*. Following its founding, under the direction of Sir Stamford Raffles, Singapore became a British crown colony in 1867 (Lam, 2007). In the process, it grew from the fishing village it once was to a vibrant port. Singapore was removed from the British rule in 1963 and was joined to Malaysia (formerly named Malaya).

In 1965, Singapore was separated from Malaysia and gained its independence as a result. Subsequently, under the leadership and direction of the elected People's Action Party, Singapore's economy developed quickly to have leading semiconductor, oil refinery, and finance industries, among others. It is also a major hub in information and communications as well as a major link for major airline and shipping routes. Today, Singapore is an important center for transportation, education, high-tech, and financial activities (Lam, 2007). It also enjoys prosperity and growth comparable to leading economies of western Europe (CIA World Factbook, 2007).

The political environment in Singapore can be said to be highly paternalistic (Yeo, 2002). Decisions are mostly made by the government. The system has worked since Independence, given Singapore's remarkable economic achievement over the last four decades. Its economic achievements can be explained at least in part by its top-down political system (Yeo, 2002).

Among its resident population, Singapore enjoys a low unemployment rate of 3.6 percent in 2006 (Singapore Department of Statistics, 2007). The government has imposed compulsory education for every Singaporean for six years (Ministry of Education

Singapore, 2004). Among residents aged 15 and above, the literacy rate was 95.4 percent in 2006 (Singapore Department of Statistics, 2007).

Singapore was among the four Asian Tigers – Hong Kong, Taiwan, South Korea, and Singapore, or sometimes called four little dragons by the Chinese community. These countries were given the title because of their high growth rates and rapid industrialization from the 1960s to the 1990s (Vogel, 1991). The four countries based their economic growth during the period on export-oriented model of development (Namazaki, 1998). As such, domestic consumption was discouraged with high government-imposed tariffs.

Singapore is known for its successful economy despite its short history. It has a reputation of a free-market economy and a corruption-free political climate. The export-oriented economy is focused on information technology products (CIA World Factbook, 2007). Therefore, it was prone to economic downturns as a result of the decline in the technology sector globally. In addition, the economy was considerably slowed down in 2003 by the outbreak of the Severe Acute Respiratory Syndrome (SARS), which led to a decline in tourism and consumer spending (CIA World Factbook, 2007).

However, Singapore's economy recovered quickly in the subsequent years with top-down strategic planning and intervention (Toh, 2006). In the strategy, biomedical engineering was an important contributor to its recovery (Toh, 2006). The government hopes to maintain Singapore's competitive position as a financial and high-tech hub. However, new growth paths have to be looked into to lower the economy's reliance on information technology (CIA World Factbook, 2007). Pharmaceuticals and biotechnology may be possible industries to focus on.

Like the Asian Tigers, Japan and China, Singapore shows its emphasis on education, and thus human capital (Federal Research Division of the Library of Congress, 2006). This is especially important to Singapore in view of its lack of natural resources (Toh, 2006). Singapore provides tertiary education through three universities: The National University of Singapore (NUS), Nanyang Technological University (NTU), and more recently, the Singapore Management University (SMU).

Technology transfer offices are available at NUS and NTU. These are known as INTRO and ITTO respectively. They were set up to catalyze commercialization opportunities and facilitate interaction between academia and industry. Similarly, the commercial arm of A*STAR, Exploit Technologies Pte Ltd., facilitates industry access to innovation within research institutes (Biomedical Sciences Initiative, 2005).

Singapore takes a structured approach towards education. There are little replications of curricula among the universities. For instance, the biological sciences discipline is only available in the NUS, and the School of Communication and Information is only located at NTU. The business schools in the NUS and NTU have different foci. The former is a more general form of business-related studies while the latter is more specialized in specific areas like banking or economics, among others. While programs at NUS in general were more focused on science and arts, programs at NTU were more engineering-focused. Increasingly SMU, established in 2000, is becoming the key university for information systems and business related studies. It was modeled after the Wharton School of Business at the University of Pennsylvania, which participated in the formulation of SMU's programs (Singapore Management University, 2006).

Infrastructure

For purposes of this study, the definition of infrastructure follows Trauth's (2000) definition in her study of the Irish information economy.¹³ Under this definition, infrastructure consists of both physical and human infrastructure. Physical infrastructure refers to information and telecommunications, as well as industrial infrastructure, while human infrastructure refers to human capital. The following table summarizes the themes discussed under infrastructure.

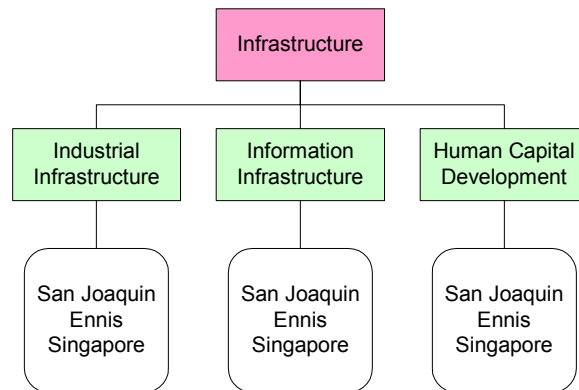
Table 4: Themes under Infrastructure

Factor	Themes (Findings)
Infrastructure	Industrial Infrastructure Information Infrastructures Human Capital Development

The relevance and implications of these themes are discussed in turn in three sub-sections. Each of these sub-sections will have three further sub-sections, each discussing the relevance of each theme in its respective region. The following diagram illustrates the organization of the discussion on Infrastructure.

¹³ Since this study was largely guided by Trauth's (2000) work on Ireland, the data collection and findings were largely based on her Influence-Impact model. Hence, it follows that the definitions were also based on her work for consistency.

Figure 11: Organization of Discussion of Infrastructure



Industrial Infrastructure

The availability of industrial infrastructure is an essential component of any economy for growth. Although industrial infrastructure comprises electricity and transportation, among others, water was a common theme that occurred through the interviews, but manifested in different ways. Under this theme, the meaning of water as an instance of industrial infrastructure was explored in each region. For purposes of this discussion, the findings related to water were abstracted to the theme of industrial infrastructure. This represents a generalization from empirical findings to the theoretical level (Lee & Baskerville, 2003).

Industrial Infrastructure: San Joaquin Valley

California produces the most agriculture outputs as a state in the nation. Agricultural receipts in 2002 totaled \$27.8 billion. Among the top 10 agriculture producing counties in California, seven are in the San Joaquin Valley (Redmond, 2005). California's large farms play a huge role in setting state and national policies around food and farming. Most of the land around the Valley are farmlands and devoted to agriculture.

These pieces of land are owned by local farmers who grow various crops. In order to boost the economy (including an IT-based economy), land was used for construction to attract anchor players into the Valley.

However, in San Joaquin Valley, the problem of land and water was perceived as a barrier to economic development. In the strategic action to address infrastructural weaknesses in the Valley, water as a part of industrial infrastructure was also identified as a challenge to regional growth (Economic Development Work Group, 2006). These translate to two inter-related problems: first, the purchase of land from the farmers who own them; and second, the purchase of water to make the purchased land useful. The Government finds it difficult to purchase land from farmers, because the farmers are unwilling to let go of their land. They understand that if they hold on to the land, the value will appreciate in due course. The only reason they would sell off their land is to relieve themselves of the burden of property taxes. As such, land acquisition for construction is slow.

At the same time, even if the Government manages to purchase the land, it may not have rights to the water underneath it. The farmers who originally owned the land could either have sold the water rights to someone else, or could have bought their land without water rights. If the farmers have been using the land to grow grapes, for example, they would not require as much water as other crops. But for construction, water is crucial. As such, being able to access water is another problem.

The necessity of water in San Joaquin Valley is more than an industrial problem. One informant explained that the *poor environmental conditions [Key Member of Development Organization]* in the Valley require more use of water. According to a

report from the San Joaquin Valley Air Control District, the region does not meet the health standards set by the United States Environmental Protection Agency given its level of pollution. In addition, it is also currently classified as a “severe non-attainment for the California ozone standard” (Valley Clean Air Now, 2006). Its climate is also hot and dry with afternoon temperatures going beyond 100 degrees Fahrenheit. Water resources such as Kern River and the Tulare Lake have dried up and terminated. The waters that led to these resources have been diverted for irrigation (Parsons, 1987). More recently, efforts have been made to govern the allocation and use of water. One example is the proposal to use the CALVIN water system, an engineering-economic optimization model, to show the benefits of water re-allocation and use in California (Ritzema, 2002). Based on the results of the model, the sensitivity of San Joaquin Valley’s agriculture to its warm and dry climate warrants water policy re-consideration to create a more strategic distribution and use of water as a scarce resource (Lund et al., 2002).

One proposed solution to the water crisis is a more coordinated effort involving alliances and partnerships among non-profits, businesses, and representatives from various sectors of the food system, the media, health, food security, and community development (Redmond, 2005). The strength of these partnerships however, depends on the mutual understanding of the Valley’s common values and shared interests. This points again, to the need for a coordinated leadership to resolve this issue so as to develop a viable industrial infrastructure for agriculture as well as other industries. Water then, continues to be relevant even in the knowledge economy. This will lay the foundation for innovative work associated with agriculture.

Industrial Infrastructure: Ennis

The infrastructure for the supply of safe drinking water appeared to be a challenge for Ennis in June 2005. Safe drinking water was not readily available from the tap. In 2005, there were reports of three outbreaks of cryptosporidiosis in Carlow, Ennis and Roscommon. This disease is caused by a parasite called *Cryptosporidium* and was associated with the drinking water (Office of Environmental Enforcement, 2005). Thus, the government advised the population in the region to avoid drinking tap water. Shortly after I left Ireland in July 2005, the issue of unsafe drinking water was resolved by the authorities. However, in September 2005, the water was declared unsafe for drinking again for the second time (Deegan, 2005). This time, the government allocated funds to rebuild the water treatment system. The entire project was estimated to take up to two years and would cost close to what it took to develop Ennis as an information age town.

This lack of safe drinking water was deemed as a problem for the attraction of businesses to Ennis. The availability of a viable industrial infrastructure is a necessary condition for the development of high tech industries. The Ennis residents I encountered and interacted with appeared to be defensive of the situation, and they did not seem to perceive this as a major problem for economic development. There was also a sense of trust that the local government would resolve the issue. However, the citizens of Ennis seemed to be more defensive of their town than others who did not reside in Ennis. One informant was particularly critical about the lack of safe drinking water in an Information Age Town.

Although the Ennis residents (including businesses) acknowledged that this poses a problem to industries, they did not seem to want to discuss this further. Furthermore, I

noticed that many tended to change the topic. During my interviews, I had to deliberately bring the topic back to the water issue so they could elaborate on their experiences.

During my return to Ennis in mid-September 2005, the water was declared unsafe for drinking again. This time, I noticed that the residents were more open to discuss the quality of safe drinking water because I did not have to deliberately bring the topic back into our conversations. The news on the quality of drinking water was salient to the public.

The water treatment system was perceived to be the root cause for the lack of safe drinking water (Deegan, 2005). In 2005, the monitoring of water supplies in Ireland was lacking. According to Ireland's Office of Environmental Enforcement, 65% and 41% of public group water schemes and private group water schemes respectively, were not actively monitored (Office of Environmental Enforcement, 2005). The efforts to rectify the water treatment and monitoring system suggested that the severity of the problem was enough to justify the high costs associated.

Industrial Infrastructure: Singapore

Singapore lacks natural resources. But it compensates this with its high levels of economic activity (IExplore.com, 2007). Human capital in Singapore then, becomes an important resource for its economy (Federal Research Division of the Library of Congress, 2006). Although Singapore has its own reservoirs and adequate annual rainfall, the amounts are insufficient to support the local demand. Thus about half its water supply is dependent on Johor, Malaysia, a country north of Singapore (Mauzy, 2006; Leslie, 2004).

As such, in 1927, a water treaty was signed with the Sultan of Johor. This treaty enabled the country to obtain water from Johor. In 1961 and 1962, two agreements were further made to allow Singapore to maintain its waterworks infrastructure in Johor and guarantee Singapore with a fixed amount of raw water until 2011 and 2061 respectively. Upon treatment, Singapore sells the processed water back to Malaysia (Mauzy, 2006).

A report by Planetary Engineering Group Earth (PEGE) illustrates how water can be a shortage in Singapore's future. In 1995, the researchers found that 180 cubic metres of water were used by each of Singapore's 3.33 million inhabitants. They predicted that Singapore's population will increase to 4.19 million by the year 2050 (Planetary Engineering Group Earth (PEGE), 1996). This would increase the demand for water.

However, Singapore's population size in 2006 was 4.6 million (Singapore Department of Statistics, 2007). Therefore, the Planetary Engineering Group Earth's early estimation of Singapore's projected population was conservative. The PEGE perceived a shortage in Singapore's water resources based on its population growth. The unprecedented growth in Singapore's population without a corresponding solution to the water resource challenge implies that water shortage is becoming a bigger issue.

Dependence on Malaysia for water may not be a long term solution. According to Mauzy (2006), there have been at least 37 violent conflicts between the two nations since then (Mauzy, 2006). The motivation of these conflicts was Malaysia's accusation of Singapore making profits from the sale of processed water (which was originally purchased from Malaysia) back to Malaysia. As a result, the Singapore government is calling for reduced dependency on Malaysia for this scarce natural resource (Mauzy, 2006).

For purposes of this dissertation, the discussion is focused on the relevance of water to the sustainability of its economy, including its knowledge economy. Fresh water is an economic resource and is vital for life. Therefore, it is a fundamental industrial infrastructure whose vitality is crucial.

While Singapore attempts to develop its human capital to remain competitive in the knowledge economy (thereby sustaining itself), basic industrial infrastructure such as water poses a challenge to the economy. Some proposed solutions are desalination of sea water, purification of waste water, and enlargement of existing water catchment areas (Mauzy, 2006). These active initiatives involved in addressing the water issue suggest the continued importance of water to its growth as a knowledge economy.

Information Infrastructure

The knowledge economy is premised on knowledge work that may leverage the use of information technologies. Thus, governments in all three regions have channeled some of their efforts towards the development of information technological infrastructures to support knowledge work.

Information Infrastructure: San Joaquin Valley

A summary of Internet services available in San Joaquin Valley is given in Appendix B. One informant shared his optimism about the development of IT-based industries in Fresno County based on two main arguments. First, there is an increase in the use of the high-end services in Fresno County. Many organizations have adopted the fast connections in their operations. And second, there are several training programs and seminars that offer support to users who are not aware of the advantages of these services.

Pertaining to the use of high end services in Fresno County, the following examples were cited, among others, as milestones of IT deployment:

- Fresno County is the first county in California to deploy the GigaMAN service. This was initiated by the local Government. It will be utilized for primary services and to back up the entire network
- Fresno County Office of Education has utilized DS-3 and T-1 services for instructional and business services
- The San Joaquin Valley Library System has installed DS-3 and T-1 for booking reservations, business applications, and to provide Internet services to users
- The St. Anges Hospital, the Chamber of Commerce, and the Latino Network are some examples of organizations using video over telephony today.
- In Fresno/Clovis, there are at present:
 - 7 5ESS digital switching offices
 - 212 Fiber hubs/remote terminals
 - 392 miles of fiber sheath
 - 28,224 miles of fiber strands
 - 205,947 households passed by DSL
- Advanced electronics allows the SBC to deliver high speed services to residential and small business customers over reliable copper facilities – for example, DSL and T-1. In addition, the fiber-optic cable brings customers greater bandwidth when needed – for instance, DS-3, OC-3 and above.

Some local businesses do not perceive the need for organizational information systems such as enterprise systems because they find it difficult to justify the high initial

investment. Some of those I have encountered, who have deployed similar systems to manage their businesses do not exploit the full potential of their capabilities. As an example, many rely much more on the telephone, and are slow to reply to emails. Many informants have explained that they prefer the telephone to email, even though email has a benefit of making one-to-many communication more efficient and effective:

I prefer using telephones. They are faster and more reliable, and I know right away what's going on [Business Owner/Professional].

This finding suggests that the use of information technology in San Joaquin Valley may have encountered cultural barriers. Several key informants suggested that there may be a lack of a market drive towards an IT-based economy due to inertia – the local Government and businesses do not wish to increase the current low overhead costs. However, there were three reasons from their responses that informants say may lead to an increased use of information infrastructures for knowledge work. First, the metropolitan coastal areas (i.e. Silicon Valley) are running out of space and are pricing themselves too high. Hence residents are starting to move into the Valley for cheaper costs of living.

Second, some residents perceive that there is a good quality of life in Fresno. Thus similarly, there is a migration trend of the affluent from the coastal regions. However, this migration involves mostly retirees. Quality of life refers to the subjective experience that life is good, meaningful, and satisfying. On a phenomenological level – the realm of individual subjective experiences – many people can attest to perceiving their lives as fulfilling and satisfying as opposed to degrading and despairing. Furthermore, many people can point to particular conditions that are conducive to

experiencing their lives as "good", including such things as safe and pleasant surroundings, economic security, social relations, and enjoyable pursuits (Sylvestor, Voelkl, & Ellis, 2001).

And third, businesses want to lower their overhead costs. Thus some move their operations from the more expensive coastal regions into the Valley, to leverage the low costs of labor especially. Since the existing political climate facilitates the maintenance of this situation, businesses can be assured of low labor costs. With the migration of businesses and residents, the SBC believes that they will bring demand of IT services and this will boost the industry.

The low labor costs will be an advantage to the region's economy. This is opposite of what some believe as a disadvantage [Key Member of Development Organization].

On the other hand, some informants argue that there is little likelihood of a high-tech environment in San Joaquin Valley within the near future.

There is persistent unemployment and higher education is not readily available to the farm workers (who constitute the poorer segments of the population). These problems must be solved first [Key Member of Development Organization].

I don't think the Valley can develop a high tech industry base, not in the near future. I only deal with international businesses, not local (those in the Valley) ones. I live here only because my wife is retired and likes the peace here [Business Owner/Professional].

Furthermore, an often cited reason for in-migration from the outside regions is the low cost of living in San Joaquin Valley (Public Policy Institute of California, 2004). It can also be said that this is the same motivation for residents to remain in the Valley. In addition, the more educated segment of the population (high school graduates and above) leave the valley because of a lack of education and employment opportunities (Public Policy Institute of California, 2004). This segment of the population are more likely to demand higher value services (knowledge services) and are more likely to contribute to knowledge work because of their higher education. Therefore, this finding suggests that the migration pattern acts as a possible social barrier to the leverage of the information technology capabilities in place.

The case of information infrastructure in San Joaquin Valley is one where the availability of infrastructure alone may not be the sole determinant of growth in its economy, including knowledge work for the knowledge economy. The cultural barriers present challenges for this development. However, the migration patterns of residents may provide answers to how knowledge work and services can be introduced and sustained for the knowledge economy. The characteristics of the population can possibly determine the demand on knowledge services and work.

Information Infrastructure: Ennis

According to McInerney (2003), there was little industrial development in Ennis until it won the competition to become part of the Information Age Town project (McInerney, 2003) It resembles a “medieval town” comprising local businesses that cater to a rural community (McInerney, 2003, p.10). The premises surrounding Ennis are farms, castles, and accommodation establishments targeting tourists (McInerney, 2003).

The Information Age Town Project task force helped implement information infrastructures and enable businesses to use these information technologies to make their operations more efficient and effective. As part of the project, information technologies were also introduced into the school curriculum to enable students to understand and use them effectively. At the same time, information infrastructures were built to enable these users to take advantage of these technological capabilities.

In 2000, Ennis had the highest household computer ownership in Europe. Eighty-three percent of Ennis' households have multimedia-enabled computers, and 91 percent of these have activated an Internet account. Among which, 45 percent had at least one active Internet user (eircom, 2000). Ennis is involved in the following high technology trials – Wireless Application protocol (WAP), ADSL (Asymmetric Digital Subscriber Line), and AODI (always on Dynamic ISDN). As a partner of ODIN, an EU project, Ennis is involved in developing third generation technologies and WAP-enabled content. These new technologies are aimed at furthering Ennis' status as an Information Age Town to a leading player in innovation (eircom, 2000).

Local residents in Ennis have access to the Internet at their homes. It is not difficult to subscribe to Internet access as costs have been reduced – it costs \$1.32 per hour during peak hours (8am-6pm), and less than 50p during off peak hours (The Clare Champion, 1998). However, one professional explained that metered use of the Internet can potentially discourage extensive use. Many developed countries have unlimited high speed Internet access packages that allow users to be always connected. In response to this need, Ireland Offline is a voluntary organization aimed at campaigning for flat rate

unmetered Internet access that is affordable to users (Ireland Offline, 2006). Its official website documents the efforts of the organization.

Public Internet access however, was targeted mainly at tourists. I was told that these comprised mostly of backpackers, who travel through Ennis and needed to find out more about accommodation options and plan their tourist itineraries, rather than businessmen and professionals. Using several machines during my stay in Ennis, I noticed that a majority of the browsing history contained websites related to flights, accommodation, and tour information.

Among the three major hotels in the city center, one had Internet access in their guest rooms, and was only available in one out of the four buildings. I scouted the town to pursue this lead and found that public Internet access was somewhat limited in the town, although I noticed more avenues for Internet access in my second trip than my first trip. There were only three public places that provided public Internet access – the public library, two Internet cafes, and the youth service club. This observation possibly supports the finding that public Internet access was targeted at backpackers who are not likely to put up at hotels. Rather, hostels and bed and breakfast inns were preferred because of lower costs. Therefore, Internet access in hotels may not have been seen as a priority. However, one business owner remarked that his guests were increasingly demanding Internet services in their hotel rooms. He saw this as an important push factor to make access to these services convenient to his guests.

On the business front in Ennis, not all businesses have access to the Internet in their offices even though they maintain their own websites. For instance, some of them may have websites that enable online sales. However, access to their own websites may

not be available in their offices. For anonymity, I will not list these specific business websites. These business owners expressed that they do the maintenance at their homes. They expressed that they prefer to conduct their businesses in their traditional ways without dealing directly with the Internet.

The concept of an information age town has to be interpreted in relation to its context. One researcher described the Information Age Town project in Ennis as a *failure* because of *limited use of the Internet (among businesses and individuals)* [Academic/Researcher]. According to Eircom, the Information Age is "one in which economic and cultural life is critically dependent on information and communications technologies and where people get the full benefits of that technology at work, at home and at play" (Mc.Quillan, 2000, p.13). However, this researcher explained that businesses in Ennis are not fully utilizing the technology that was built through the project.

But at the same time, another researcher deemed it as a *success* [Academic/Researcher] because it facilitated the development of technological infrastructure and portrays Ireland as a continued success story after its rapidly developed information economy. In this success story, the project was the largest technology community project in the world (eircom, 2000). Businesses and individuals learned about the possibilities of using these technologies. One local business owner explained that the project was successful because of the lessons learned about his own operations. With the implementation of information technologies, he began to understand the value of using these technologies for his business. These responses suggest the different meanings associated with technological infrastructure in Ennis, which in turn influence how technologies are used for various purposes.

Taken together, these mean that infrastructure is available in Ennis, but are perceived differently by people. Some informants explained that these variations in perceived value can possibly become a regional problem for developing knowledge industries. Business owners may not see the value of leveraging information technologies for their operations. Furthermore, some students are not interested in studying information technology disciplines because they perceive these as entertainment tools. While the same technology is available, the value attributed to it can influence the extent of its use.

Information Infrastructure: Singapore

Access to advanced telecommunication networks and services is easy in Singapore. This is in part due to its small size, wealth, and the Singapore government's emphasis on information technologies development (International Telecommunication Union, 2005). Formerly known as the National Computer Board (NCB), the InfoComm Authority of Singapore (IDA) was strategically set up to maintain Singapore's competitive advantage of the information technology industries in Singapore by attracting foreign investments and technology penetration (Infocomm Development Authority, 2007).

Singapore first began introducing information technology planning and development in its economic strategy in the late 1970s. The strategic goal of the government was to change the labor intensive manufacturing-based economy to a high value-added post-industrial economy (Ang, 1999). As a result of the implementation, Singapore has one of the most developed information infrastructures in the world (Raveedran, 1998).

Singapore has a high level of high-tech exports. As of 1999, its annual high-tech exports totaled more than US\$60 billion each year. The high value of exports not only suggests that Singapore has in place good information-based industries; it also suggests the high quality of its IT output (World Development Indicators, 2005).

Having lived in Singapore for more than 25 years, I began to take the access to information technologies for granted. Therefore, I had an expectation for information services on demand anywhere in Singapore. For instance, I expected to be able to find out about movie listings anywhere easily. Especially after 2000, the connectivity to the Internet was almost always a given whenever access was needed.

Under the Intelligent Nation 2015 program, the government intends to provide wireless fidelity (wi-fi) Internet coverage throughout the country. According to the Executive Vice President of Singapore Telecommunications (SingTel), a leading wireless service provider in Singapore, the country will become a single hotspot for wireless Internet connectivity (Kanellos, 2006).

This is partially enabled by Singapore's high mobile cellular service coverage of 99.9 percent. This means that mobile cellular phone users can have access to services throughout the country. According to data from the International Telecommunications Union (2006), it also has a high mobile cellular phone penetration. As of 2003, about 85 percent of its population owns a mobile cellular phone; with an annual percent increase of about 20 percent (International Telecommunications Union, 2006).

Having lived in the U.S. for five years, I have had more opportunities to interact with foreigners like me, including Singaporeans, who have lived or are living away from their home countries. I shared with them my experience of the availability of public

Internet services in State College, Pennsylvania, upon arrival in the U.S. Public Internet cafes for instance, were not as ubiquitous as in Singapore. A possible explanation was that it is a college town, and Internet access is much more readily available to students on campus than in the streets. I found that Singaporeans (and especially those who have left their country for the first time) have a tendency to expect ubiquitous public connectivity outside Singapore. However, this expectation may not necessarily be always satisfied in the same way in other cities.

This tendency was more pronounced than foreigners of other nationalities. This observation suggests the presence of high quality and quantity of information infrastructures in Singapore. One key informant explained that *Singaporeans are quite privileged (with their access to information technologies and services) [Academic/Researcher]*.

With the level of technological integration and reliance on information services in Singapore, the Information Technology Standards Committee (ITSC) was formed to create and maintain technical standards in 1990. This industry-led effort comprises industry and government parties to ensure the neutrality and viability of these technical standards. For example, these standards include those applicable to the construction industry as well as more tailored for integrated circuits (Information Technology Standards Committee, 2003).

Singapore's information infrastructure can be said to be transcending the development stage to the point of leverage of the existing infrastructure. This appears to be a key thrust of the government's IT strategies. The standardization program is an example of this strategic focus. Also, the Intelligent Nation 2015 program shows that the

government is attempting to use the existing penetration to increase the quality and quantity of information services through nationwide coverage. Taken together, Singapore appears to be on the forefront of information technology infrastructure development. There is a strong government push from the government to develop IT infrastructures, and at the same time, the high penetration reflects positive public responses towards IT development.

Human Capital Development

According to DeVol (2002), a region's technology dynamism and outcomes are essential to a region's economic well-being (DeVol, 2002). In this intangible asset-based economy, human capital is an essential component that can be leveraged to promote economic development (DeVol, 2002). DeVol (2002) continued to argue therefore, that economic growth depends on investments in education, new work-based learning and training procedures. The importance of human capital can be clearly illustrated by Nobel laureate Gary Becker - "The continuing growth in per capita incomes of many countries during the nineteenth and twentieth centuries is partly due to the expansion of scientific and technical knowledge that raises the productivity of labor and other inputs in production. The increasing reliance of industry on sophisticated knowledge greatly enhances the value of education, technical schooling, on-the-job training, and other human capital" (Becker, 1992).

Human Capital Development: San Joaquin Valley

San Joaquin Valley participates in attempts to increase the quality of its workforce. As of December 13, 2005, under Executive Order 962 from the Office of the Chancellor

of the California State University system, the university could allocate up to four percent of its student quota for bachelor degree programs to disadvantaged applicants. According to Reed (2005), within this order, disadvantaged applicants, as defined under Section 90401, Title 5 of the California Code of Regulations, applies to applicants who come from low-income families and have potential to perform satisfactorily at the college level, but are unable to do so as a result of their economic or education backgrounds. Hence they require special assistance (Reed, 2005)

Looking at education demographics, only approximately 30 percent of high school students graduate in San Joaquin Valley. Among them, only 15 to 30 percent go to college (Gradeck & Paytas, 2000). Furthermore, as discussed, the more educated segment of the population (high school graduates and above) leave the Valley for employment and education opportunities elsewhere (Public Policy Institute of California, 2004). Knowledge workers were also documented to avoid working or residing in the San Joaquin Valley (Rural Migration News, 2006). One much cited reason was this *lack of (knowledge work) opportunities [Key Member of Development Organization]* in the region. In general, places that have more employment and career advantages are more poised to attract and retain talent (Gradeck & Paytas, 2000).

In 2001, San Joaquin Valley's per capita income averaged between \$21,300 and \$23,700. This was considerably lower than averages in California at \$32,950, and the Bay Area at \$45,555 (J.K. Inc., 2004). The low income level in the Valley suggests the low value of jobs. This ties in with the earlier finding that many residents graduating from high school and above leave the region for better employment and education opportunities (Public Policy Institute of California, 2004).

The lack of a high quality workforce may lead to the lack of economic opportunities, which in turn facilitates a low demand for talent from universities within and outside the region. The locations of major corporations can be said to be partially determined by ease of access to a region's available talent pool. For instance, Google set up its operations in Pittsburgh to leverage the region's available and longstanding expertise in high-tech – primarily from Carnegie Mellon University and the University of Pittsburgh (Wong et al., 2006).

A good initiative to increase the value of work in the Valley was to develop its human capital. The Economic Development Work Group was initiated in 2006 as a strategic action to address the infrastructure challenges in the Valley. The aim of the strategy was to promote business advantages in targeted industries (Economic Development Work Group, 2006).

In this strategy, two programs were related directly to human capital development. The first was to use an industry cluster approach to support the expansion of targeted industries. These targeted industries are agriculture (including agricultural technology and biotechnology), manufacturing, supply chain management and Logistics, healthcare, and renewable energy. The approach involves increasing the collaboration links among universities and these industries (Economic Development Work Group, 2006). Knowledge work involves knowledge accumulation and interactions to carry out knowledge transmission activities. In view of this complexity, firms in a knowledge economy are increasingly faced with the need to work in networks of establishments (clusters) to create value-added knowledge chains (Houghton & Sheehan Peter, 2000).

In this approach, the created links can facilitate a flow of innovation among the universities and industries. As an outcome of this action, this proposed action aims to create incubators as part of the clusters. This is an example of human capital development in the Valley to address the low value of work.

The second program that was directed related to human capital development went a step further from industry cluster development to support entrepreneurship in the Valley. The Economic Development Work Group proposed to leverage resources such as the Lyles Center for Innovation and Entrepreneurship at Fresno State University and the Valley Small Business Development Center. In the process, business and education leaders were incorporated to support the program (Economic Development Work Group, 2006).

In 2006, the California Partnership for San Joaquin Valley also approved programs to directly address the economic challenges facing San Joaquin Valley. The Partnership was formed by Governor Schwarzenegger in June 2005 to initiate a collaborative effort for regional growth in the Valley (California Economic Leadership Network, 2006). Among which, the higher education and workforce development strategy comprised specific programs to develop human capital in the Valley. One such program was a public outreach effort to create accessible education opportunities to the residents of the Valley. Within the same strategy, a related program was the creation of a college-going culture in the Valley to encourage residents to pursue tertiary education (California Partnership for the San Joaquin Valley, 2006).

These strategies acknowledge the importance of human capital for the region. Not only was the proposed focus targeted at creating access to education, it was also to

encourage and motivate college attendance. The Valley appeared to have a cultural barrier towards collaboration. One informant remarked that it was not easy to execute a collaborative effort among the public and private sectors for regional growth in the Valley. Echoing this remark, according to Kissam, the resistance to private and public sector collaboration can be an inhibitor because the development of IT skills is a foundation for knowledge work (Kissam, 1998). Therefore, in San Joaquin valley, the importance of human capital development strategies lies with addressing the underlying social and cultural issues

Human Capital Development: Ennis

As an Information Age Town, Ennis is unique because it “does not have the proximity to or the direct support of a university” (McInerney, 2003, p.10). But to become a leader in the knowledge economy, the Irish government recognizes human capital development as the most importance factor for science and technological innovation (Science Foundation Ireland, 2006). By the end of the 1980s, the country’s focus on tertiary level education, especially in technical disciplines, pushed its workforce towards high-tech jobs (Kirchberger, 2002). This change supported an industry shift towards knowledge work.

The Ireland training and employment authority, FAS, is organizing training programs for various regions including Ennis. This initiative is funded by the government and is aimed at increasing IT literacy and use. These programs are targeted at both individuals and businesses. Topics covered include Internet surfing and email, as well as Microsoft Office functions. Their programs are varied in terms of complexity, which

were targeting different types of attendees. For instance, business professionals learned about office-related applications, while senior residents learned about checking emails.

I found that Ennis' residents have a positive attitude towards learning. Many middle-aged people (approximately 50 years old) whom I have encountered may not have had high educational qualifications. But they see education as critical to their children as well as Ireland's future. This positive attitude was also found to be present among educators. According to McInerney (2003, p.25), the Irish have a "high interest and commitment to education." This implies that the importance of education is etched in the Irish cultural fabric. As discussed in the regional overview of Ennis, about one third of the residents surveyed had tertiary education.

The attendees of the FAS training programs in Ennis comprised largely of older people in this age range. Since these programs are conducted at one of the two Internet cafes in Ennis, I observed this marked difference between the attendees and the typical patrons, who comprised of youths. The latter group was more interested in knowing about new applications for entertainment purposes, such as games and personal networking, rather than the formal uses, such as application development.

The programs were well-coordinated and detailed. Although the programs were funded by the government, there was limited reach in the town of Ennis. The Internet café could accommodate up to 15 people at any one time. And there were only two or three sessions a day at the maximum. Furthermore, the training programs were not conducted daily, over long periods of time.

One informant agreed that this is not likely to reach a critical mass of trainees. In addition, some attendees were close to retirement and are only learning out of curiosity,

rather than effectively contributing to the economy after obtaining the skill sets. However, he commented that it is also possible that heightened literacy will lead to heightened consumer spending in information technologies, which is beneficial to the knowledge economy because increased demand facilitates competition, which facilitates innovation.

In the school curriculum, integrating information technologies was part of the Information Age Town Project. According to McNerney, Ennis educators were initially unprepared for this change in the school curriculum (McNerney, 2003). Teachers did not have sufficient experience with information technologies to be able to participate actively in the new curriculum (McQuillan, 2000). In addition, human capital development for knowledge work was inhibited by infrastructural limitations because there were limited computer laboratories and a lack of Irish-developed software applications to support the curricula (McQuillan, 2000).

To facilitate the human capital development for information and knowledge work, training programs were also initiated to train teachers. According to McNerney, teachers realized that they could play a catalytic role in facilitating the training of students in information technology related work (McNerney, 2003). These programs included workshops in schools and programs at the Clare Education Centre.

As some examples, I discuss two programs that exemplify the training and learning mechanisms in schools among students. The Online Newspapers program introduced online school newspapers. It was an effort to bring the community and school together, as students played a vital role in news reporting and publishing (McNerney, 2003). For example, St. Flannan's College¹⁴ in Ennis, County Clare, has a comprehensive

¹⁴ St. Flannan's College is a secondary school in Ireland.

newsletter that provides news and information about the school and community (St. Flannan's College, 2007).

The Meet the Musician program is one where schools in Ennis collaborated with the Clare Education Centre and the Traditional Music Archive to showcase biographies and music of local Irish musicians through the Internet (McInerney, 2003). This program was introduced because according to (McWilliams, 2006, p.224), Irish music continues to be popular in Ireland, despite the globalization accompanying its growth from an agrarian economy to an information economy. Furthermore, within Ireland, Irish music is even more popular in Western Ireland, including Ennis (McInerney, 2003). Through this interactive program, students learned about the history of Irish music, musicians, the music, the culture, and developed various research skills in the process. One outcome of this project is a quiz on Irish music where students participated and stood to win prizes (Clare Education Centre, 2005).

In addition, school teachers were increasing the use of software to teach subjects such as mathematics. Their teachings included reasoning and critical thinking (McInerney, 2003). The use of information technologies in the curricula also enabled students to collaborate with other students in 13 European countries (McQuillan, 2000). Furthermore, teachers shared their software evaluations with each other. This was important because of the lack of Irish-developed applications for the school curricula in Ennis. The process enabled schools to continuously learn new ways to educate students for the knowledge economy.

Human Capital Development: Singapore

Singapore places a strong emphasis on education and workforce training. In the Times Higher Education Supplement of 2005, its two universities – National University of Singapore and Nanyang Technological University were ranked 25th and 77th in 2004.¹⁵ The National University of Singapore Student Enterprise Program was launched in 2004 as a venture support initiative to help aspiring entrepreneurs from the university through funding support. It is open to full-time undergraduates, post graduates and alumni within 12 months of graduation. The condition however, requires the business venture to be initiated or conceived while the individual(s) are at the university (National University of Singapore, 2005).

The education system was also revamped to match demands from the new global economy. These are aimed at developing a sustainable knowledge economy through the production of human capital. Importantly, Singapore attempts to attract foreign students to create a diverse and multi-talented workforce. The Global Immersion Program (GIP) is one that promotes internships among students to China or the U.S. Not only do these train Singaporean students in a market other than Singapore, they also develop links with Chinese and U.S. companies (Lim, 2004).

The Singapore government has actively promoted the concept of training, (education), re-training, and in the big sense, upgrading of skills and knowledge for the local Singaporeans. The National IT Literacy Plan was implemented in 2002 to educate

¹⁵ These two universities in Singapore are government-funded. For a long time, Singapore only offers its degree programs through these two universities. Subsequently, a third university was added to the list – Singapore Management University was set up to focus on business disciplines, including information systems management programs.

the non-IT-literate Singaporeans on the use of information technologies. The initiative was executed by the Infocomm Development Authority of Singapore (IDA) and the Ministry of manpower, with \$30 million to train 350,000 Singaporeans over three years with basic IT skills (Ministry of Economic Development, 1999). Based on this initiative, every Singaporean will have an opportunity to obtain basic IT skills. The following paragraphs describe this initiative as illustrated from the (Ministry of Economic Development, 1999)

The targeted group includes workers, homemakers and senior citizens. With this initiative, the government aims to improve the attendees' quality of life and enhance their employability. Through the Lifelong Learning Endowment Fund and the Skills Development Fund, the costs of training are very low so as to allow all citizens and permanent residents of any age to enroll. All trainees were eligible for a support of 80 percent of the total course fees, which were capped at an hourly rate of \$8. Furthermore, additional financial assistance was given to low-income trainees by the Community Development Councils and self-help groups (Ministry of Economic Development, 1999).

As a complement, an e-Learning web-top in English, Mandarin, Malay and Tamil was launched to serve as a continuous, interactive learning platform. Some of the features in the web-top include "simulations of e-Transactions such as e-shopping, online travel bookings and general interest information such as hobbies and recipes" (Ministry of Economic Development, 1999).

The program was available to the public through 22 Authorised Training Centres (ATC) located around the island which will provide basic information and communication training in English, Mandarin, Malay and Tamil languages. NITLP

consists of three modules, each to be completed between three-and-a-half to seven hours. At the end of the course, trainees will be able to search and retrieve relevant information, surf the Internet, communicate via email and perform online transactions such as online shopping and banking (Ministry of Economic Development, 1999).

The Singapore government emphasizes the use of technology in educational institutions. Schools were the first public institutions to be connected to the broadband infrastructure. The use of IT in schools facilitate teaching and condition students to the use of these technologies (International Telecommunication Union, 2005)

In October 2003, the Backpack.NET Initiative, a five-year project, was implemented. It was aimed at first enhancing learning experiences through the use of emerging information technologies such as tablet PCs and digital ink, and second, creating a framework for industry players, schools and researchers to develop software and solutions. In the first phase, students in selected schools were equipped with individual tablet PCs with wireless connectivity and digitized textbooks. Access to lesson materials and various Internet resources were available anywhere on campus. This allowed one-to-one teacher-student attention and increased the efficiency involved in pedagogical practices. The wireless connectivity also allowed students to participate outside lesson times and conduct real time consultations with experts in various subject matters (International Telecommunication Union, 2005).

Preliminary findings from the trial showed that independent learning was facilitated and schoolwork was made more interesting. Teachers also experienced little difficulty in adjusting to the increased reliance on various information technologies for teaching. Two schools have also deployed Microsoft Learning Gateways as part of the

Initiative, to allow students to work collaboratively across the country among other applications. This portal also allows parents to track their children’s performances daily (International Telecommunication Union, 2005).

Singapore is receptive to new technological changes. With the increasing emphasis and use of RFID, Singapore is attempting to facilitate the growth of an RFID industry, leveraging its position as an information and communication hub. The two major universities – the National University of Singapore and Nanyang Technological University are developing courses to provide electrical engineering graduates with specialized RFID knowledge.

Public Policy

Similar to the other themes, public policy is discussed in the social context. For purposes of this dissertation, I discuss public policy in terms of its related social issues relevant to the making, execution and function of development efforts. Here, I investigated regional economic leadership and economic development initiatives in the three regions. The following table summarizes the themes under public policy.

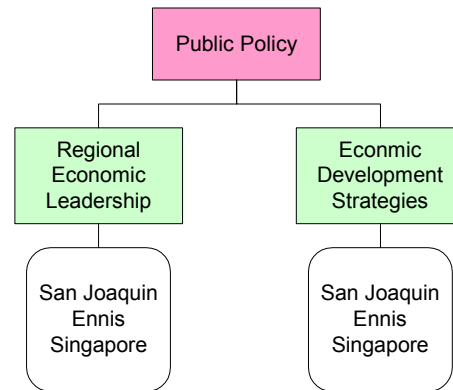
Table 5: Themes under Public Policy

Factor	Themes (Findings)
Public Policy	Regional Economic Leadership Economic Development Strategies

The relevance and implications of these themes are discussed in turn in two sub-sections. Each of these sub-sections will have three further sub-sections, each discussing

the relevance of each theme in its respective region. The following diagram illustrates the organization of the discussion on public policy.

Figure 12: Organization of Discussion of Public Policy



Regional Economic Leadership

Leadership development is an important theme in the knowledge economy (Sankaran, James, Kouzmin, & Hase, 2004). Regional economic leadership, conveniently referred to as leadership here, is a concept that emerged through the course of my interviews. For all three regions, leadership was seen as an important factor that determined the sustainability of the respective economy. However, they can appear in different forms and from different establishments in a region.

Regional Economic Leadership: San Joaquin Valley

In San Joaquin Valley, some informants explained that there could be more regional leadership to ensure a coordinated effort towards regional economic development, and much less developing innovation in businesses for the knowledge economy. It was a challenge to develop collaborative efforts between the private and public sectors for economic development (Kissam, 1998). According to Schreiber *et al*

(2001), in land use for example, there were no requirements to ensure that local land use plans are consistent with plans for the regional communities. In addition, these local activities need not be consistent with regional policies (Schreiber, Church, Binger, Salazar, & Taketa, 2001). Furthermore, the poorer segments of the population appeared to lack an effective leadership to represent their interests. Over time, the issue of low wages paid to farm workers remained unchanged because of their lack of representation at a regional level. As discussed, San Joaquin Valley's per capita income in 2001 averaged between \$21,300 and \$23,700, compared to California's average of \$32,950 (J.K. Inc., 2004).

There were several development initiatives from various non-profit social and economic development organizations. The Fresno Interdenominational Refugee Ministries (FIRM) and Stone Soup for instance, serve to give minorities among the local population a voice in the public arena. The Fresno Interdenominational Refugee Ministries (FIRM) is a coalition of ministry building communities based on the Christian faith, targeting refugees by providing training for jobs and various forms of social assistance (<http://www.firminc.org>). Stone Soup is a non-profit community building organization aimed at improving lives in its immediate community (<http://www.stonesoupfresno.org>). Their websites have considerable information on their activities as well as various salient issues. As an example, Stone Soup Fresno focuses on issues related to health, education, culture and civic engagement. Recently, their efforts were directed towards the Southeast Asian community in the Valley. Importantly, Stone Soup is a consortium of dedicated individuals and organizations from various streams of social activities, such as those Buddhist activities at the Fresno Buddhist temple and

Christianity at the United Japanese Christian Church. Stone Soup Fresno hires volunteers to assist in their social work.

However, the volunteers' levels of commitment may be a challenge to the organizations' mission because of the lack of accountability as opposed to full time employees. It is more difficult to recruit volunteers as opposed to people who are willing to contribute in more subtle ways. At the same time, it is also difficult to obtain large amounts of donations regularly for such social work.

These organizations, with Stone Soup Fresno as an example, have a wealth of information from their programs on their websites. But they do not seem to support a similarly wide range of political participation from the public. The only times when the public can convene to discuss issues were in seminars, which might not be well-attended because these targeted segments of the population are usually unaware of these seminars.

They (the targeted population) do not reach out to community resources like non-profit organizations and the mass media (such as the internet) [Key Member of Development Organization].

However, it could also mean that these reach out efforts are not sufficiently extensive and effective. In other words, there may be a lack of communication because the targeted population does not participate in the decision-making process. Online communication is also a challenge because the websites do not have public forums for online participation. This possibly leads to a lack of collaboration as decision-making remains the prerogative of a few individuals rather than those who need public representation.

Informants from various economic and business development organizations commented that San Joaquin Valley is fragmented in terms of political representation and collaborative economic efforts. They explained that there is a need for people to assume leadership positions because the lack of clearly focused leadership and direction especially for the socially excluded have failed to resolve social problems and develop innovative business practices in the region.

The Regional Jobs Initiative (RJI) is an attempt to pull together various community leaders as well as resources to push development in the region. Prior to the RJI, there had been no clear consensus on the focus of economic development efforts. The RJI targets employers to create jobs in the Valley. In other words, farm workers and the poorer segments of the population are not the primary focus. One key informant explained that social organizations such as Stone Soup and FIRM address the social issues. These are not within the scope of the RJI task force. The reason for this separate focus is that it is difficult to address every issue. The RJI's primary focus is to enable the region to create jobs by focusing their efforts on the employers through effective use of resources. By making businesses more competitive, more jobs can be created and social and economic opportunities for the population may grow.

The RJI focuses on nine targeted industries. These are given in Appendix C. Universities are also participating in the initiative and they play a role in generating funding to support the initiative. With constant funding, the task force seeks to make every effort to keep up with the increase in resources. The task force works on informal transparent work structures. Regular meetings were held and the discussions and conclusions were regularly posted on the RJI website for public viewing

<http://www.fresnorji.org/industry/clusters.php>). The task force seeks a wide, coordinated and collaborative participation, with low barriers to entry for participation as volunteers.

The RJI was a recent major economic development initiative that was geared towards the knowledge economy as of 2005. However, some informants explained that it is still difficult to resolve the lack of coordinated leadership despite the scope of this collaboration. While the RJI task force members are dedicated, the other camp that champions the rural communities feel that the initiative has neglected their interests. Social problems from refugees are not the direct focus of the initiative. The RJI holds a position that posits that economic growth will improve the social and economic conditions of the refugees and other poor communities. However, the other camp of rural community developers argues that these poor communities are the root of social and economic problems in the Valley. Their interests have to be considered in economic development initiatives. This division shows the lack of collaboration and the lack of a coordinated effort towards a similar goal. Coupled with the informal work structures of the RJI, developing and sustaining a knowledge economy may pose challenges since leadership is lacking in a major way.

San Joaquin Valley has a largely rural geography. Hence, effective leadership in the region requires considerable understanding of issues related to the special needs of residents. For instance, the lack of access to resources and social and economic opportunities in rural regions are different from the same issues in urban regions. To address the economic conditions in the Valley, Governor Schwarzenegger established the California Partnership for the San Joaquin Valley in June 2005. This Partnership comprises eight state government, eight local government and eight private sector

members to develop a collaborative development strategy (California Economic Leadership Network, 2006). These recent developments suggest the importance of regional leadership in San Joaquin's growth, including knowledge work and industries.

Regional Economic Leadership: Ennis

In the growth of Ireland's information economy, it was necessary for government policies to strategically lead in the development of selected high-valued added industries so as to encourage investment in these industries. The reason was the extended period of time for these investments to reap positive returns (O'Malley, 1985). Leadership thus, played a key role in Ireland's information economy and its growth in the 1980s and 1990s.

Using the Information Age Town Project as an example, Ennis appears to have a coordinated and collaborative effort, with a staff strength of more than 20 and several volunteers (Mc.Quillan, 2000). The organizing committee included major development establishments such as Shannon Development, Clare County Council, the Chamber of Commerce, Ennis Task Force Ltd, and eircom (eircom, 2000). The project was organized into different areas, such as businesses and community, with a staff member in charge of each area. These highly coordinated efforts are reflected in the interviews with the task force and businesses who took part in the project.

We were given a lot of help. They (Information Age Town Project Task Force) knew exactly what to do and helped us. It was a very good learning experience for us [Business Owner/Professional]

The financial resource of \$25 million¹⁶ for the project provided support for a range of activities (Mc.Quillan, 2000). The project focused not only on businesses but also on schools and residential areas. The aim was to enable the economic actors of the town to partake in using information technologies for their purposes. Households were given computers and household members were trained by the task force personnel on using them. Schools were financially supported and encouraged to use information technologies in the classrooms and curricula. Businesses were invited to participate and taught how to use these technologies to support their business objectives (Mc.Quillan, 2000). A good example is helping businesses develop websites to support their businesses online as well.

The project led to the development of the necessary infrastructure and potential leverage of these infrastructures. Businesses began to have their own websites and began to change their business models to use the Internet to support their operations. A good example is a travel agency that added e-commerce to their traditional face-to-face model. Through their website, customers were given the option to do their own research and purchase air tickets and tour packages. Payment can also be made through the website as it is e-commerce enabled.

However, when the project was completed and objectives met, some informants expressed they desired more follow-up activities. As such, although these businesses were IT-enabled, there was limited leverage in the technologies that were in place for them. This does not apply to every business. But several expressed their preference for their traditional model of conducting business – the face-to-face model. Others explained

¹⁶ Based on conversion rate of IEP15 million = USD 25,127,109.

that the new model is not applicable to their businesses. Having the customers make their purchases via the Internet allows them to conduct research on competitive prices. This is especially disadvantageous to the local businesses because their small sizes do not allow them to offer prices to compete with the major players. Furthermore, if the target market is the local community, there is no need to spend long periods of time doing research on competitive prices when the physical store is a few minutes walk or drive away.

One business owner expressed that the use of the Internet reduces the personal touch they give to their customers face-to-face. Thus, while the Internet has the potential to reach many, it loses the richness of the information given to customers. As a result, some businesses began to go back to their old practices. However, they expressed that their participation in the project helped them learn about their own niche markets and enabled them to exploit these niches better. On the other hand, there were some businesses that saw a lot of potential and intended to expand their operations using these infrastructures and newly learned business practices.

The coordinated leadership involved in the Information Age Town project has clearly led to benefits to the local businesses in two major ways – some businesses learned about their niche markets and began to exploit them better, and others learned about the potential of information technologies. Overall, this leadership was beneficial to the regional economy. However, given the success of the leadership, some informants expressed their concern that there was a concern about follow-up activities to the project.

There was no communication after the project was completed. Some of us have not fully learned about fully using the Internet for our businesses.

There should be a strong leading effort even after the project [Business Owner/Professional].

While some businesses have identified lessons learned, there are others who see the potential but are still uncertain about the full potential of how information systems can support their businesses. The leadership from the project brought about lessons learned among local businesses. Business owners' perceived importance of follow up activities suggests that their learning processes may be dependent on these activities.

Regional Economic Leadership: Singapore

Singapore exhibits a centralized power structure characterized by a top-down style. This was facilitated by Singapore's relatively small size and population. Economic growth and political stability were maintained by the paternal guidance from the government. It was argued that in Singapore, meritocracy was exercised in recognition of skill and performance (U.S. Library of Congress , 2005).

According to Rechtsanwaltgesellschaft (2004), Singapore's rapid economic growth is partially attributed to the transparency, efficiency and integrity of its legal system, with highly protected and easily enforceable contractual intellectual property rights. In Asia, Singapore is known for the quality and integrity of its effective legal system and it enjoys one of the lowest crime rates in the world (Rechtsanwaltgesellschaft, 2004). Its top-down policies were not only effective, but efficient in bringing about economic, social, and political changes.

Although the strong leadership promotes innovation for competitiveness in the knowledge economy, in terms of innovation creation for sustainability, some key informants commented that Singapore is strong on information but less so in knowledge.

In other words, Singapore excels in information management but not knowledge management. The centralized control over the media (Yeo, 2002) allows Singapore to control information and efficiently and effectively manage them semantically. As such, information (or data) on Singapore in various aspects are stored and managed by authorities such as the Singapore Department of Statistics.

However, knowledge is cumulative and requires sharing to boost innovation. For instance, data on patents and licensing revenue are immensely useful in research and development. Various R&D departments such as colleges and institutes keep their data to themselves and relevant information is only available upon request individually. This suggests that there is less collaboration and information sharing among these establishments for the innovation creation at a higher level.

Nonetheless, the Singapore government recognizes the relevance of the knowledge economy. In fact, the government initiated efforts to develop a knowledge economy in the late 1980s with the TradeNet, the first countrywide electronic trade documentation system that system enhances efficiency and lowered costs for the trading community (United Nations Social and Economic Commission for Asia and the Pacific, 2006). The system introduced a common standard for trading documents. The exchanges of these documents were enhanced by a nationwide information system that took over the manual labor from workers. As a result, speeds of transactions were tremendously increased.

This system was introduced before the hype of the information and knowledge economies in Asia. It led to the creation of new job categories as a result of IT implementation. The availability of the complex information system created the necessity

for knowledge work, as well as the re-deployment of existing workers to carry out knowledge work in new divisions. At the same time, training programs determined in part the extent to which workers acquired the necessary skills to carry out knowledge work (United Nations Social and Economic Commission for Asia and the Pacific, 2006).

As a whole, Singapore recognizes the relevance of the knowledge economy. The government uses a top-down approach that exercises considerable control over information. Although knowledge is cumulative and thrives on sharing, the state controlled approach has its roots historically in its first development plan between 1960 and 1964 (Toh & Low, 1990). This approach has proved to be a successful model for Singapore's growth to a vibrant knowledge economy today (Bureau of East Asian and Pacific Affairs, 2006).

Economic Development Strategies

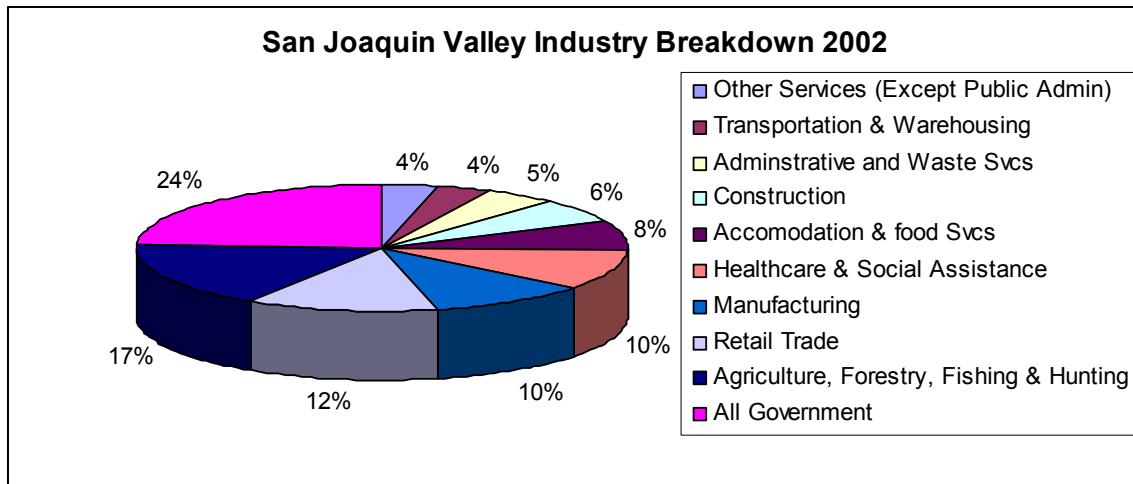
Economic development strategies (including policies) form a substantial component in economic development. San Joaquin Valley is targeted by California's development plans, and aims to develop its economy from its primary agricultural base towards a modern knowledge economy. Ennis seeks to sustain its growth and continue growing as an information age town towards a knowledge economy, reflecting natural global trends. Singapore, having developed its high-tech economy, attempts to sustain its knowledge economy to compete effectively globally.

Economic Development Strategies: San Joaquin Valley

San Joaquin Valley accounts for 25 percent of agricultural production in the U.S (in terms of dollar value) (Answers.com, 2006). Products include grapes, wine, raisins,

cotton, nuts, citrus and vegetables. In Kings County, the Boswell farm occupies more than 40,000 acres, and is the largest single cotton farm worldwide. Fresno, the most central county in the valley is known for its grapes production. In addition, small oil wells are located throughout the region, making California one of the most important oil-producing states in the U.S. An industry breakdown for the major industries in San Joaquin Valley (J.K. Inc., 2004) is given as follows:

Figure 13: San Joaquin Valley Industry Breakdown 2002



In San Joaquin Valley, the Telework Initiative is a collaborative effort involving the Great Valley Center, the San Joaquin Valley Air Pollution Control District and Operation Clean Air (The Great Valley Center, 2003). The Initiative was designed to provide business leaders with tools to design teleworking programs to increase worker productivity while reducing air pollution by reducing car trips (Fresno Business Council, 2003).

The rationale for the Initiative was based on the low air quality in the region, thus negatively affecting public health and the regional economy (Union of Concerned Scientists, 2005). There was a series of three seminars held concurrently at the Air

Pollution District Offices in Modesto, Fresno, and Bakersfield (The Great Valley Center, 2003). This initiative is important because advances in computers, cellular phones, the Internet, and affordable high speed communications access have all but removed the physical barriers that once required workers to be in their offices and in their cars every day. With it, businesses can profitably move their work around the Valley to their workers (Salerno, 2007) according to Seth Fearey, President of Connected Communities, a Menlo Park-based firm that played a key role in implementing the Telework concept in Silicon Valley.

More recently, the RJI, a major economic development initiative for San Joaquin Valley, boosts participation from business owners and managers (Regional Jobs Initiative, 2005b). The RJI focuses on nine industry clusters. These are described in Appendix C. The RJI is a cluster based economic strategy aimed at developing industry clusters (Regional Jobs Initiative, 2005b). Their primary focus on these nine industries seeks to create jobs for related industries to build industry clusters for economic development. One key informant explained that among the nine industries, the focus on construction follows the industry's recent growth. It is possible that this is an attempt to diversify from the agriculture-based economy.

The construction industry in San Joaquin Valley performed well in 2004. There has been an unprecedented increase in housing. According to Frith (2005), Bakersfield ranks fifth in housing production among metropolitan areas in California. Comparing counties, Kern, San Joaquin and Fresno were among the top 10 counties in terms of total housing production (Frith, 2005).

The real estate industry in San Joaquin Valley was a thriving industry. In the north and east of Fresno, many houses have been built very quickly. In the north, 4,000-5,000 houses were being built to replace the orchards. Such developments are proceeding at a very fast pace. Residents in these new residential estates commented that many of those newly-built houses were not there even a few months ago.

Several informants commented that single dwelling houses in Fresno, the key metropolitan area in San Joaquin Valley, have increased dramatically since 2002. According to Economy.com, Inc., house prices in 2002 was only 50 percent higher than what it was in 1987. In 2006, it was more than 350 percent higher. Part of the reason was the increase in demand for houses. One of the motivations for moving to Fresno from the coastal areas such as San Francisco and Los Angeles is its lower cost of living. According to statistics from Economy.Com, Inc., Fresno's cost of living in 2006 was only three percent higher than the U.S. average. In comparison, the cost of living in San Francisco and Los Angeles were 42 percent and 15 percent higher than the U.S. average in the same year respectively.

It has been noted by several informants that people are coming from San Francisco and Los Angeles to find cheap housing in the Valley. Looking at estimates from the National Association of Realtors, Fresno saw an increase in sales of single-dwelling houses of 29 percent from 2002 to 2004. In contrast, San Francisco saw a nine percent decline in the same period.

The rich come from coastal regions to retire in Fresno. They bring with them their upper class tastes. This brings demand for high tech services [Business Owner/Professional].

It is plausible that the affluent are demanding these services because they wish to be connected and informed. However, at the same time, some informants questioned whether this small number of retirees can produce a significant impact on the existing economy.

A possible reason for the conversion of land use to real estate is the shift in land usage from agriculture to commercial, retail and residential.

Farms face external competition from Chile for grapes. So, land owners are starting to sell their land to real estate developers, instead of using them for farmland since it is more profitable [Key Member of Development Organization].

One key informant explained that the increase in housing prices corresponds to the increase in the number of investors. When property mortgage interest rates are low, there will be increases in the number of property investors from the Bay Area. As a result, property prices will rise. In addition, residents who are richer invest in properties and purchase more than one property for rental purposes. With an increase in population, investments in property are a lucrative investment strategy.

However, some informants did not agree that property investments are useful.

This is hardly sustainable, just like the property bubble (during the financial crisis) in Asia (towards the end of the millennium). We need high tech industries today [Key Member of Development Organization].

Among cities in San Joaquin, Reedley City in Fresno County has had the highest increase in property value in the U.S. In 1990, the median home price in Fresno was \$100,000 per unit, which was approximately 40 percent the state's median home price of

\$250,340 per unit. In 2005 however, the median home price in Fresno was \$230,000, or 47 percent of the state's median home price of \$485,700 (NexTag. Comparison Shopping. Mortgage, 2005). While investors may use purchased properties for retirement purposes, many among the poor are finding it hard to own houses and many of them cannot afford to pay rent. This restricts socio-economic mobility and causes social problems stemming from the rural communities.

Economic Development Strategies: Ennis

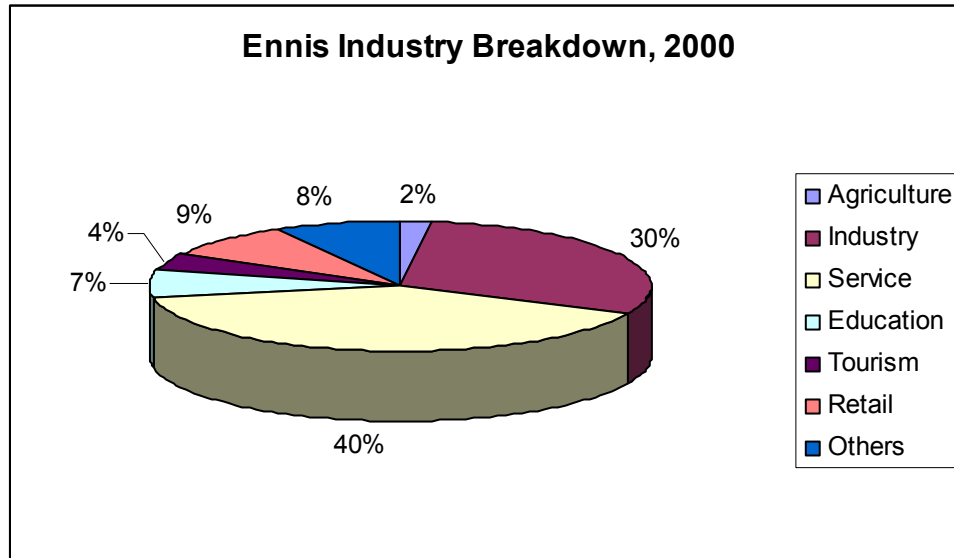
According to McInerney, this leapfrog phenomenon that created the Celtic Tiger did not directly lead to the creation of a vibrant information sector in Ennis compared to the rest of Ireland (McInerney, 2003). Therefore, the Information Age Town became a unique opportunity for Ennis to participate in the country's leapfrog.

There was no public explanation for the choice of Ennis as the Information Age Town (McInerney, 2003). However, Ennis' geographic position appeared to be a possible reason for becoming an Information Age Town. The major roads that connect Ennis to these industrialized regions are already narrow and the convergent point in Ennis makes them narrower and incapable of handling large amounts of traffic. Due to transport difficulties, Ennis becomes a major bottleneck in the geography of West Ireland. Developing Ennis then becomes a geographically and logistically strategic decision in the economy of Western Ireland, since it was not directly affected by the country's economic growth in the 1990s.

Ennis' industry breakdown is given in the following diagram. Ennis is a largely rural town, characterized by dominant agricultural activities in the area outside town (McInerney, 2003). However, with the Information Age Town project, a majority – 40

percent, of Ennis' industrial structure comprised of services. This may hint at the possibility of an industrial transition towards knowledge work.

Figure 14; Ennis Industry Breakdown



As part of the Information Age Town project, personal computers with software suites (supplied by Dell) were distributed to households below the dominant market rate (approximately US\$250). However, each household had to nominate a person to show competency in using personal computers or had to attend a course on computer use to qualify. About 5,600 households (83 percent) obtained the personal computers (eircom, 2000). With the advent of the project, Ennis became one of the fastest growing Irish towns with a 24 percent (approximate) increase in population between 1996 and 2002. Its current population is 22,050 (Shannon Development, 2006a).

The Information Age Town project was aimed to establish the town as a vital part of Ireland's high tech economy. The objectives were not designed merely to build information infrastructures in Ennis. A strategy of the project was to enable businesses to use information technologies in innovative ways to support their respective businesses (e-

business). It was aimed at helping businesses understand the benefits of using these technologies and they can develop opportunities. These came in the form of consultancy services such as web hosting and design (Mc.Quillan, 2000).

From a regional economic perspective, the widespread innovative use of information technologies in businesses is likely to attract investors to the region to leverage the expertise involved. The knowledge economy is highly human capital intensive and hence if businesses rely innovatively on information technologies, it is likely that they employ more talent. Within a three year period from 1999 to 2002, approximately 453 businesses were enrolled into the project. The training programs enjoyed participation from 350 representatives from local businesses. Among which, 50 representatives undertook customized specialized training on e-business (Mc.Quillan, 2000).

One of the applications that was developed and implemented was the electronic point of sales systems (EPOS). These were implemented in businesses to help them leverage the potential of information technologies for efficiency. In addition, businesses were encouraged to engage in e-commerce to widen their markets beyond the local and tourist markets.

The Information Age Town project was a major initiative that gave considerable publicity to participating businesses beyond Ennis. Many businesses saw the project as a means to deploy cutting edge information technologies to their businesses. Many explained that they were happy to be among the first businesses in the region to use these technologies.

Although these businesses invested considerably in their information systems, particularly the Internet, the costs of deployment were funded only partially by the project. Upon completion, many businesses explained that they realized that utilizing innovative uses of the Internet was not applicable to their businesses. They were small businesses that catered to tourists and the local market. Taking the major leap to cater to a global market through the Internet was not something that they could undertake and manage over a short span of a few years. As such, many stopped maintaining their websites and reverted to their traditional business practices.

Some informants living outside Ennis did not see the project as a success.

The project is an experiment... Ennis cannot be considered an information age town. People are still using their old ways (of doing business). There are improvements. But being information age town is more than home internet and business websites [Academic/Researcher].

Some businesses in Ennis also seemed to have little intention of expanding by leveraging the potential of information technologies. They cited a common reason – that their businesses cater primarily to the local market.

We are not a global business. If we want to reach the global market, then these IT becomes very important. But the change cannot be made overnight [Business Owner/Professional]

However, in terms of educating the population about the benefits and importance of using IT, it can be deemed as a success. Although some participants of the project contended that some businesses may not gain any profit through the project as they may have originally anticipated, it was a learning experience for them.

We don't use the new systems. But we understand our business. We know where we stand and what we can do [Business Owner/Professional]

Therefore, in terms of learning, this economic development strategy can be seen as successful in creating learning opportunities for local businesses. In terms of learning, businesses learned how they can benefit from the innovative use of information technologies. However, they also learned about whether these technologies suited their businesses. Hence, while many maintain their websites, some do not fully utilize them for electronic commerce despite the implemented electronic points of sales.

At the same time, some key informants brought to my attention that wireless offices were set up as individual efforts due to the demand for wireless services outside Ennis. One informant expressed that he hoped that the government could be more supportive in the implementation of these initiatives. I searched for articles and documents about these initiatives but experienced difficulty in identifying them in the mass media. I followed up with these key informants and one explained that these are not widely documented because they are grassroots efforts. Therefore, while some of these initiatives have been going on, little was being documented.

The infrastructure for wired services is available in Ennis, but leverage is another issue. Training programs thus, play a major role in disseminating information and educating the public about information technologies. It was deemed important not only to teach individuals and businesses about the benefits of information technologies, but also how they can leverage it to their own respective advantages.

As part of the information dissemination effort, websites (<http://www.ennis.ie> and <http://www.eiat.ie>) were created with updated information regarding information

technology and relevant initiatives. On the websites however, there appeared to be a lack of places where the public can contribute to discussions about economic issues pertaining to Ennis. The websites were designed mainly to provide information rather than to support public forums online.

Members of the Information Age Town project task force contend that connection is not a problem in Ennis. This constitutes a major success for Ennis which started out as a small rural town in the western part of Ireland. The lack of continued funding for the project is a challenge to Ennis.

*We are facing difficulties in the last mile of helping companies leverage their systems better. But we are still hoping to raise funds in other ways
[Key Member of Development Organization].*

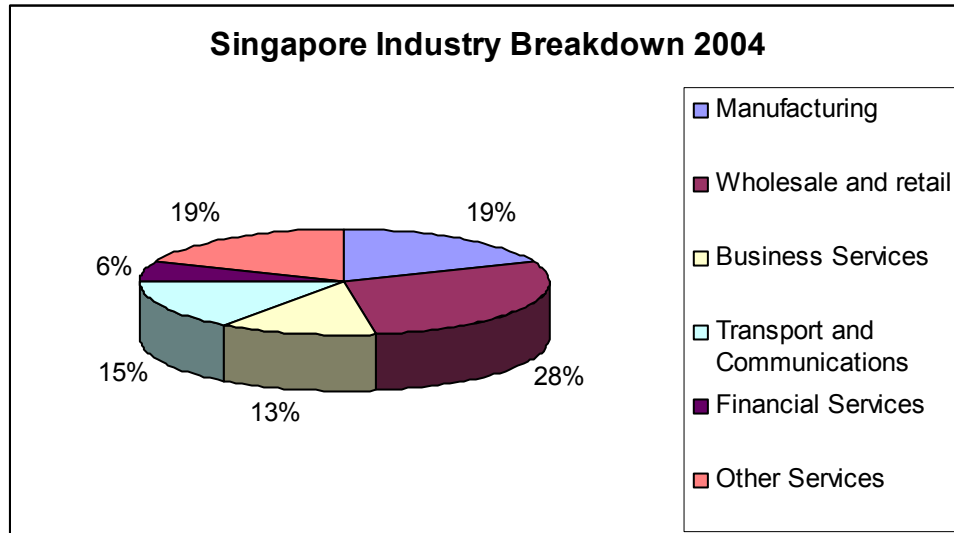
This connection to enhance their businesses in innovative ways appears to be a challenge to the region. Nonetheless, the development initiatives have been influential to developing a foundation for innovative businesses in Ennis. In terms of real profits, technology investments require extended periods of time for investors to reap the returns on investments. Furthermore, a majority of businesses in Ennis do not aspire to expand their businesses beyond their local and tourist markets. One informant argued that this may possibly be the next step for another information age town project.

Economic Development Strategies: Singapore

Singapore's economy was founded by the British during the colonial era on entrepot trade whereby goods were imported, added value and re-exported. This was grounded on the good harbor and strategic geographic location, which led the British East India Company to develop Singapore as a port. Between 1960 and 1964, Singapore's

economy focused on import substitution, followed by export-oriented industrialization from 1965 to 1978. Singapore's industry breakdown in 2004 is given as follows:

Figure 15: Singapore Industry Breakdown



Singapore's manufacturing industry is diversified into bioinformatics, bio processing, molecular and cell biology as well as nanotechnology. The government aims to develop industrial and intellectual capitals. The former are industrial parks such as Biopolis and Tuas biomedical park. Intellectual capitals are knowledge based research and development efforts to focus on new knowledge development in these areas for competitiveness in the new global economy.

Singapore gained its independence in 1965 (Toh & Low, 1990). Upon which, there were problems such as the high unemployment, tense employer-labor relationships, uneasy relationships with major neighbors – impeding trade and investment flows and reduced export market and the British withdrawal from Singapore.

From 1979 to 1985, the government initiated an industrial restructuring and the following 11 years from 1986 to 1997 were characterized by capital building and

economic diversification. From 1998 onwards, the government focused on transforming the information economy to a knowledge economy. At present, Singapore's main economic activities include its status as an international and financial center, regional business hub, a major high tech manufacturing center, offering manufacturing, retail and wholesale, as well as business services.

Singapore is geographically small and is lacking in natural resources, including land and minerals. Its domestic market cannot fully sustain its economy, and this limitation applies in the knowledge economy. As such companies are encouraged to venture overseas while based in Singapore to tap the global, especially regional, markets. Therefore, it becomes paramount to develop homegrown industries that are geared at higher value added services. Its present economic development is the result of effective strategies to leverage human resources, and it remains globally competitive today.

Major aspects of the Singapore economy are coordinated actively by the Singapore government. These activities include proactive initiatives to facilitate favorable conditions for business and technology development, as well as direct financial support for critical industries. This policy is founded on the basis that Singapore's small domestic market is not self-sustainable. The Singapore government therefore, provides direct financial support predominantly through the holding of indirect equity stakes in local companies and the provision of grants and subsidies to companies engaging in technology and service innovation.

As of 1974, the Singapore government started a holding company called Temasek Holdings Ltd. to channel its capital investments into the Singapore economy. This holding company is entirely government-owned and has substantial holdings in economic

sectors such as transportation, energy, banking, shipping, diversified energy, real estate and information and communication technologies. (International Telecommunication Union, 2005).

There are increasingly locations that offer lower production costs in this new global economy. An example is China. (Singapore) firms must therefore change their strategies to concentrate on higher value-added markets. [Academic/Researcher]

With the increased concentration of manufacturing activities, and Singapore's economic make up, it is crucial that regional supply chains are well structured and coordinated with high efficiency. Singapore boasts of a well connected information and communication services and more importantly expertise in supply chain management to be a major player as a regional supply chain center (Lee, 2004).

In view of these, Singapore continues its strategy as a middle contact and encourages companies to set up headquarters in Singapore. This hinges on its economic history as an entrepot trading hub. Singapore's economy is also dependent on regional growth because investors invest in regions rather than individual nations solely.

There are continuous economic restructuring efforts initiated by the Grassroots Committee (GRC). These activities are aimed at identifying new growth niches to ensure that Singapore remains competitive as a trading hub. Remaking Singapore is the Singapore government's long term vision. The committee was set up in 2002 to review strategies for Singapore in the 21st century. Singapore is a key node in the global network, and aims to remain a vibrant key node. With a creative and entrepreneurial workforce, Singapore can leverage its longstanding economic strength to compete globally as a

knowledge economy through high end manufacturing and business services industries. Many informants stressed the importance of the financial services sector.

In today's economy, it is crucial that Singapore draws asset-rich individuals and companies to park their wealth in Singapore. In the long run, this would lead to a more vibrant capital market for competitiveness as a knowledge economy [Researcher/Academic]

Singapore's economic strategies are well-coordinated. Over the years, Singapore has sought to internationalize Singapore's companies. Agencies have been established to facilitate this in a top down fashion. Among which, International Enterprise Singapore (IE Singapore) is a main government funded facilitator. International Enterprise Singapore was formerly the Trade Development Board. It is responsible for pushing Singaporean businesses overseas to exploit regional markets. Among its activities, IE Singapore organizes mission trips for companies to venture overseas, based on region or industry, such as Southeast Asia or the automotive industry.

Singapore is known for its top down socio-political structure, which as some informants argued, may pose as a challenge to some Singaporeans who prefer to remain passive. With this mentality, it becomes a challenge to develop entrepreneurship values necessary to address challenges in the new global economy. Therefore, this coordinated effort allows Singaporean companies to overcome the passivity and *kiasu-ism*¹⁷ and develop entrepreneurial values through concrete planning and venturing.

All officers at IE Singapore are expected to contribute knowledge management articles to IE Singapore publications. It is a requirement to write about their respective

¹⁷ Kiasu-ism is literally defined as a state of being afraid to lose out to others. It is a characteristic of the Singaporean culture and is commonly acknowledged

specialty areas (such as China, or land). The aim is knowledge retention and distribution among readers. However, knowledge management is not easily conducted through the Internet and publications, unlike information. Singapore capitalizes on its largely viable information infrastructure to conduct knowledge management. However, knowledge is human capital intensive. Therefore, it further justifies Singapore's economic strategy to attract foreign talent to boost its human resources

Transferring knowledge through the media is not as effective as through human capital because of the differential characteristics of knowledge versus information. While information can be codified, knowledge is largely tacit. As such, IE Singapore organizes seminars to educate Singapore companies on knowledge transfer and management. These are open to all but the 500 targeted companies are invited personally.

International Enterprise Singapore also adopts a matchmaking strategy for their clients. When a client expresses interest in a particular city, meetings will be arranged between them when the relevant affiliates visit Singapore. Singapore was the first nation to use a top-down approach towards economic growth sustenance. Although the government helps Singapore companies venture overseas, they tend to stay in Singapore because many of them originated from Singapore.

There are some companies who leave Singapore to venture overseas. But many of them tend to return because this is home base. So, Singapore can benefit by using these companies to channel funds and other related firms here. [Researcher/Academic]

It was also pointed out that Singapore's top down approach may prove to be counter productive for the knowledge economy.

A company's decision to venture overseas is its strategy. It is decided internally. (Venturing) overseas is a major decision. So these involve a lot of advanced planning. If IE Singapore pushes them, they may not be financially capable to handle the challenge. This may affect our aim to build a knowledge economy because knowledge cannot be taught like information can be transferred [Business Owner/Professional]

Given that overseas ventures are major strategies, they are usually planned well beforehand due to the need for considerable preparatory work and research. If initiated and pushed by IE Singapore, the company may not be financially ready to take on the challenge. Nonetheless, development initiatives are relevant factors that facilitate or inhibit economic growth.

Economy

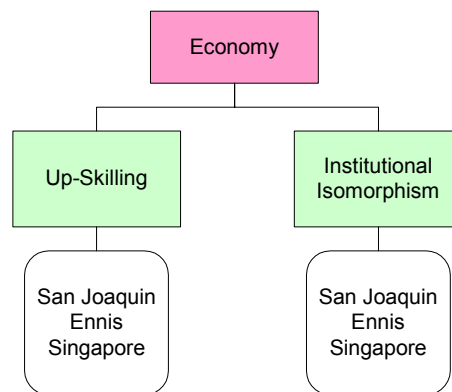
In this dissertation, I investigated the social dimension of up-skilling among workers, which occurred as the economy changed towards a knowledge economy. The other theme related to the economy is institutional isomorphism, a social explanation of economic behavior. The following table summarizes the themes under economy.

Table 6: Themes under Economy

Factor	Themes (Findings)
Economy	Up-Skilling Isomorphism

The relevance and implications of these themes are discussed in turn in two sub-sections. Each of these sub-sections will have three further sub-sections, each discussing the relevance of each theme in its respective region. The following diagram illustrates the organization of the discussion on economy.

Figure 16: Organization of Discussion of Economy



Up-Skilling

The increased reliance on technology in work creates new dynamics in production. In some cases, it results in de-skilling because people do not need complex skills to work – machines now handle the manual work. On the other hand, it creates a whole new set of skills – upskilling. Upskilling occurs along with the development of the knowledge economy because new skills are needed to enhance the production processes. According to Burtless (1994), most labor economists explain that this change in production techniques, leading to changes in demand for skills of workers, is the best explanation for wage disparities in a region. Technological change changes employers’ demands towards skilled rather than unskilled labor (Burtless, 1994).

Up-Skilling: San Joaquin Valley

During my first field trip to San Joaquin in the summer of 2003, I learned that farm workers were paid low wages for their manual labor, with a per capita income similar to that in Mexico (UC Davis, 2004b). In fact, many of them were immigrants from Mexico. Because of the lack of jobs in their home country, they accepted farm jobs at the minimum wage rate (Migration Dialogue, 2000).

My key informants explained that with the availability of abundant cheap labor, local farm owners did not want to rely on machinery in their farms. In addition, using corn as an example, the cost of machine labor in was 10 percent higher than non-machine labor in San Joaquin Valley (\$9.00 versus \$7.80 per hour respectively) (Campbell-Matthews et al., 2001a). For green beans, machine labor cost 20 percent more than general labor (Campbell-Matthews et al., 2001b).

They explained further that this had caused the problem of low skill levels among workers in the San Joaquin Valley. Indeed, farm workers in San Joaquin Valley had low levels of education but high levels of labor engagement (UC Davis, 2004b). This means that the jobs were labor-intensive, rather than skill-intensive.

During my subsequent field trips spanning the summer and fall of 2005, I learned that some farm owners were convinced that technology can increase productivity beyond the cheap labor. Therefore, some began to use machines and skilled labor to carry out farm work, such as grape picking.

Therefore, there was a need for skills related to machine maintenance and operation. This creates a new occupation class within a traditional work system. At the same time, some key informants explained that unemployment may increase due to the

lower demand for labor-intensive workers. This is especially important because San Joaquin Valley's economy is highly dependent on agriculture, according to analytical reports from Economy.com, Inc. Furthermore, the key metropolitan area in the San Joaquin Valley, Fresno, is dependent on immigrant labor.

There are initiatives executed to train and re-train people. An example of this is the Regional Jobs Initiative (RJI). It is a partnership comprised of public and private entities aimed at expanding and diversifying the economy by creating 30,000 new jobs in the Fresno metropolitan area by the end of 2008 – five years since its inception. Originally focused on Fresno, it is presently focused on nine industries in the entire San Joaquin Valley – advanced logistics, construction, food processing, health care, information processing, innovative energy, manufacturing, tourism, or water technology. Currently, this initiative is the top priority in economic development for San Joaquin Valley (Regional Jobs Initiative, 2005a).

If successful, this process will double the region's normal job growth in the same period and change the competition dynamics in the region's industries from a commodity- and cost-driven system to one based more on value. As a catalyst for economic development throughout the San Joaquin Valley, efforts have been initiated to help other Valley communities launch efforts similar to the RJI. Importantly, the RJI is assisting Sacramento and Washington to help deploy resources for economic development of the whole of San Joaquin Valley (Regional Jobs Initiative, 2005a).

However, some informants commented that the RJI does not appear to be sufficiently focused on knowledge jobs. Rather, they are more focused on creating service jobs that pay approximately \$7 per hour than knowledge jobs like R&D jobs. In

addition, the rural areas and disenfranchised segments of the population remain unaffected by this major initiative.

This also implies that knowledge workers will have less employment opportunities in the San Joaquin Valley. According to the Public Policy Institute of California, one of the reasons for outward migration of residents from the San Joaquin Valley is the lack of education and employment opportunities (Public Policy Institute of California, 2004). The RJI initiative shows the importance of upskilling in the local labor force. However, as one key informant explained, the knowledge economy comprises knowledge work, which is beyond knowledge of machine operation.

Up-Skilling: Ennis

In Ennis, while businesses are equipped with Internet technology, not every business actively uses it. According to some business owners, to the extent that they did not need complex information systems, they did not need knowledge workers.

We operate in a small way. Our market is local. We cannot compete with global players because they have more resources. But we create specialized local markets. We are different, so we do not need huge systems, and we do not need so many managers [Business Owner/Professional].

With the Information Age Town Project, some have tried to use more sophisticated systems to support e-commerce. However, they later found that their small scale operations cannot compete with large national and international players. Subsequently, these businesses reverted to their original ways of doing business without reliance on high end technologies. Many business owners explained that they employ

workers from eastern European countries to perform jobs that did not demand high skill levels, such as waiters and kitchen assistants. This is an example of a case whereby existing information infrastructure was not leveraged.

Their rationalizations appeared to be reasonable from their perspectives. However, taking a regional economic perspective, the use of high end information technologies among businesses helps attract other businesses into the area to leverage the existing infrastructure. This can move the industries up the value chain as new skills are required. This could support autonomous development among these higher value added industries (O'Malley, 1985). This means that an upskilling of jobs is accompanied with a shift of the economy to a knowledge-driven economy.

There are training programs initiated by the government to train and upgrade the skills of the Irish in Ennis. FAS initiated a community training project to help residents in Ennis learn about computers. This government funded project received good response from the residents, who were mainly in the 50s and 60s. The courses were held at the local Internet café with a small capacity of 13 people at a time. Course contents included office applications, email and the Internet. There were also courses targeted at businesses which were more advanced.

These training programs appear to be pushing Ennis towards a knowledge economy by first encouraging and educating the population, including businesses, to use information technology. The training programs initiated by the Information Age Town Project Task Force in Schools as discussed earlier, shared the same objectives of creating awareness and increasing literacy (Mc.Quillan, 2000). These programs were initiated because of the importance of fulfilling requirements from higher value industries.

Therefore, with the declaration of Ennis as an Information Age Town, and the industrial development initiatives towards a knowledge economy, this upward mobility of the labor force appears to be a vital consequence. Participants of this upward mobility included businesses as well as teachers and students (McInerney, 2003).

However, some businesses in Ennis commented that their operations were dominantly local and did not have major requirements on elaborate information systems and knowledge workers. As such, there appears to be a possible challenge for Ennis because the upskilling of the labor force was not accompanied by an increase in demand for knowledge workers in the local market.

Up-Skilling: Singapore

Singapore's urbanization and rapid economic development meant that rural jobs had to be actively phased out for the service industry, and recently the knowledge industry. With limited land resources, Singapore cannot afford to allocate large acres of land to farming. As such it is important to actively and effectively utilize the sole economic resource – human resources.

Singapore has regular programs to train and re-train its workforce. Its education system is also quick to adapt to the rapidly changing world economy. Businesses in Singapore spend considerable amounts of their budget on training and re-training their staff. In addition, Singapore human resource organizations and consultancies are helping local companies train their staff. As an example, Public Service 21 (PS21) is a public service reformulation initiative designed to develop a public service in Singapore that is relevant for future challenges and needs. Importantly, this initiative aims to develop a

culture of continuous learning and upgrading of skills in Singapore.¹⁸ This initiative was initiated by the Civil Service College under the Public Service Division of the Prime Minister's Office. The aim of this college is to provide training and consultation services to help improve the public service sector (Civil Service College Singapore, 2005).

Despite rapid economic development to meet constant challenges, Singapore's knowledge economy faces an internal challenge. One key informant explained that members of the middle level management seemed to have slightly more negative attitudes towards these training programs than the lower and higher level management staff. The middle level management individuals tend to be university graduates and are therefore, more highly qualified than diploma holders from polytechnics. As such, they have been described as slightly more arrogant and resistant to learning programs by one key informant. This is not applicable across all cases but based on anecdotal experience.

Bachelor degree holders are usually 'ya ya papaya' [a Singaporean term which means being arrogant about ones own abilities]. When in training sessions, they seem to think that they know everything, while those with lower qualifications are more open to learning new things. This does not apply to everyone of course [Business Owner/Professional].

This becomes an even more important challenge when economic development focuses on the rising middle class. This is applicable to many countries in East Asia. During rapid economic development spanning from the 1970s to the 1980s, Singapore, along with South Korea, Taiwan, and Hong Kong saw the development of the middle class. They were followed by Thailand, Malaysia, the Philippines, and Indonesia about a

¹⁸ The culture of continuous learning is a Confucian culture that posits that individuals should engage in lifelong learning. Singapore's policies are largely founded on Confucian principles and this represent one among many instances.

decade later. In view of this development, politics was influenced by the new middle class who are unlike their parents. They have had affluent lives since their childhood, are more educated, have higher educational attainments, and exhibit self-confidence in their abilities (Shiraishi, 2004). This perception of confidence may affect their responses towards demands for upskilling in the economy

Isomorphism

The decision to adopt technology and hence develop knowledge work may not necessarily be the direct result of economic motivation. Complying with norms can be a factor that influences decisions, including those that relate to economic behavior. Hawley (1968) first defined the concept of isomorphism in organizational theory to reflect the imitation process among organizations. As a socially constraining process, isomorphism influences an organization's decision to resemble another when they face a similar situation in a similar environment (Hawley, 1968). The result of isomorphism is homogenization among organizations.

There are three types of isomorphism. The first is coercive isomorphism whereby organizations are influenced by formal and informal pressures from other organizations that they are dependent on. This can come in the form of political influence for example (DiMaggio & Powell, 1991). The second form is normative isomorphism whereby organizations are influenced by the professional knowledge of other organizations. This is based on the knowledge base established by these professional organizations or group of individuals (Larson, 1977). The third form is mimetic isomorphism whereby organizations respond to uncertainty by imitating other organizations in similar situations (DiMaggio & Powell, 1991). In such situations, following the imitation is the least

expensive way to face the uncertainty (Cyert & March, 1963). Elevating the organizational concept to the regional level, normative and mimetic isomorphisms have been found to occur in all three regions.

Isomorphism: San Joaquin Valley

San Joaquin Valley's farming working population is typically employed at low wages for labor-intensive jobs. The labor-intensive agricultural industry is dependent on farm workers. It was deemed as economically unsound by farm owners to deploy machinery because this will mean high initial investments. Furthermore, as explained, the cost of machine labor is 10 to 20 percent higher than non-machine labor. (Campbell-Matthews et al., 2001a; Campbell-Matthews et al., 2001b).

However, with the introduction of initiatives such as the Regional Jobs Initiative, farm owners began to adopt practices which use more complex technologies. While some informants were of the opinion that farm owners became aware of the potential of incorporating technologies in their farming practices, others contended that there is a trend going on in the adoption of machinery. The former view suggests a normative isomorphism while the latter is a representation of mimetic isomorphism whereby they were persuaded amidst an uncertainty about using machinery and hence, more expensive machine labor. While it is difficult to prove this motivation, it can be said that farm owners are increasingly led by the trend towards new practices.

Mimetic isomorphism can be seen as a desire among farm workers to remain in their low wage farm jobs. In San Joaquin Valley, the largest foreign-born population comprises of the Mexicans. Among them, many do not have high levels of education and incomes, but have high levels of labor force participation (UC Davis, 2004b).

According to a report by UC Davis, the per capita income of these immigrant workers is similar to those in Mexico. The Mexican immigrants in the Valley take up jobs in agriculture. However, they do not leave their jobs even though they find non-farm jobs that pay higher wages or offer more hours of work. As a result, about 50 percent of these workers remain in their farm jobs, thus limiting their upward mobility (UC Davis, 2004b). Furthermore, the San Joaquin Valley becomes more dependent on low wage immigrant labor in agriculture because of the availability of the low wage workers.

Upon further investigation, based on some of the opportunistic interviews I conducted with residents I encountered during my stay, I found out that the working class residents have little intention to leave the San Joaquin Valley. Many immigrant farm workers decide to remain in their farm jobs partially because their peers in their immediate social circle are doing the same.

However, one informant explained that she may want to leave the San Joaquin Valley for the coastal cities such as Los Angeles or San Francisco once she obtains her bachelor degree. When I probed further about her reasons, I expected her to give reasons such as better opportunities for higher education or employment. Instead, the first reason was because her friends were doing so. Subsequently, she explained that jobs were better in the coastal cities.

Her immediate reaction suggested that her decision was affected by her immediate social circle. This was similar to the desire to remain in farm-related jobs, despite better wages in non-farm jobs. The motivation for these decisions has implications on the regional economy. An outward migration trend of students may lead to a brain drain of locally trained talents for the local economy.

Isomorphism: Ennis

Among the activities of the Information Age Town Project, the task force sought to educate businesses about the benefits of using information technologies. In the process, task force personnel helped businesses to implement these technologies (Mc.Quillan, 2000).

However, although business owners learned about these benefits, some businesses in Ennis did not seem to have participated in the project because they were directly motivated by these direct economic outcomes – increase in productivity and market expansion. Rather, it was perceived to be part of the cultural norm around the town (mimetic isomorphism) and peripheral persuasion (normative isomorphism) from the publicity of the project.

This finding was based on my interpretation, as business owners did not explicitly admit to this. An evidence of this account is some business owners interviewed attributed little value to what the internet can do to support their businesses after the completion of the project. Several businesses have websites but do not have machines in their offices. Upon further enquiry on their motivations to participate in the Information Age Town Project, some replied that *everybody was doing it [Business Owner/Professional]*,

The project was executed by an independent task force that provided consultation and financial support services. As such they were perceived as being objective and independent of any implicit political and profit motives. This being the case, participants trusted the task force.

This trust can also be related to a cultural trait among the Irish. According to Trauth's (2000) findings on egalitarianism, the Irish tend to accept authority in the

workplace (Trauth, 2000, pp.254-255). However, at the same time, she found evidence of resistance and questioning of authority when individuals acted out of curiosity or adopted a position to challenge (Trauth, 2000, p.264). In this case therefore, perceiving the Information Age Town Task Force as an independent entity became a strong motivation for the participants of the project. The independence of the Task Force gave participants a strong reason to trust their authority and in the process, gave them less reason to mistrust them.

Business owners interviewed expressed their liking for the idea of having information systems in place to support their businesses. They were aware of the growth in the Irish information economy and were confident about using information technologies for growth in their businesses. As an example, they started to have websites catered to disseminate information to customers and enable them to purchase their products and services online.

However, upon further enquiry, some of the business owners admitted that they did not fully utilize their systems in place. For example, one business owner explained that although his shop has a website with e-commerce services, he does his accounting manually. Purchases were also recorded and processed manually in a book, rather than a computerized cash register. Based on the interviews with business owners, a total of three main reasons were given: They were still unfamiliar with their systems, prefer to rely on their traditional labor-intensive methods, and did not see a need for these systems. These reasons could have come about through their participation, although some of them were merely *joining in [Business Owner/Professional]* the project during its implementation. However, the isomorphism led to new lessons learned. One business owner explained

that these lessons were particularly valuable because they helped him understand that his targeted market was local and therefore did not require elaborate e-commerce systems to compete with competitors that target the national and global markets.

Isomorphism: Singapore

Being a small country with a well networked transportation infrastructure, Singapore is a highly networked island. Hence, it follows that physical accessibility to goods and services is not a problem for Singaporeans who can at least take public transport. As a result, Singapore does not have a matured e-commerce culture, although getting online for entertainment is very common and deemed as an important recreational activity among many Singaporeans.

However, many businesses adopt IT practices because they are being persuaded by the norm set by large established corporations (normative isomorphism). Many businesses use websites to fulfill the information-seeking function: They serve as a rich source of information to the public about their goods and services. In addition, many of these websites are heavily embellished with animations.

It is not common for a teenager to have a credit card. As such, online purchases are not as common as in the U.S. Cashless purchases at the counters are typically done using ATM cards (or debit cards). There are online auctions too. However, many transactions are still done physically upon delivery.

This means that the implementation of websites served primarily as an information resource. However, directories in Singapore are increasingly becoming online as the public has come to prefer online versions. As such, having websites allows potential customers to reach their range of goods and services more easily. Over time,

some businesses may begin to utilize their websites further and adopt new business models.

A reason for business owners to subscribe to the notion of having a website was that others are having it. This was especially so for businesses owned by middle class and middle-aged business owners who were part of the industrial economy. One key informant explained that this can be attributed to the sense of being ahead in technological complexity was found to be much desired among Singaporeans, both on individual and organizational levels.

According to Teo, Tan and Wong (1997), the actions of an organization to be technologically ahead of peer organizations was a significant determinant of Internet adoption among businesses. In addition, competitive intensity of markets was not significant in determining Internet adoption (Teo, Tan, & Wong, 1997). In an earlier study on small businesses, competitiveness of the environment was also found to be insignificant in influencing decisions to adopt information technologies (Thong & Yap, 1995). This could mean that the motivation to adopt current business practices or to change old business models may not be initially motivated by direct economic objectives. This could also reflect normative isomorphism whereby the adoption of information technologies is sometimes the result of a direct understanding of the tangible benefits of investments in these technologies.

However, regionally, isomorphism may work well for the economy. Over time, businesses begin to move in line with the information and knowledge economy to empower their businesses with information technologies and potentially and/or

continuously change their business practices in innovative ways. As noted by some key informants, these may possibly lay the foundation for entrepreneurship.

We can create a bandwagon (of entrepreneurs). If you do, I will also do.

And everybody will do [Academic/Researcher].

Isomorphism therefore, can lay the foundations for learning opportunities. As discussed earlier in the findings, Singapore has a high level of support from the government in pushing for learning and knowledge work. At an organizational level, top level support was found to be a significant determinant for Internet adoption among Singapore businesses (Teo et al., 1997). This may be explained culturally because of Singapore's history of top down economic planning, which has proven to be an economic success (Toh & Low, 1990). Elevating this finding to the societal level, the government's high level of support may trigger isomorphic tendencies among Singapore individuals and organizations towards the engagement of knowledge work.

Culture

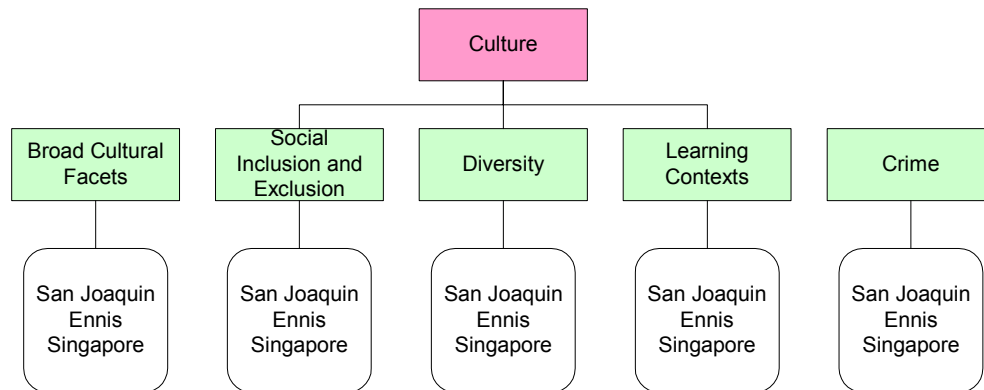
This section comprises a discussion of common themes related to culture that were found to be relevant to the sustainability of a knowledge economy. These five themes are general cultural facets, social inclusion (and social exclusion), diversity, learning contexts, and crime. The following table summarizes the themes under culture.

Table 7: Themes under Culture

Factor	Themes (Findings)
Culture	General Drivers Social Inclusion Diversity Learning Contexts Social Tension

The relevance and implications of these themes are discussed in turn in five sub-sections. Each of these sub-sections will have three further sub-sections, each discussing the relevance of each theme in its respective region. The following diagram illustrates the organization of the discussion on culture.

Figure 17: Organization of Discussion of Culture



General Drivers

There are several cultural facets that came across as influential to the sustainable knowledge economy in all three regions. Each cultural facet may not be exactly similar to the other sites. However, the data showed that region-specific cultural facets of any region may implicate the knowledge economy.

General Drivers: San Joaquin Valley

From my experience in the San Joaquin Valley, I was told by several informants that it is one of the most conservative regions in California. This conservatism is reflected in the culture, including the political culture (Bender T., 1984). An example of this conservatism can be seen in a resistance towards change. According to Schreiber et al (2001), some decision makers in the Valley believe that in economic development, there are conflicts of interest among the economy, environment, and equity. These conflicts of interest may also be extended to cars and transit, single-family homes and attached housing, as well as between infilling and outward development (Schreiber et al., 2001).

In contrast, a less conservative region may see the possibility of integrating these elements in a development strategy. In such regions, there are collaborations among organizations with different interests for a cohesive focus on regional development. An example is Florida, whereby I was involved in the development of a life science industry roadmap for statewide economic growth (DeVol et al., 2007). In this study, the various stakeholders in the state of Florida collaborated by representing their different interests in a statewide development strategy.

According to some key informants, the slower pace of life in the San Joaquin Valley is one of the main attractions to retirees, who migrate from more affluent areas such as the Bay Area or the Los Angeles metropolitan area. Within the Valley, Fresno is the most developed and most urbanized metropolitan area. One informant, who migrated to the Valley, commented that in terms of living standards and conditions, he did not find Fresno attractive in terms of its cultural, social, and economic conditions. However, his wife wanted to retire in Fresno because of the quality of life she experienced, which she refers to as strong family-orientation among people.

Residents enjoy the low stress lifestyle because it allows them to spend more time with their families. This family life is valued as more important than career advancements and upward mobility at least within her social circle in the Valley. This family orientation can be explained historically. According to Parsons (1987), the growth of the fruit industry began in 1875. At that time, grapes were accidentally allowed to dry on the vines near Fresno. Subsequently, the grapes-related industry developed in the area and spread to the vicinity. Families came to occupy the land to engage in the farm activities (Parsons,

1987). The rise of family-based farming activities can be one reason for the family orientation in the culture.

In addition, according to the interviews with the local students, it was found that many of the Hispanic population came from households that could not converse well in English. Furthermore, a majority of their families were not literate. With the exception of Mariposa County, the SAT performance of San Joaquin Valley residents was five to 10 percent lower than the California average in 2000, based on reports from the California Department of Education.

Many residents in the San Joaquin Valley, whom I have encountered, appeared to be contented with their simple lifestyles and did not show a keen interest in investing time and energy to upgrade their skill sets. Being more competitive in the job market as the economy grows did not seem to be of prior importance to them. However, this observation applies less to university students, who expressed some concern about employment and higher education. However, many of them explained that they were likely to leave the San Joaquin Valley for better higher education and employment opportunities.

One possible result of these broad and general cultural characteristics could be the low value of the workforce in the San Joaquin Valley. Consolidating some of my findings discussed earlier, the Valley has high dependency on labor-intensive agriculture. Farm workers were paid low wages (UC Davis, 2004), thus suggesting the low value of their work. In addition, some farm workers chose to remain in their jobs despite higher wages in non-farm jobs (UC Davis, 2004). At the same time, creating collaborative efforts for economic development was a challenge to the region (Kissam, 1998). These findings,

coupled with the general cultural characteristics, may be inhibiting learning among the population. Some key informants suggested that the laid back culture can be a barrier to the knowledge economy because of the resistance towards upward mobility. Knowledge work is cumulative. Hence, a willingness to engage in learning new skills and new work can facilitate knowledge accumulation and production.

General Drivers: Ennis

Ennis is a medieval-looking town in Western Ireland (McInerney, 2003). During my stay in Ennis, the town came across to me as a simple laid back town. The dominant music preference in Western Ireland is still traditional Irish folk music despite globalization (McWilliams, 2006). Therefore, even though it is a small town, the pubs decide to compete with each other by offering the same type of music rather than diversify and offer different kinds to tourists. The local residents appeared to be proud of their own identity and heritage. They also see themselves in cooperation rather than competition.

This sense of cooperation among these businesses in this regard can be seen partially as the result of a heightened respect for their own tradition among the Irish. According to McWilliams (2006), globalization has brought increased popularity of Irish music. This is contrary to popular belief that globalization brings about preferences for foreign cultures. He commented further that Irish tradition became perceived as a “precious resource” and an “inspirational font” despite the influx of western cultural products such as Music Television (MTV) (McWilliams, 2006. p.224).

The dot com crash at the turn of the millennium brought considerable skepticism to the population of Ennis. Many of which began to distrust the potential of information

technologies. As a result, the work ethic became one where people preferred to work manually, rather than use machines. One business owner commented that he prefers to do manual stocktaking than to use an electronic inventory for his store. Business owners in Ennis appear to be confident about their old ways of working.

I like tradition. I like using old methods. We communicate. New methods work too but not for me. I am used to doing things the old way. Too much technology can isolate people. Interactions among workers are important [Business Owner/Professional].

Some informants exhibited a fear of investing in information technologies because of the long time needed for these high investments to reap an acceptable return on investment, and also because they cannot see the final product prior to investments.

Despite their preference for the old ways, and their skepticism, they are still open to learning new things. Several businesses that have websites explained that they are happy with their old style of doing business – catering to a small local market and not relying extensively on information technologies for operations like accounting. Although business owners do not use elaborate information systems to power up their businesses, they are aware of the latest technologies. For instance, they are aware of how enterprise systems can work to integrate large enterprises and manage their workflows efficiently. Their knowledge allows them to justify their need for such elaborate systems. Many of the business owners interviewed do not perceive a need for them because they do not see themselves expanding their operations beyond the local market and seasonal tourists.

This ties in well with their perceived importance of the family unit. According to Commins, the Irish place considerable importance on the family unit (Commins, 1986).

This is consistent with Trauth's (1996, p.255) research finding that emphasis on the family is an important aspect of quality of life in the Irish culture. Family-operated farms therefore, were desirable as their intrinsic value became the basis for political stability, democracy, and equality. The change towards productive land use from self-sustaining family agriculture came about with economic growth in Ireland (Commins, 1986).

I found that the Irish in Ennis retained the sense of the family as an important social unit. In contrast, some of the Irish I encountered in Dublin, the capital of Ireland, did not seem to share the same values to the same extent. For instance, some of the Irish I encountered in Dublin were more open to work longer hours and therefore spend less time with their families than those in Ennis. One business owner in Ennis expressed his desire to spend more time at home instead of expanding his business. He explained that an expansion will mean having less time for his family and he would much rather spend more time with his family than devote all his time towards his business.

It appears that the Irish in Ennis may not have great aspirations of becoming the head of a major corporation, but they are optimistic about finding ways to improve their lives in various ways. For instance, they are curious to learn about the world (beyond Ireland) and are happy with their learning process. They value their times with their family and friends and see these times as an important contribution to their happiness.

Surveys have shown that the Irish are the third most contented among European countries. Many perceive that earning beyond basic income levels may not lead to increased happiness. Incidentally in 2004, the European Foundation for Improvement of Living and Working Conditions found that only four percent of households in Ireland were in poverty (McWilliams, 2006).

The desire to spend more time with families is also similarly reflected in their desire to spend time with friends in pubs as well as various gatherings. This can be generalized as a general desire for companionship. In general, I found that people were very concerned about companionship and drinking. For business owners, this attitude is manifested in their lack of inclination towards leveraging information technologies.

Similar to Trauth's (2000, p.317) finding, the Irish tend to be positive and team players as these broad cultural facets suggest. One informant mentioned that the Irish work ethic is different from the American one, because the Irish stress more on communication and companionship rather than deadlines. They place importance on their own identity in their connections at work. Thus, it is common for workers to know many people within the IT industry (Trauth, 2000, pp.157-159). Such inclinations support collaborations and are influential on knowledge work, which is cooperative and cumulative.

General Drivers: Singapore

In terms of the pursuit for technologies, Singaporeans tend to demand the highest possible end. The rush for broadband connection and mobile information services are good examples. Based on a study by the International Telecommunication Union, as of 2005, among a population of 4.2 million, 74 percent of all Singapore households own one or more personal computers and 65 percent have Internet access. Among which two thirds access the Internet through broadband connections. Approximately 83 percent of all companies in Singapore use computers and 76 percent have Internet access. Furthermore, mobile phone penetration in Singapore was 92 percent in 2004 (International Telecommunication Union, 2005).

Short Messaging Services (SMS) are based on a popular communication application among mobile phone users in Singapore. This is especially so for Singaporean youth. All mobile phone operators provide SMS services which are inter-operable, under the mandate of the InfoComm Development Authority (IDA).¹⁹ In December 2004, there were 692 million SMS messages sent, with a daily average of 22 million messages (International Telecommunication Union, 2005).

With the introduction of multimedia messaging services (MMS) in March 2002, Singapore's mobile phone subscribers were already actively using them as of 2004. This is largely attributed to the low costs and increase in the number of camera and various multimedia capable mobile phones in the market (International Telecommunication Union, 2005).

It is therefore, not surprising that Singaporeans exhibit a race towards upgrading.²⁰ The main thrust of this notion is materialistic. In other words, Singaporeans see the ends of self-improvement as material comforts or rewards. It is commonly thought of as something which everyone has to do because everyone else is doing it.

Singaporeans place a strong emphasis on upgrading. While there is a race among the population to upgrade their skills, the material dimension comes into play as well. By upgrading skills, Singaporeans perceive themselves as becoming more competitive and better positioned to reap benefits in the knowledge economy where skills and knowledge are increasingly important.

¹⁹ Singapore became the first in Asia to mandate the inter-operability of SMS (International Telecommunication Union, 2005).

²⁰ This term was originally coined to refer to the upgrading of government subsidized apartments, which house 84 percent of the population. This term has also been extended to apply to skill sets especially since the Singapore government advocates continuous learning and re-training for new challenges in the new economy, amidst global economic changes. The coming of knowledge economy is one major change that warrants upgrading.

Singapore has an interesting blend of traditional and modern cultures. In Singapore, it is common to find facets of conservatism among liberalism. The drive towards personal investment is promoted by the government to encourage Singaporeans to manage their finances and improve their quality of life materialistically.²¹ The Singapore Government is actively encouraging entrepreneurship. Rules and regulations are reviewed and changed to ease the setting up and management of businesses. The government has also distributed national shares to the public as investment opportunities.

However, within this liberal undertaking, there is also a sense of conservatism among Singaporeans in the way they regard investment opportunities. A dominant cultural trait among Singaporeans is *kiasu-ism*, which can be literally translated to “afraid to lose out to others.” Singaporeans tend to be afraid of being left behind. However, they are also afraid of being the first one to lose out. The latter is more dominant than the former. Based on a survey of investors from Hong Kong, Singapore and Taiwan, Singaporeans are similar to Hong Kong citizens in terms of social risk. Social risk refers to risks undertaken in social environments, such as approaching one’s employer for a salary increment. However, Singaporeans scored much lower in terms of inclinations towards investment risk compared to Hong Kong citizens and Taiwanese. In addition, Singaporeans are less inclined to take a portfolio approach (that is combining different financial strategies) in investments compared to the other two Asian countries (INSEAD Center for Decision Making and Risk Analysis (CDMRA), 2005).

On a company level, some companies targeted by IE Singapore are not necessarily willing to go overseas despite professional calculations. Although this is

²¹ I do not mean this in a negative way. Weber’s Protestant Ethic is an example of how wealth is created through continuous investments. As such, encouraging personal investment behavior is a way to encourage wealth creation on an individual level.

possible in any scenario, informants suggest that some companies show signs of fear of risk and are therefore unwilling to invest beyond local shores.

The survey conducted by CDMRA suggests that Singaporeans are risk averse and individualistic. Their risk aversion serves as an inhibitor in a knowledge economy where ideas catalyzed by entrepreneurial traits are important. Also, the knowledge economy emphasizes the sharing of knowledge for synergistic results. The individual tendencies appear to also inhibit the synergy required for sustainability. There is a passivity involved in the fast paced environment. This example of investment behavior is a good one to illustrate the passivity against a backdrop of *kiasu-ism*.

Singapore's culture is largely founded on Chinese culture, which generally values education above all else. The ultimate aim as a man in Chinese culture is to become a scholar. Next in line in terms of esteem is the farmer. This is followed by the worker, and finally, the merchant, which is the entrepreneur. Senior Minister Lee Kuan Yew proposed in an interview that Singapore must therefore overcome this "anti-entrepreneurial ethos" by promoting "little Bohemias" (Hamlin, 2002). These are "informal enclaves where the sometimes stifling sense of order that pervades this sophisticated city-state will give way to creative chaos (measured out carefully, to be sure) so as to generate innovation, stimulate entrepreneurship and ultimately spawn the kind of ferment epitomized by early Silicon Valley" (Hamlin, 2002). This proposed solution seeks to address Singapore's preference for security than risk taking (Hamlin, 2002).

Social Inclusion

Sen (1999) describes social inclusion as elements of society that include egalitarian opportunities, active citizenry, and fundamental well being (Sen, 1999). These translate to equality, which can be established through diversity and the celebration of differences within global, societal, and organizational contexts (Huang, Quesenberry, Morgan, & Yeo, 2005). Information technologies have been described as a means to social inclusion through the extension of resources to individuals' use of these technologies (Philips, 2000).

This area of research seeks to understand discourses within which people, groups, and communities are marginalized (Huang et al., 2005). Baskerville and Stage (2000) emphasize the importance of social issues in information systems research. They explained that information technology breaks through technological as well as social barriers. Research on social inclusion (and social exclusion) with respect to information systems research is highly contextual. It investigates power related issues of technology that may empower or disempower various segments of a population of people (Cecez-Kecmanovic, 2001; Howcroft & Trauth, 2004).

Social Inclusion: San Joaquin Valley

According to a report by UC Davis, federal policies in the U.S. are not highly focused on integrating immigrants to rural regions of the U.S. These policies, for example, encourage poor immigrants to work and marry when most immigrant families have working husbands and wives. These policies were not “appropriate to help immigrant families to climb the economic ladder out of poverty” (UC Davis, 2004. p.1).

However, there is a lack of representation of the poor immigrants' interests despite their social conditions. The San Joaquin Valley has a complex cultural fabric that comprises several stakeholders with different interests. As explained, these stakeholders exert influences on development efforts based on their different interests.

According to Schreiber, *et al*, (2001), regional development organizations therefore, experience the challenge of resolving social and economic issues to create a collaborative and coordinated development. Extending their attention across the different interests may lead to political controversy because each stakeholder or decision maker wants to work independently on its own area – such as environment or education (Schreiber et al., 2001).

As a result, there are different groups and communities that are socially isolated from each other. A lack of communication among these groups may lead to the exclusion of key organizations in various development initiatives.

To bring about change, we must work together, not separately. Right now, we are each doing our own thing [Key Member of Development Organization]

It becomes a challenge to regional development because social exclusion can be a barrier to a coordinated regional leadership. Therefore, to address the need for social inclusion among key decision makers, the California Partnership for the San Joaquin Valley was proposed in June 2005 by the state Governor. It comprises eight state governments, eight local governments and eight private sector members to develop a collaborative development strategy for the region (California Economic Leadership Network, 2006).

On another level, in San Joaquin Valley, a social exclusion boundary divides the farm owners and real estate business owners on the one end, and farm workers and refugees on the other. Generally, the farm workers are paid low wages for their manual labor (UC Davis, 2004b). Real estate owners were the rich while the refugees remain poor and were the center of social problems. The refugees who were a considerable segment of the poor, experience a lack of social and economic opportunities. As explained, it was argued that rural communities were excluded from the RJI initiative. In addition, their interests may not have been fully met by organizations such as Stone Soup and FIRM.

During one of my field trips, I encountered a community health forum dedicated to the welfare issues of the farm workers, who constitute the poor segment of the population. This organization was focused on improving community health, particularly for the poor. This voluntary organization was made up of academics and practitioners of the field, as well as other health-related organizations. There was no hierarchical structure. They met regularly in the form of forums. In the forums, there were a few key speakers, typically higher position holders of the organization. Their speeches were oriented around figures that show the severity of poverty followed by their recommendations for the community. From the forums and my interviews, it appears that the key power pool players were the speakers because they were the ones who started the forums and seemed to take a lead on determining their agendas.

Although the forum participants seemed to be taking steps at eliminating poverty and improving community health in the region, there was not a single representative for the segment of the population with low socio-economic statuses. In particular there was

no representative for the farm working population. I inquired further about this observation from several key informants and found out that the targeted segments of the population were not aware of these forums despite the publicity in the newspapers and the Internet. They explained that it was a challenge for these initiatives because of the exclusion of the poor from these activities. At the same time, there was no collaborative leadership to provide an adequate representation so as to bridge the gap.

Social exclusion in San Joaquin Valley becomes one of exclusion within exclusion – there is evidence of social exclusion of different forms among the decision makers on the one hand, and among the population on the other hand. There are efforts to bridge the exclusion boundaries by creating more collaborative initiatives. However, there were some professionals, who work in the rural regions, but live outside these areas.

There are some experts who live outside these areas, even though they work in the rural regions. Their work is aimed at regional development in different ways, such as teaching, but yet they do not see the need to stay with the people. [Key Member of Development Organization]

Some informants contend that this creates a barrier between them and the local population. It can thus, be interpreted as a social barrier that prevents their direct involvement with the regional development issues.

Social Inclusion: Ennis

Achieving social inclusion was one of the objectives of the Information Age Town project. This involved the removal of social barriers among local communities to create town-wide support for users to leverage on the town's technological infrastructure

and to facilitate the integration of these technologies into their daily lives (Mc.Quillan, 2000).

The project has since ended in 2002 and funding has since been terminated. Various businesses who were part of the Information Age Town project explained that they experienced relatively little communication with the task force after the project was completed. There was little advice given to them after which. Some of these businesses who invested in information technologies were not leveraging them to their full potential.

Consequently, some businesses have resorted to their old ways of running their businesses. One business owner in particular explained that the systems were not appropriate for his operations, especially since his focus is on a small local niche market. He elaborated further that providing the richness of face-to-face personalized services was of more value to him than the reach of services through information systems. This observed behavior shows that technology and information services do not have universal value. Therefore, some users were excluded from full leverage of technological infrastructure.

Among the workforce, there was a generation of workers in Ennis (in their 30s) who were active learners especially in information technology related matters. However, they appeared skeptical about these technologies after the dot com crash. They remained active learners, but had become more passive.

I believe in schools. But my children cannot study computers (IT-related disciplines). The computer industry failed. They must know the risks. But computers are still very important [Resident].

The younger Irish generation in Ennis on the other hand, seemed to care less about information technologies and their potential. Speaking to them, I found that they see technology as a means of entertainment. They do not aspire to take on IT-related careers despite their literacy.

Social inclusion can also be seen in another dimension – the traditionalists versus the modernists. Traditionalists are those who prefer Ennis to remain as a traditional small Irish town. Some traditionalists perceive that the Information Age Town project *took away the beauty of the old town [Resident]*. Traditionalists are older, and have experienced the growth of Ennis to become an Information Age Town. These traditionalists constitute a substantial proportion of Ennis' residents. The evaluation report of the Information Age Town Project concluded that information technologies are irrelevant to many people in the local community (Mc.Quillan, 2000).

On the other hand, modernists are those who push for urbanization. They share the optimism of the Information Age town Project and see Ennis becoming a *key node in information technology [Business Owner/Professional]*. One particular business owner shared his enthusiasm by explaining the possibilities of leveraging the technological infrastructure for various innovative services for his customers. He explained that with the infrastructure in place, there will be more opportunities for *every person [Business Owner/Professional]* to use these services. His vision is similar to a goal of the Information Age Town Project to develop an active knowledge-based regional economy with heightened use of information technologies across all segments of the population (eircom, 2000).

On both dimensions, there is a challenge to meet eircom's goal of social inclusion. Cultural characteristics related to age and values appear to be potential catalysts of social exclusion, which impedes equal access and use of services. In turn, access and use of information services are opportunities for learning and can therefore, serve as bases for knowledge work. While there are other relevant factors, the cultural significance of social inclusion can be a relevant theme in influencing the development of knowledge work.

Social Inclusion: Singapore

In Singapore, the distinct economic actors are based on their socio-economic status. The middle class workers are part of the population with tertiary education. They appear to be confident about their abilities. The upper class comprises either innovative business owners or people who have flown high and fast upon graduation. The lower class consists of either very motivated innovators who have less access to opportunities or exclude themselves from knowledge work for various reasons, including having less aspirations for social mobility.

Singaporeans show little social disparities in terms of housing, since 84 percent of the population resides in government-subsidized apartments (Housing Development Board (HDB), 2006). However, the remaining 16 percent who reside in private condominiums and private houses constitute the top income group of the population (Lui & Yeo, 2000). The Singapore government makes a consistent effort to upgrade the housing standards, while maintaining the subsidy for these apartments. As a result, the government can be said to be consistently bridging the gaps within the population so as to reduce the possibility of social barriers via housing.

Similarly, the introduction of IT curricula and the National IT Literacy Program (NITLP) in 2001 appeal to students as well as adult learners to keep them up to date with current technological trends. In this way, the government is actively attempting to bridge a potential digital divide, so as to create a literate population.

However, income disparity has been increasing in Singapore. According to the Singapore Department of Statistics, the income disparity increased by more than 10 percent from 1990 to 2000. From the same source, the ratio of the average income between the top 20 percent of households to the bottom 20 percent of houses increased from 11.4 percent to 20.9 percent between 1990 and 2000 (Singapore Department of Statistics, 2000).

With the advent of the knowledge economy, the labor market has been re-structured. This led to the development of new knowledge-oriented jobs and technical jobs. As discussed earlier, the Singapore government has initiated training programs to keep its population competitive in the knowledge economy. However, the enhanced training in the education system may be causing some additional stress, leading to a social boundary between students who can cope and those who experience difficulties. In my experience being a secondary school (middle school) teacher in 2000, I learned that many students were experiencing tremendous pressure associated with the high level of competition in primary and secondary schools (elementary and middle schools).

Suicide is one of the top causes of deaths among youths in Singapore (The Straits Times, 2007). In 2001, a 10-year old Singaporean schoolgirl committed suicide because of the stress level she experienced in her public primary school (Asian Economic News, 2001). In the Singapore meritocracy school system, students' results in final year

examination determine their subsequent years of education. In other words, students are streamed into different programs depending on their annual performances. The pressure exerted by parents to perform well in schools may also play a role in accumulating stress among students in Singapore (Tan, 2001).

Amidst this school system, different students experience different stress levels from school. While some perform well, some are discouraged as a result of their poorer performances. I have also come across some who lose interest in learning and give up. By doing so, they may exclude themselves from actively participating in the education programs developed by the government.

Thus, a social boundary appears between the active actors in the economy and those who fail to participate. While the government actively introduces training and re-training programs to enable all individuals to participate, the programs themselves may exclude some from participating. The challenge to include the population in the knowledge economy is thus complex and can be approached from different levels.

Diversity

Regional economic outcomes are closely related to contextual conditions that facilitate creativity and diversity (Florida, 2002b). A diverse set of firms and industries benefit the regional economy (Quigley, 1998). Along similar lines, innovation and city growth are fueled by the immigration of diversity in the population (Jacobs, 1961).

The theme of diversity was brought up in a number of interviews in each of my study sites. It is closely related to social inclusion (and social exclusion). While the latter involves a discussion of the existence of different social groups and how their communication behavior inhibit the sustainable knowledge economy, the former

represents an extension of social inclusion (and social exclusion) in such a way so as to constitute a facilitator of innovation. Therefore, these are presented and discussed as different themes.

The importance of diversity in the sustainable knowledge economy lies in its influence on talent. Talent is defined as human capital which includes people with a bachelor's degree and above (Florida, 2002a). Looking at the economic histories of national economies, the openness to immigration is a key to innovation and economic growth. The competitiveness in the high tech industries of the U.S. is largely attributed to its openness to foreigners. Conversely, the economic stagnation of Japan and Germany are due to their relative homogeneous makeup in population (Zackary, 2000). Along the same lines, high tech industry concentration and diversity was found to have a positive relationship with each other (Florida & Gates, 2001). There is a stronger relationship between talent and diversity, than between talent and conventional measures such as climate, cultural and recreational amenities (Florida, 2002a). As an example, diversity is a characteristic of IT work because of its global nature. It is a key facet in the global outsourcing of IT work whereby participants and activities are becoming increasingly diverse (Trauth, Huang, Morgan, Quesenberry, & Yeo, 2006).

Diversity: San Joaquin Valley

In San Joaquin, this theme was oriented around foreign immigrants and how they contributed to the workforce. These foreign immigrants referred to in the interviews were Mexican farm workers. From the informants, members of the farm working population lived under harsh living conditions. They were paid low salaries and had long working hours (UC Davis, 2004). As a result, they could not afford proper housing. Many of them

lived in hazardous areas such as open spaces or unused garages. Given the warm weather conditions, some of these places become fire hazards.

In California, 30 percent of the population is comprised of Hispanic. Based on project figures, by 2025, Hispanics will constitute 43 percent of California's population, making them the largest ethnic group in the state (Lopez, Ramirez, & Rochin, 1999). According to Barlett and Kinney, in 2005, almost 25 percent of Hispanic children in California did not have health insurance (Bartlett & Kinney, 2005). With the high Hispanic population in California, almost 50 percent of Californian children are Hispanic (Bartlett & Kinney, 2005). According to the National health and Nutrition Examination Survey, 77 percent of first-generation Hispanic children were never insured. This stands in sharp contrast with 12 percent of non-Hispanic white children (Bartlett & Kinney, 2005).

The low opportunities for medical care leads to their lower performances in schools and later on in their careers (Bartlett & Kinney, 2005). Furthermore, the Hispanics' in San Joaquin Valley have their livelihood threatened with the introduction of machinery. Since they constitute largely the unskilled labor force, the use of farm machinery replaces a lot of their manual labor more efficiently. For instance, in large farms, the harvesting of grapes utilized more machines than physical labor. This meant the reliance on higher skilled workers, who cost more than non-machine workers (Campbell-Matthews et al., 2001a; Campbell-Matthews et al., 2001b)

The United States used temporary labor as a solution to address its labor shortages during and after World War II. In fact, during the war in 1942, The U.S. signed a legal agreement with Mexico to allow laborers (commonly called braceros) to work in the U.S

(Valenzuela & Ong, 2001). The authors argued that the physically strong men were fighting the war and that left the country with a labor shortage. This program, called the Bracero Program lasted for 22 years and resulted in the participation of more than 4.5 million Mexicans (Valenzuela & Ong, 2001).

California's proximity made it the choice for Mexican immigrants. However, it may be useful to note that California's reliance on immigrants was not only on Mexico. The advent of the high tech economy led to increased immigration from other countries in Asia. And it has been argued that the growth of California's economy was substantially the result of foreign immigrants (Valenzuela & Ong, 2001).

Of note, in 1996, forty percent of undocumented immigrants in the U.S. resided in California. Among the foreign-born immigrants in California, 53 percent were Hispanic and among which, 73 percent were between the ages 19 and 55 (Valenzuela & Ong, 2001).

On the topic of diversity, several key informants explained that the Hispanic population contributes substantially to the Californian economy. In the course of my residency and work in California, I became more aware of the Hispanic population, as opposed to Pennsylvania, where I lived for three years. I noticed the salience of the Hispanics at various jobs, such as construction workers. Thus, in the process, I learned that the Hispanic population in California, legal and illegal, plays important roles in the economy. This was also documented as a satirical movie release called "A Day without a Mexican" by Sergio Arau in 2004 (Arau, Arizmendi, & Guerrero, 2004).

The economic potential of Hispanics is tremendous in California, according to a study by (Lopez et al., 1999). In 1998, 86 percent of the Hispanic population had a high

school diploma or less, and 8.4 percent had a bachelor's degree or more. However, changing these percentages to 55 and 33 percent, the econometric modeling showed that the economic benefit is \$28 billion, which is an increased order of economic output (Lopez et al., 1999).

Taking the argument amidst the diversity theme, this group of workers has the potential to benefit the regional economy. San Joaquin Valley stands to benefit potentially from its makeup of the Hispanic population and the White community. In this respect, proper healthcare and education can be promoted to facilitate high value economic output, which can be achieved in its thriving agricultural economy by both the White and Hispanic populations.

Diversity: Ennis

With the Celtic Tiger, there was an increase in revenue from foreign high-tech firms as they established bases within the country. This phenomenon was commonly called the "Greening of Ireland" (McInerney, 2003, p.13). Hence, there was an increase in foreign culture in the country. This increase was a result of increases in the multinational IT firms (Trauth, 2000, p.338) and American cultural forms such as MTV (McWilliams, 2006, pp.224-225). It was also the result of wider travel and exposure to foreign media among the Irish (Trauth, 2000, p.338). Therefore, there was an accompanying increase in cultural diversity in the country as it grew from an agrarian economy to an information economy.

As explained earlier, the Celtic Tiger had little influence on developing Ennis' information sector prior to the Information Age Town Project (McInerney, 2003). In Ennis, conversations about diversity began on the topic of the increase in the number of

non-Irish Europeans in various jobs. Based on accounts from informants, there were considerably fewer non-Irish workers in Ennis before the Information Age Town project was implemented in 1997. However, these workers were employed in mostly labor-intensive work.

Upon further enquiry, I came to understand that employers preferred to *trust* the Irish with work at the higher management levels. They also preferred to keep these higher paying jobs among their own people. At the same time, with higher education among the Irish, and the recent growth of the economy, employers faced difficulties in trying to employ Irish for less knowledge-intensive jobs, such as waiters and kitchen helpers. With their higher education, they necessarily preferred to work at the management levels. In such cases, eastern Europeans were typically employed to fill in the gaps.

Much of Ennis' foreign workforce comprises those in blue collar jobs or in the lower management levels at most. Businesses contend that they will not employ non-Irish at top management positions.

Usually, businesses employ only local people as managers. The non-managerial jobs are usually held by non-Irish, although you will find local people too. [Business Owner/Professional]

This was reflected at the employee level. In telecommunication firms, fresh graduates preferred to start at the management level instead of the lower levels such as customer service. However, it was difficult for fresh graduates to work at these higher levels without on-the-job training. According to one key informant, this may involve work at lower levels, so as to understand the nature of the business. In such cases, foreigners may be employed to fill in the management level positions.

It appears that in the cultural fabric, the Irish accept diversity and welcome it in some sense – at the lower management levels and at higher levels when deemed necessary. In schools, Ennis enjoys an ethnic mix of races in schools. They were from various parts of Europe and Africa. The history of the diverse population of Ennis dates back to the time when political exiles entered Irish lands through Shannon airport. These exiles were from Cuba, South America, and Russia.

Hence, Ennis has a history of being accommodating towards non-Irish. They also have an open-minded approach towards the election of public representatives. As an example, in 2002, a non-Irish, Mosajee Bhanjee, a man of African descent, was elected as the representative of County Clare (Took & Connelly, 2007; Wikipedia, 2007). He was a psychiatrist from South Africa but his position obtained through the election was equivalent to the senator in the American system.

Yet on the other hand, Trauth (2000, p.338) found that imported culture was not easily assimilated into the existing culture in the workplace. In her interviews conducted in 1989-1990, respondents explained that in Ireland, tasks were performed differently from the way they were done in American culture.

As a recent similar finding, McWilliams (2006, pp.224-225) explained that Irish music became perceived as a “precious resource” in Ireland despite the influx of MTV with globalization. I followed this lead and noticed that the majority of pubs in Ennis were providing Irish sessions as live entertainment, instead of having wide variations. These suggest that there could have been a preference for local cultures in Ennis, as opposed to foreign cultures.

Taken together, Ennis may be in a state whereby there are variations in reactions among its population towards present and new cultures. Trauth (2000, pp.259-260) found that there was evidence of both acceptance and resistance to authority in the information sector workplace. This was characteristic of multinational firms which had both the American and Irish styles of management (Trauth, 2000, pp.259-260). The former workplace culture was less authoritarian and the latter.

The same may be said of diversity in Ennis, whereby there was evidence of varied reactions towards diversity. One possible explanation for this contradictory finding is that the experience of diversity was new to Ennis, especially with the region's recent growth stemming from the Information Age Town Project. Therefore, there were both acceptances to new cultures as well as preferences for local cultures.

One informant pointed out that the new global economy implies increased mobility of workers around the world. He further explained that it is important to be able to accept contributions based on talent rather than nationality. The influx of foreign workers at all management levels suggests the acknowledgement of the importance of diversity. The acceptance of diversity can be seen to be dependent on factors other than foreigners' abilities to perform in their jobs.

Diversity: Singapore

The ethnic makeup of Singapore can be divided into four groups – Chinese (76.7 percent), Malay (14 percent), Indian (7.9 percent) and others that do not fall into this category (1.4 percent). Most of the latter category comprises Eurasians. In 2006, Singapore's population strength was 4.5 million. However, only about 80 percent were

citizens and permanent residents. The rest of whom were foreigners (Singapore Department of Statistics, 2007).

In Singapore, the theme of diversity is oriented around foreign talent and their economic significance. This was a substantial topic of conversation even before I moved to the U.S. in 2002. The reason is Singapore's foreign talent policy supports using high salaries to recruit foreigners who have specialized expertise. Positions that the recruited foreign talent take include CEOs (including CTOs, CFOs and such), faculty, consultants, various directors, and top managerial positions.

Singapore's research and development innovation policy is largely focused on recruiting and incorporating foreign talent. It has openness towards diversity at many levels of management. In other words, innovation, as the main thrust of Singapore's economic strategy for the knowledge economy, is valued regardless of ethnicity and nationality.

As an example, the CEO that manages tourism in Sentosa²² in 2002 was an Australian (MediaCorp Press Ltd, 2007). Having a non-Singaporean in charge of a national tourist attraction is quite unexpected. The reason is a foreigner will lack the local knowledge required to effectively and efficiently manage the attraction. This case highlights the emphasis on talent rather than nationality in Singapore. In addition, it is implicitly assumed that foreign nationals holding top management positions will have considerable support from locals, which resolves the lack of local knowledge.

The introduction of a diverse makeup of Singapore's workforce is an interesting one. Singapore is a metropolitan island republic that is an attraction to many foreign

²² Sentosa is the most famous island resort in Singapore. It draws tourists as well as local residents with its range of beach resort activities such as holiday chalets, beach games, and even historical attractions, amidst a tropical climate.

expatriates because of the quality of life. In 2006, Singapore was ranked by expatriates as the top Asian country of choice in terms of quality of life.

This celebration of diversity marks the country's emphasis on it and its economic relevance. Although not explicitly stated, the country is leveraging its social policies, which are oriented around themes of inter-racial harmony, to promote a diverse economy of multi-nationals, beyond its multi-racial makeup.

The reason behind this emphasis and value is Singapore's diversity was imposed, rather than naturally evolved. The racial makeup existed during the British Colonial era from 1819 to 1965. Although housing among the different races was segregated during the colonial era – 1819 to 1965, thus preventing different races from interacting with each other, the Singapore government actively promoted inter-racial harmony and initiated the recruitment of foreign talents since independence in 1965. The rationale behind this was the lack of natural resources. In other words, Singapore, as a small nation, could only strategically compete on the basis of its human capital (Federal Research Division of the Library of Congress, 2006). Singapore, being a small country, has a small domestic market, comprising its population of 4.3 million people. As such, it has a global orientation in its economic strategies, to market to the world. Also, given its lack of natural resources, it has been reliant on services, rather than primary manufacturing. Singapore has been economically successful since the colonial era even before World War II.

Singapore's economic orientation can be traced historically to its role as an entrepot trading center between the U.K. and East Asia. Singapore's global orientation implies that it has a diverse market. Therefore, having a diverse workforce (including

talents) becomes a strategic asset for the country to continue to grow in the age of the knowledge economy. This is so especially when continuous innovation and learning is the key – Singapore can stand to benefit from its diversity because of the resultant comprehensive understanding of the global market, as well as diverse sources of continuous learning based on the diverse sources of knowledge among its talents.

Learning Contexts

Empirical research in labor economics suggest that education improves productivity (Marshall, 1994), thus supporting the importance of human capital. Attitudes towards learning were found to be influential to the nurturing of continuous learning for the sustainability of the knowledge economy. These contexts of learning involve accounts of receptivity as well as conditions related to training (and re-training) environments.

Learning Contexts: San Joaquin Valley

Findings from my interviews suggest that the local population who depend on agriculture for their living do not place a high importance on their children's education. Many informants content that many ranchers and farm workers alike do not make elaborate plans for their children's education and would very much prefer them to help out in the farms and carry on the family tradition of agriculture. In addition, some of them do not think that upward social mobility is possible for them.

This observation may at least partially explain the tendency for farm workers to remain at their jobs despite the availability of better wage non-farm jobs (UC Davis, 2004b). The lack of encouragement from the families facilitates the negative attitudes towards education among the younger generation.

Local farmers harvest different crops at different places at different times of the year. As such, their children are forced to move with them. Thus, they are unable to continue their education at the same place throughout their candidature. This means that it is very difficult to track the needs of the children who have to leave school. Furthermore, many who manage to complete their education tend to leave San Joaquin Valley because of a lack of education and employment opportunities in the Valley (Public Policy Institute of California, 2004). Over time, this leads to a drain of human capital from the Valley to regions such as San Francisco or Los Angeles, despite their higher costs of living.

My interviews with the general population suggest that the local farm working population is less concerned about their children's future. Among those I interviewed, many do not seem to have long term aspirations for their children:

I don't think it's (thinking about my children's education) is necessary.

They will study here and move with me when I move [Resident].

Given that most of the farm working population had low levels of education but high levels of engagement in labor (UC Davis, 2004b), I wanted to understand the origin of such negative attitudes. In addition, based on a report on comments from key stakeholders in the implementation of the California Partnership for San Joaquin Valley, addressing the negative attitude towards change is important to facilitate regional growth (High Beam Research, 2006).

I inquired further about my observations by discussing my findings with key personnel from development organizations in the Valley. From their expertise and local

involvement, I came to understand that the learning environment could have been the reason for these negative attitudes.

San Joaquin Valley is largely made up of rural environments. However, teachers teaching in the rural regions tend to reside in urban regions, such as Fresno City. This makes it a challenge for them to be engaged in the local learning contexts because they may not have an in-depth understanding of their students' needs.

This disconnection inhibits regional progress because they don't understand enough and don't commit enough. A teacher must understand the context to work effectively in the system [Key Member of Development Organization].

Therefore, the challenge to create a positive learning environment for rural San Joaquin Valley can be interpreted as the level of commitment teachers have in helping and supporting rural education initiatives. Furthermore, one key informant explained that a community is reflective of its citizenship. Therefore, bringing leaders to develop a community is different from bringing leaders to live in the community. The learning context then, becomes a key challenge for San Joaquin Valley to develop effective educational programs for continuous learning.

Learning Contexts: Ennis

The Irish place a large emphasis on education. They value the importance of general literacy, language facility, and mental alertness (Trauth, 1993 p.209). A key objective in the Information Age Town Project was to develop Ennis as a center of excellence for lifelong learning (eircom, 2000). Ireland has a long tradition in education. In terms of education participation, Ireland has one of the highest rates in the world, with

81 percent of Irish students completing second-level (secondary) and 60 percent continuing further studies (Education Ireland, 2007). According to Trauth's (2000) findings on Ireland, "education became a way of maintaining national and religious identity," (Trauth, 2000, p.60).

Over here, education is as important as religion. We must know the world.

Our children must know the world. World conflicts are the result of a lack of education [Resident].

My opportunistic conversations with people at the Ennis public library reinforced this emphasis that continuous learning is rooted in the Irish culture, and is still held in high regard today by the Irish. This translates to the perceived importance in education among the Irish (McInerney, 2003, p.25). Our conversations were in part, oriented around how people use the Internet and what kinds of people visit the library and for what purposes. The public library in Ennis is small. It does not have scholarly publications. It has books (some of which are very old) on history and culture of various parts of the world, especially Europe. Many books are targeted at children. These cover topics from art and craft to science. I observed that parents spend the afternoons with their children in the library, reading to them, because they deem it as an important learning opportunity for their children.

The eagerness to learn can also be seen among female workers I encountered, who were then in their mid 30s. These women lived through the hype and crash of the dot com. According to business owners who employ workers of both genders and across a wide age range, this group of female workers exhibit a fear of information technologies. But one business owner explained that they were quick to embrace new methods of

working once they were convinced about how these new methods can lead to higher productivity. From my conversations with them, they appeared to be open to new technologies, but they also trust manual ways at the same time because they are afraid that computers may fail. For instance, when I asked one of them about using personal digital assistants to compute orders and sending them to the kitchen, she explained she would like to try.

Conversely, younger workers I encountered appeared to have relatively less positive attitudes towards learning new technologies. They seemed aware of the potential of information technologies for entertainment, but did not seem to relate learning about these technologies to work. This observation is analogous to the newly introduced academic syllabi for Irish music.

Irish music programs were found to be recently commercialized and have set graded rituals that are similar to commercialized music programs. From 2003, syllabi were developed by Comhaltas Ceoilteoiri Eireann (Organization of Musicians of Ireland) for Irish music in association with a music academy in England. The aim is to develop respectability for traditional Irish music, as with classical music in England. The initiative to academize Irish music answered people's desires to have grades for Irish music.

(The new generation of Irish wants to) make a science out of everything through formulae. But little do they understand that culture is abstract [Business Owner/Professional].

The newly developed syllabi are concrete, while a traditional Irish session²³ is abstract. Irish music is about spontaneity and abstraction. Irish music challenges practitioners to innovate without compromising the traditional feel. As a result, the younger generation formally trained in Irish music may not have the same spontaneity the previous one had. This finding reflects an inherent cultural characteristic of the Irish – they are curious and want to explore (Trauth, 2000, p.264). However, the systematization of culture may reduce the room for this exploration. In other words, the learning context may restrict positive attitudes towards learning

In Trauth's (2000) study of the Irish information economy, the young workers were found to be more flexible and quicker to grasp new knowledge (Trauth, 2000, p.56). They were the innovative thinkers who fueled the information economy. These young workers are now the middle aged workers who are still innovative thinkers, despite their new found skepticism. However, in contrast, the younger generation appeared to be less optimistic about information technologies.

Furthermore, among third level students (tertiary students), there is some fear of unemployment. The fear is the result of the experience in the 1980s when it was difficult for university students to get decent jobs. Following the dot com crash after the turn of the millennium, many became skeptical about the prospects of an IT career, despite the growth of the Irish information economy. The learning context in Ennis is thus, challenged by both the attitudinal differences across age, and fear and skepticism of the IT industry. In the development of an innovative workforce, these negative attitudes can potentially lead to increased training costs, workload and frustrations (Mc.Quillan, 2003).

²³ Irish music is about playing spontaneously with two or three other people in a group – called a session. It is important to understand the open-ness and the style to be able to play innovatively. The members of a session may not necessarily know each other beforehand.

Looking at Ireland as a whole, the segment of the population that has done well economically are those who have successfully generated their own income. This includes entrepreneurs and artists. On other hand, those who failed to change and adapt did not perform as well. These tended to be civil servants and priests (McWilliams, 2006). The learning context then, is an influential factor in facilitating knowledge work.

Learning Contexts: Singapore

In Singapore, the middle level management workers are usually university graduates or have consolidated a wealth of industry experience with a polytechnic degree.²⁴ These workers tend to have less positive attitudes towards training and re-training programs. This stands in contrast to foreign employees who tend to have more positive attitudes.

Singapore's education system is designed in such a way that career paths are highly structured and laid out. This system is called the streaming system whereby students are streamed into different programs based on their performance. For instance, going to the science stream (the other two streams are commerce and arts) during junior college (equivalent to high school in the American system) will mean it is likely that this student will be an engineer. Similarly, going to the technical stream in secondary school (equivalent to middle school in the American system) will mean this student will attend vocational training in a technical skill upon graduation and will become a technician. While there are always exceptions to these possibilities, the system and curricula are

²⁴ In Singapore, tertiary certifications include bachelor degrees and polytechnic diplomas. The former requires more years spent in schools and commands higher starting salaries.

designed to facilitate this process. In this way, the labor market is efficiently filled for the growth of its economy.

It was introduced in 1984 by the government as an efficient way to tailor education programs according to the needs and abilities of each student (ThinkQuest, 2006). From a regional economic perspective, this can quickly create a labor force for the fast growing economy. Interesting enough, attempts to implement a similar system in the U.S. were met with opposition because it is a form of social class stratification and was perceived as unfair (ThinkQuest, 2006). However, the attempts suggest that there are merits in the system.

In view of the high emphasis on examinations in Singapore's learning context, exam anxiety was perceived as a major reason for unhappiness among children in Singapore. Almost 50 percent of children participating in the United Nations Children's Fund (UNICEF) survey in 2001 responded that performing lower than expectations in school would make them unhappy. Furthermore, more children fear failing examinations than their kin dying. In a survey conducted by the Singapore Press Holdings in 2000, 36 percent of the children surveyed rated failing examinations as their greatest fear, compared to 17 percent who rated family members dying as their greatest fear (Family and Community Development, 2003).

The findings from a Ministry of Children and Youth Services (MCYS) study in 2004 showed that parents place high emphases on their children's performances in school. About two-thirds want one of their children to be university graduates and about 50 percent want all their children to hold bachelor degrees. In addition, 50 percent of parents

surveyed were afraid that their children would not be able to graduate from the university (Family and Community Development, 2003).

As such, students in Singapore appear to experience pressure from both the system and their families. However, with the structured streaming system, students would be likely to graduate with available jobs that apply to their major and in accordance to their abilities. Given that the economy is highly structured and known for its efficiency (Asia Market Research, 2002), the supply and demand for labor appear to be well-managed. As such, for the university graduate, it may seem that it is less necessary for him or her to continuously explore different upgrades to his or her skills, since the career ladder is well laid out.

Compared to diploma holders, university graduates are more assured of a successful career path by virtue of the system. They would have gone through the system successfully amidst possible pressure from their families and the system. Thus, this may explain why some may be less concerned about upgrading options to compete with their peers. Diploma holders on the other hand, need to be consistently upgrading their skills so as to compete with university graduates. With better skills, they can prove that they are as capable, if not more capable, despite their lower qualifications.

With the information and knowledge economy, it becomes increasingly necessary for workers, including managerial staff, to upgrade their skills, so as to keep up with the rapid on-going changes.

Knowledge is cumulative and requires positive attitudes towards learning.

Everybody must understand the importance of upgrading (of skills)

[Business Owner/Professional]

These positive attitudes may lead to increased motivation for learning. As I recalled my teaching experience, I found that some students were more concerned about performing well for examinations, while others were more concerned about the learning process. This difference was brought out in their reactions to their grades. In the former category of students, they sometimes asked me how they can make up for the loss of points. In the latter category, they sometimes asked me how they can avoid making the same mistake in the next test.

This difference in attitude may be a product of the learning context. The emphasis on examinations in the Singapore education system may have led to a fairly high degree of emphasis on paper qualifications. Hence, it may be plausible for some workers who have certain levels of qualifications to be less open to learning.

Social Tension

The theme of social tension first arose from my interviews in San Joaquin Valley. According to Sen (1999), a public sense of security among the population is one of the means to economic development. Social tensions constitute behaviors that can threaten the security in a region.

Social Tension: San Joaquin Valley

In San Joaquin Valley, real estate investors can purchase low income properties and renovate them to be sold or rented out as low income housing. Several landlords changed rental rules such that a housing property can house only a limited number of people. However, rural communities include families in poverty, who tend to be large extended families. As such, they were no longer able to share houses to reduce rent under

the new regulations. Furthermore, based on computations by the National Association of realtors, U.S. Census Bureau, and the Bureau of Economic Analysis, the housing affordability in Fresno decreased by 36 percent between the first quarter of 2000 and that of 2004. This stands in sharp contrast with only 13 percent in San Francisco for the same period.

As a result, there were sometimes trailers between properties to house the poor. Some of these families rent garages from various houses as homes if the owners wish to capitalize on the situation for individual profit. Outdoor living is also common because it has a warm Mediterranean climate with heat waves that occur occasionally. These lead to fire hazards which threaten the social security of residents in the Valley. In fact, many parts of California, including San Joaquin Valley are prone to forest fire risks and hazards (California Department of Forestry and Fire Protection, 2006). The presence of outdoor living may thus increase the potential damages that may occur in the event of a forest fire.

San Joaquin Valley is a primary relocation zone for Hmongs, Cambodians, Laotians. They were refugees from Southeast Asia who were relocated to the U.S. because of their assistance in the Vietnam War. They came for agricultural purposes and some operated small family farms. The first wave of them came in the 1980s and there was another wave subsequently. According to the Department of Social Services in California, Fresno, Merced, Sacramento, and San Joaquin counties in the Valley have the highest concentrations of these residents in California (Department of Social Services, 2005). Their inward migration created increased sizes in their families. This may lead to potential hazard, similar to the outdoor living among farm workers. For instance, in a

survey conducted at UC Davis, a Hmong family in the Valley planned to house 28 family members and relatives in a three-bedroom house (UC Davis, 2004a).

Among the refugees, some perform well in schools, while others become social delinquents. These delinquents form gangs and rely on state welfare programs (UC Davis, 2004a). To resolve such issues, a grassroots organization – @GRASS-ROOTS.ORG (www.grass-roots.org) was set up in 1990 by award-winning journalist Robin Garr. It is aimed at seeking out America's most innovative grassroots organizations and pulling together their actions into a single site. The organization does not appear to be sponsored by any major organization, but primarily funded by Robin Garr himself. On the website, he appealed for voluntary help from the public in three ways – monetary contribution, voluntary services, and publicity.

Among its stories, the story of the Fresno Interdenominational Refugee Ministries Inc. (FIRM) was of primary interest to me. This story documents three major problems in the community – an overall 16% unemployment rate, and 10% (60,000) of refugees. Next, among the refugees, 65% are unemployed. Finally, there are 25 known youth gangs that prowl the streets of Fresno city (Garr, 1998).

These problems are causing considerable stress to the development of the region. The lack of safety means the region becomes less attractive to human resources [Key Member of Development Organization].

However, although the problem of social deviance is acknowledged by development organizations, @GRASS-ROOTS.ORG and other sites do not appear to be administered in the sense that the targeted audience cannot post messages and conduct discussions. One key informant suggested that an improvement could come in the form of

a forum to facilitate discussion and social action. In this way, various interest groups can have more opportunities to collaborate.

Social Tension: Ennis

In Ireland, it is illegal to sell alcohol to anyone under the age of 18, under the Intoxicating Liquor Act, 2003. Alcohol patrons are required to produce legal proof of age for purchase and consumption. They also need to provide age verification documents when they patronize places that are licensed to sell alcohol outside business hours (Citizens Information, 2007)

However, I found that some stores in Ennis do not enforce this age verification strictly. When I patronized pubs, I noticed that there were some patrons who looked like teenagers. I sought explanations for my observations with key informants outside the pubs and during business hours.

Drinking is common among under-aged teenagers here. Just go in and buy.

Some pubs don't even check. It's so common that we all accept it.

Drinking is part of being Irish [Business Owner/Professional].

From tour guidebooks, travel websites and conversations with tour guides, I came to understand that drinking alcoholic beverages in pubs is an integral part of the Irish culture (Scotney, 2003; Fodor's, 2005). Based on a survey by the Organisation for Economic Cooperation and Development (OECD) in 2005, Ireland has the highest alcohol consumption per person aged 15 and above (13.6 litres) (Organisation for Economic Cooperation and Development, 2006). According to the World Health Organization, Ireland's per capita consumption of alcohol increased from 7.0 to 14.5 between 1970 and 2001 (Finfacts Ireland, 2007).

It has been widely written that this pub and drinking culture, along with its lively atmosphere and friendly staff and patrons is one of the most unique characteristics of Ireland (Authentic Ireland Travel, 2004; Scotney, 2003; Fodor's, 2005). I also learned that a common Irish expression for this fun ambience is “craic,” and the Irish use the term to express their enjoyment associated with their pub experiences (Fodor's, 2005).

The high incidence of drinking and pub patronizing is also a sign of affluence (McWilliams, 2006). The Irish accept this as an important social activity, involving conversations and entertainment (O'Connor's Fairways Travel, 2006). I found out that the Irish have a tradition of engaging in business-related discussions outside their offices. It is common for the Irish to have meals, engage in business discussions over drinks at the pubs. This observation was consistent with Trauth's (2000) finding that pubs play a “central role... in work and social life” and is a “symbol of social interaction in the Irish culture” (Trauth, 2000, p.152). Workers like to engage in these social activities, and these interactions in pubs among them foster better and closer working relationships in the workplace. It is therefore, not surprising to see businesses transacted or completed in pubs (Trauth, 2000, p.153).

On weekends, the pubs become more crowded and the incidents of drunken individuals become more common. According to Houston, the stricter laws on drinking have not discouraged this social activity (Houston, 1999). It is plausible that residents accept it and some pubs do not enforce strict age verifications because this activity is so entrenched in their culture.

Some informants say that Ennis faces a challenge from this drinking culture. According to Roughneen (2003), high levels of drinking have possibly led to a high level

of social disorder through anti-social behavior. These forms of behavior include assaults, road accidents and violent crime (Roughneen, 2003). Therefore, this cultural characteristic may be an explanation for anti-social behavior.

Pubs in Ennis serve alcoholic beverages till about two or three o'clock in the morning. Thus, it is common for people to order several drinks at one go towards closing time or they will have to wait till the next day. However, since the pubs close and stop serving drinks at the same time, some drunken individuals can only take their unfinished (if any) beverages out onto the streets with them. According to one key informant, this may threaten safety for other residents in the streets. At a regional level, the cultural characteristic of drinking alcoholic beverages then, influences economic development indirectly because it threatens social security (Sen, 1999).

Anti-social behavior is a problem for Ennis because it threatens the safety of the town. If we want to become an information age town, we must ensure our streets are safe. The pub hours can be open later but alcohol serving has to stop earlier. This will allow the patrons to continue drinking in the pubs, where there are higher security levels. Anti-social behavior is very damaging to the economy [Key Member of Development Organization]

Social Tension: Singapore

Singapore is known for its safety, suggesting the low occurrence of anti-social behavior. The result of which is attributed to the country's strict legal system. In Singapore, the government has hanged 340 people between 1991 and 2001. Based on

reports by the Think Center²⁵, 70 percent of those were due to drug offences (Soltani, 2003).

Singapore has been commonly referred to by some Singaporeans as a *fine society* [Academic/Researcher]. The word fine has two meanings here. The first signifies the peacefulness and harmony in the country. The second refers to the high number of fines for offences committed by individuals and organizations in Singapore. Lam (2007) commented that fines are meted out to offences such as spitting and chewing gum. The customs forms handed out at the airport mention the death penalty for drug trafficking. The government has also placed a strong emphasis on ethical business practices (Lam & Graham, 2007).

Lam (2007) further argued that the dynamic business culture that resulted from the ethical business practices has led to Singapore's affluence. The straightforward business dealings represent the values that Singaporeans hold in their entrepreneurial culture (Lam & Graham, 2007). One key informant explained that Singapore's high level of safety makes it an attractive place for entrepreneurship indirectly. This high level of safety refers to the lack of corruption, strict meritocracy, and transparency (Saw, 2004). Investors are drawn to the low crime rate in Singapore – with only 843 occurrences per 100,000 population in 2005 (Singapore Department of Statistics, 2006).

This major attraction strengthens Singapore's position as a stable economy. As of 2006, Singapore has signed investment guarantee agreements (IGAs) with at least 31 countries and regional groupings. These IGAs serve as mechanisms to protect investors and allow fair treatments of investments made by Singapore companies (Saw, 2004).

²⁵ A Singaporean civil rights group (<http://www.thinkcenter.org>)

With such transparency and safety mechanisms, the country's ability to attract foreign direct investments increases the country's competitiveness.

With the advent of the knowledge economy, Singapore benefits from its reliance on human capital. As discussed, almost one million of its 4.5 million people are foreigners. Expatriates are attracted to Singapore partially because of the quality of life they experience. Among which, the safety, low crime rates, and political stability were mentioned as significant pull factors. Based on the results of a Location Ranking Survey conducted by Employment Conditions Abroad (ECA) International Ltd., Singapore was voted by expatriates to be the best place to live among 254 countries (Channel News Asia, 2007).

From the observation, it may be argued that the low level of social tension (seen as crime in this case), possibly facilitates the influx of foreign human capital. This constitutes a highly educated and skilled labor force for the Singapore economy. Without natural resources, Singapore's human capital becomes a major resource for its economy. In turn, this can fuel its innovation capacity for a knowledge economy.

CHAPTER 5. DISCUSSION

The 12 themes from Chapter Four were generalized to the four factors, thus, showing the relevance of infrastructure, public policies, economy, and culture to the sustainable knowledge economy. Therefore, in this chapter, I reviewed the literature on the four factors and showed how the 12 themes can be discussed at the theoretical level. In addition, the discussion shows where these four factors may be inter-related and further explored as a research agenda. Finally, three broad implications of these four factors were discussed – the transition to knowledge work, the structure encompassing knowledge work, and social challenges.

Overview of Findings

The following table provides an overview of the key findings from the three regions as discussed in Chapter Four. In the first column, the 12 themes are aligned with the three regions in the second, third, and fourth columns. In each cell, the key finding about each theme from each case is given in key words. The fifth column (the right most column) provides key words that summarize the results of comparisons across the three cases for each theme. The bottom row – regional case study, gives a summary of each region pertaining to its development towards a sustainable knowledge economy.

Using Lee and Baskerville's (2003) theory on generalization from the empirical to the theoretical level, the empirical findings in the cells in each row were generalized to the respective theme on the left. These were subsequently generalized to the respective factor. For example, water shortage in San Joaquin valley, the lack of safe drinking water in Ennis, and the water treaty in Singapore were generalized to the theme of industrial

infrastructure. Subsequently, industrial infrastructure, information infrastructure, and human capital were generalized to the factor of infrastructure for discussion. As explained in Chapter Three, this generalization allows the theorizing of empirical findings from a systematic high level perspective. It allows a theoretical discussion of the findings to support a theoretical understanding of the themes.

The believability of the study was achieved through the triangulation of interviews, document review, and participant observation in each case. Although Yin's (1994) generalization to theory was largely based on positivist case studies, his method was acknowledged in the interpretive realm by key interpretive researchers such as Walsham (1995b) and Eisenhardt (1989). Furthermore, generalization to theory is important in interpretive research because it differentiates theoretical arguments from anecdotal evidence (Klein & M. D. Myers, 1999).

Table 8: Overview of Findings

Themes	San Joaquin	Ennis	Singapore	Lessons learned
Infrastructure				
Industrial Infrastructure	Water shortage	Lack of safe water	Water treaty	Remains a necessity
Information Infrastructure	Available, not highly leveraged	Available, not highly leveraged	Available, highly leveraged	Necessary but not sufficient
Human Capital	Low education	Small scope of application	Coordinated programs	More important in knowledge economy
Public Policy				
Economic Leadership	Non-Cohesive	Coordinated	Top-Down	Different forms from all levels are important
Development Initiatives	Regional Jobs Initiative	Information Age Town Project	IE Singapore	Different approaches similar goals
Economy				
Up-Skilling	Skilled labor in farms	Training but lack of market	De-skilling and up-skilling	Consequence of the knowledge economy
Isomorphism	Work decisions	Internet use	E-commerce	Indirect motivations towards learning
Culture				
General Drivers	Low cost labor	Tradition	Trends	Varying demand for knowledge work
Social Inclusion	Little personal control	Consciousness	Driven by education	Internal and external factors
Diversity	Economic value of diversity	Recent experience with diversity	Imposition of diversity	Diversity is part of the knowledge economy
Learning Context	Barriers to conduciveness	Positive attitudes	Unequal attitudes	Necessary for continuous innovation
Anti-Social Behavior	Driven by poverty	Driven by drinking	Safe and strict	Security as freedom for development
Overall Summary				
Regional Case Study	Lacks coordination	Slow market development	Paternalistic	Sensitivity to local conditions

In terms of infrastructure, a generalization from the findings show that industrial infrastructure continues to be important in the sustainable knowledge economy. Although this does not only apply to the knowledge economy, the findings show that different regions face different challenges in ensuring a viable supply of water for their industries. Information infrastructure constitutes one basis for technology-based innovation. The regions have respectively acknowledged this importance through their efforts to build a viable information infrastructure. However, the findings suggest that effective leverage of

these information infrastructures is also important in creating the basis for innovative information services. Human infrastructure is a very important basis for innovation in the knowledge economy because knowledge work stems from ideas, rather than just capital and other tangible inputs, as in the industrial economy. The three regions face different issues in ensuring a viable human infrastructure for the knowledge economy. Increasing the education levels, developing demand for knowledge work, and developing effective programs are issues confronted by San Joaquin Valley, Ennis, and Singapore respectively.

Under the factor of public policy, the three regions showed different types of leadership in implementing economic development initiatives. The different interests among different stakeholders in San Joaquin Valley led to a non-cohesive leadership. The focus on a wide range of industries in the Regional Jobs Initiatives suggests a consideration to different interests. Ennis, as a town in Ireland, which is a parliamentary democracy, benefited from its coordinated leadership partially because of its small size. Its mix of government and grassroots initiatives in the Information Age Town Project shows that the region has a coordinated leadership to steer its development of learning and innovation. Singapore relies on top-down government efforts for human capital development and market development. These efforts from International Enterprise Singapore, for instance, have been highly efficient, although some informants argue against the real effectiveness. What is important in these findings is the different types of leadership reflect the types of initiatives, which are based on considerations given to the respective local contexts.

With the knowledge economy, new skills are needed. According to the findings, the demand and market for these new skills were manifested through up-skilling and

isomorphism. Primarily, the findings were focused on technology-based skills. However, this does not mean that other skills are not important for innovation. Entrepreneurial skills are not necessarily technology-based, but are a part of innovation as well. The use of machinery in San Joaquin farms suggests a change towards the demand for skilled workers. In Ennis, while training programs are initiated, there is a small market, and hence demand, for knowledge work because of the small scope of operations of the local businesses. Singapore is fast-developing and hence, shows the rising demand for new skills through training and re-training programs. However, at the same time, workers need to keep up with new skills in the knowledge economy.

In all three regions, there is some evidence of isomorphism whereby businesses and individuals adopt technologies because of prevalent norms. They also make economic decisions based on their immediate social groups. Although these motivations may not be economically-driven, they form a basis for learning new skills or inhibit economic activities, as in the case of farm workers in San Joaquin Valley. Together, these create the demand for new skills and create new job categories for the knowledge economy. These new job categories can be said to constitute a new industrial structure.

Culture is a broad concept to explore because of its multi-faceted nature. The simplicity in San Joaquin Valley, preference for tradition in Ennis, and pursuit for technology trends in Singapore suggest that broad cultural facets can facilitate the demand for information services. At the same time, the different segments of the population lead to some being socially excluded from the new economy. Communication efforts, such as education, may be a key to bring these segments together.

Diversity is reflected in each region in the recognition of its value. San Joaquin Valley's population of Hispanics creates substantial positive impact to the economy. Ennis exhibits conditional tolerance towards foreigners because of their value to the economy. Singapore's foreign talent policies are geared towards the leveraging of expatriates for the local economy.

Within each region, the learning contexts are directly influential on continuous learning. In San Joaquin Valley, the conditions for farm workers may not provide an effective environment for education among the younger generation. The Irish in Ennis show positive attitudes towards learning, and have access to local universities. In Singapore, training programs are available. However, the attitudes towards learning differ across different social classes.

Finally, social tension constitutes a part of security, which was argued by Sen (1999) as an instrumental factor towards economic development in general. Social tension in San Joaquin Valley was found to be driven by poverty. In Ennis, social tension manifests as anti-social behavior resulting from drinking. Singapore has a low crime rate under its strict laws. Social tension was deemed as a factor which affects the social well-being of each region's residents. Following Sen's (1999) argument, social tension then, as a threat to security may affect economic stability. This influences the environment for continuous learning for the sustainable knowledge economy.

Overall, the case of San Joaquin Valley shows a lack of coordinated effort. There are multiple interests and complex social conditions. In addition, the region is considerably larger than Ennis and Singapore. Ennis shows a coordinated effort but has a slow market development because its businesses are primarily catered to the local

population rather than regional or global markets. As such, there is a lack of demand in knowledge work locally. Singapore uses a paternalistic approach towards the development of knowledge work. However, some informants argued that this reliance may impede the development of entrepreneurship.

Taken together, these regions are markedly different in their local conditions, despite the extraction of similar themes. Therefore, it may be useful for policy making to take into account these local conditions to be effective. The 12 themes represent necessary considerations, but may not be exhaustive for any particular region. Furthermore, their manifestation may be different and warrant further considerations to local conditions.

In the following sections, these findings are discussed collectively under each of the four factors of the Influence-Impact Model. This is a theoretical discussion of my findings to understand the importance of these four factors to the sustainable knowledge economy. In addition, relevant challenges and issues in relation to infrastructure, policy, economy, and culture were also discussed. Following this, a discussion of the three broad implications suggest three layers of analysis to study these themes, which constitute an impetus for future research on the sustainable knowledge economy.

Infrastructure

Information technology can be a facilitator to support information and knowledge work. As such, in all three regions, there were major efforts to develop viable information infrastructures for economic growth. In addition, water, as an industrial infrastructure is also crucial to the sustainable knowledge economy. As noted earlier, although industrial infrastructure includes more than water, for purposes of this discussion, the findings

related to water were abstracted to the theme of industrial infrastructure. This however, does not mean that water alone represents the entire spectrum of industrial infrastructure. The importance of water is acknowledged by researchers because it is directly related to sustainable development. According to Johnston, a sustainable economy has an environmental dimension because the use of resources continues to grow with economic development (Johnston, 2006). Therefore, he argued that efficient water use and adequate water supply are important to a sustainable knowledge economy (Johnston, 2006).

However, the development of these infrastructures can be influenced by contextual challenges. In San Joaquin Valley, despite the existence of high-speed cables, the actual leverage was minimal. Key informants in the Valley contended that leaders in the dominant industries were less inclined to employ innovative practices in their businesses. Similarly in Ennis, businesses did not see the need to utilize the existing cables for e-commerce. This decision was based on their smaller and localized scope of operations. In Singapore, the ready supply of fresh water formed a basis for industrial development. Given Singapore's limited national resources, the availability of fresh water was facilitated in part by the Water Treaty with Malaysia. This was discussed in Chapter Four.

Beyond these physical infrastructures, a developed human infrastructure in the form of labor and education allows regions to meet demands from the knowledge economy. As shown in the literature review, innovation is fundamental and hence used as a proxy for the sustainable knowledge economy. The presence of ideas and creativity as key determinants of economic growth in the knowledge economy suggests that human-related elements are critical. However, as an economy, the fundamental infrastructures –

industrial and information also constitute essential foundations. Therefore, while these physical infrastructures are important, a discussion of the sustainable knowledge economy may focus more on the human element – human infrastructure.

Human infrastructures facilitate the development of human capital, which comprise knowledge and skills held by people as a result of accumulation through human infrastructure and individual work experiences (de la Fuente & Ciccone, 2002). Human infrastructure, and therefore capital, facilitates the production of goods, services and development of new knowledge in a knowledge economy (de la Fuente & Ciccone, 2002).

The fast rate of technological change is coupled with fast changing market conditions. These cause human infrastructural changes in terms of labor patterns, whereby workers have to continuously stay on top of technology and engage in continuous learning, or face the threat of becoming obsolete (Benner, 2002). In Ireland, the key to upward social mobility is the ability to generate individual income through entrepreneurship (McWilliams, 2006, p.123). Rather, amidst this outsourcing phenomenon is the theme of decision-making and professionalization. These are explained in the following paragraphs.

Scholars are divided into two schools of thought about professionalism. The first argues that there is de-professionalization and proletarianization, while the second advocates the dominance of professions (Freidson, 1984). The democratizing effect of information technologies empowers clients and consumers, thus leading to de-professionalization. For example, deprofessionalization can be brought about by challenges to physician autonomy as a result of higher education among patients as well

as information technologies that allow patients to have greater access to medical knowledge (Haug, 1973).

This was shown in Ennis where an electronic database of medicines gave pharmacists access to a wider range of medical information. In Singapore, the ease of Internet access enables individuals to seek medical advice without consulting general medical practitioners. Using another example in San Joaquin, refugees can seek social assistance through the Internet by reaching out to social organizations. They can gain access to information about services without direct intervention from social workers. However, gaining access to the Internet is another issue altogether. For instance, as discussed in Chapter Four, the metered use of the Internet in Ennis may discourage extensive use. This may then reduce the chances of accessing the Internet for information.

Advocating professionalization, Friedson (1984) argued that existing professions remain unchanged and maintained dominance because consumers are not likely to catch up with dynamic and specialized professionals. Therefore, there is still a professional group that has restricted knowledge by virtue of its training and access to various resources. Furthermore, in a bureaucracy, empowerment is not evenly distributed. Professionals usually have more control over their work. In addition, in cases where bureaucratic control is exerted on professionals, supervisors usually come from the same profession. This restricts an outflow of professional knowledge (Freidson, 1984).

Singapore presents a useful example. Universities are centrally controlled because they are government-funded. However, results of research and development from various departments in universities are not typically shared. The bureaucratic control over knowledge restricts knowledge sharing among departments without authorization.

Professionals are defined by the specialized knowledge that they possess. For example, medical doctors have specialized knowledge in medicine. In addition, there are formal educational systems that are designed to train and produce medical doctors. This allows them to put their specialized medical knowledge to practice. Therefore, there is a social boundary created to bind these specialized forms of knowledge to the circle of professionals. These boundaries are necessary to preserve the status of professionals. In Ennis, business owners explained that they prefer to keep top management positions to be filled by Irish. This may imply that there is a subtle cultural tendency to maintain strict social boundaries of professional knowledge within their own countrymen.

Managing Human Infrastructure

Effective management of human infrastructure can facilitate continuous innovation. San Joaquin Valley, Ennis, and Singapore have each adopted methods towards this goal. A common method is the execution of training initiatives to change the characteristics of the labor force to accommodate this change. All three regions attempted to develop information infrastructure, thus implying the importance of information technologies. Therefore, training programs were executed to encourage and facilitate the use of these technologies for various purposes. These were discussed in Chapter Four.

However, with these changes, labor-intensive jobs may become low in demand. The use of information technologies and the continuous introduction of new technologies outsource labor-intensive work to machines. The use of machinery for grape picking in some San Joaquin Valley farms is an example of how labor-intensive jobs are giving way to machine labor.

However, this may possibly lead to economic effects such as increased unemployment in a region if training is not efficiently and effectively executed. Human infrastructure may change with the introduction of technology to replace human labor. In Canada, unemployment increased with the introduction of information technology (Menzies, 1996). This is the reason for Singapore's strong advocacy of re-training, or the upgrading of skills. With de-skilling and changes in job requirements, labor-intensive jobs become increasingly phased out. Singapore's human capital development initiatives seem to be in line with the growth in its economy. As discussed in Chapter Four, Singapore's Backpack.NET initiative was aimed at training students with emerging technologies. This prepares students for new technological developments and may also explain at least in part Singapore's low unemployment rate.

Micro-economic empirical evidence suggests that there is no significant correlation between technological change and wages of human capital (DiNardo & Pischke, 1997). This is due to increases in the number of information workers engaging in information services and products distribution in the information economy (Lyon, 1988). In view of professionalization therefore, new jobs are created. The title of Chief Technology Officer (CTO) was less common before the heightened use of information technologies in organizations. These new jobs create new boundaries that restrict access to specialized knowledge. Administrative rights in an organization-wide information system are also not evenly distributed to all employees. Hence, access to knowledge is also bounded with the creation of new types of employment.

Singapore relies heavily on strong initiatives to enforce the upgrading of skills among its population. These initiatives are not only encouraged but indirectly

motivational because of the stiff competition among workers. They must constantly upgrade their skills to remain competitive and in demand. In Ireland, educational institutions shifted towards emphases on science subjects, to develop an adequate supply of labor for its information economy (Trauth, 1993). This shift shows the importance of policies to create labor force readiness in an economy.

At the micro-economic level, a study conducted by the Organization for Economic Co-Operation and Development (OCED) concluded that the private rate of return²⁶ for a tertiary education for men in Europe averaged more than 12 percent. Their corresponding average social rate of return²⁷ was lower on the average by two percent (OECD, 2001). Furthermore, these rates of return are likely to be lower bounds because the effect of education on wages is higher by one percent to two percent on the average, and social rates of return do not include social benefits in excess of private benefits of education (Arias & McMahon, 2001).

In a study of 21 industrialized nations at the macro-economic level by de la Fuente and Ciccone (2002), empirical evidence suggests that an additional year of education increases the level of aggregate productivity by five percent on impact and an additional five percent in the long run. This clearly suggests the importance of human capital in the development and use of new technologies in the production process. These contribute to economic progress on a societal level (de la Fuente & Ciccone, 2002). In addition, human capital is closely associated with economic growth (Becker, 1992).

²⁶ The private rate of return relates the resources invested by individuals obtaining education (including opportunity costs and direct costs) to the private benefits of education (de la Fuente & Ciccone, 2002).

²⁷ The social rate of return is similar to the private rate of return but it includes the public cost of education in the calculations (de la Fuente & Ciccone, 2002).

Firms locate their operations in regions that are accessible to talents so as to leverage the available human capital (Florida et al., 2006).

But continuous learning can be argued to be dependent on learning attitudes to be effective, based on the findings as shown in Chapter Four under Learning Contexts. Therefore, the infrastructural and policy issues in human capital development also become cultural issues. Individuals require motivation to learn and to use new technologies, even for their purposes. The motivation may not arise from direct benefits, but rather indirectly from peer influence (isomorphism). Nonetheless, its strength may encourage an individual to adapt and use new knowledge to achieve his or her goals. In San Joaquin Valley, despite low levels of education and high labor engagement among the farm working population, I found that there was a possible low emphasis placed on education. In addition, about half of the farm workers do not switch to higher paying non-farm jobs despite their availability. These attitudes may influence the level of continuous learning on a regional level.

Therefore, the social context can have a bearing on this continuous learning process. The role of technology involves a consideration of its contextual domain rather than an isolated entity (Pacey, 1983). Therefore, information technologies are not the only determinant in the development of information and knowledge economies. The influence of technology is embedded within its contextual domain.

Businesses in San Joaquin Valley have relied on labor intensive methods for farm work. The change to incorporate machinery was slow partially because of its social context. As discussed in Chapter Four, the abundance of cheap manual labor encouraged farm owners to rely less on more expensive machine labor. Another possible reason was

the nature of crops – the harvesting of vegetables for instance, is harder to mechanize. As a result, there was little motivation to learn and innovate.

On the other hand, the cultural importance attributed to education in Ireland encouraged learning. According to the western Development Commission (Western Development Commission, 2006) in Ireland, Western Ireland has a higher share of university students than other regions in the country. Galway has a university admission rate of 67 percent compared to the national average of 55 percent. Although western Ireland is more rural than Dublin, average student-teacher ratios were lower than those in Dublin. They also continue to perform well at the secondary level. The cultural emphasis among parents on education for children in Western Ireland appears to have facilitated learning effectiveness. Incidentally, the National University of Ireland in Galway has the lowest dropout rate in the country. In this regard, the issue of learning becomes tied to its cultural context, which can affect the effectiveness of continuous learning, and hence continuous innovation and sustainability (Western Development Commission, 2006).

Social Networks

Knowledge work is more dependent on networks of learning than the industrial economy (Houghton & Sheehan Peter, 2000) because knowledge is accumulative and more difficult to transmit than data. Therefore, Houghton and Sheehan (2000) argue that a successful organization in the knowledge economy is one that is network-oriented. Given the embedded nature of the knowledge economy, knowledge, and hence, work dynamics, is embedded in social networks among businesses, development organizations and economic actors. A closer look at social networks highlights the implications of social factors on economic behavior in the knowledge economy.

An economy comprises various industries and hence, markets. These are social structures that are mutually constituted by producers who observed one another (White, 1981). According to White (1981), these producers were not engaged in an abstract, internal calculation of optimization as expected in neo-classical economics. Rather, they were acting based on cues from the actions of their peer producers. The evidence of mimetic isomorphism among some business owners in Ennis constitutes a similar phenomenon. When business owners participated in the Information Age Town Project because it was a cultural norm, they were acting based on cues from their peer producers, who in this case, refer to their fellow business owners. Similar evidence from San Joaquin farm workers, who follow their peers in taking lower wage farm jobs as opposed to higher wage non-farm jobs, shows that farm workers were taking cues from their peer workers, rather than the wages.

White (1981) argued therefore, that markets are social spaces – Producers differentiate themselves so as to establish their positions, but decide what to produce by observing others. Markets are thus, the results of joint social constructions. They comprise a structure of roles with a differentiated niche for each firm (White, 1981). Through this conceptualization, the economy then, becomes a socio-cultural concept.

Several studies have shown how social networks influenced economic behavior and outcomes. For example, Baker (1984) investigated the influence of stock trading patterns among buyers and sellers on stock prices. He argued that securities markets can be conceptualized as social networks of buyers and sellers. His results showed that smaller trading crowds had lower price volatility in comparison to larger crowds. This result was against conventional expectations of economic theory whereby a larger group

of traders will lead to heightened competition. This will in turn, lower price volatility. An explanation is that in larger groups, the anonymity enabled traders to evade responsibilities to ensure price stability through trading actively.

Furthermore, Uzzi (1996) showed that inter-organizational networks facilitate better economic performance. This is the result of resource procurement and cooperation among firms (Uzzi, 1996). In the case of universities, they are necessary but not sufficient conditions for economic growth. They need to work with the larger ecosystem of the innovation pipeline to create a regional absorptive capacity for human capital and innovation (Florida et al., 2006). However, the author also argued that these networks can also impede performance because cooperation is not always possible in a practical sense. Nonetheless, social networks among firms can affect an organization's operations (Uzzi, 1999).

Taken together, the implications of social networks, and hence, social groups, are therefore, tremendous on the economy. As discussed in Chapter Four, in Singapore, entrepreneurial support groups form a network of entrepreneurs where knowledge is shared. This stands in contrast to San Joaquin Valley whereby the political context of conflicting interests can possibly restrict a cohesive effort towards economic development and growth. The wireless entrepreneurs in Ennis are creating a network of knowledge and support for each other. However, they are also restricted by the political environment, where one informant explained, that there could be more top down support from the government to encourage their efforts.

Therefore, social networks may become a key area for further research in this direction, to study the transmission of knowledge and its implications on the regional

economy. The addition of social networks to study human capital extends the meaning of human infrastructure from workers and institutions, to include also the cultural component that provides a cultural context for interpretation.

Public Policy

Following the findings in Chapter Four, regional leadership plays an important role in implementing development initiatives. Leadership can enable collaborative action in a region to implement these initiatives – Regions with leadership that is more effective have been more successful in their development efforts, compared to those with weaker leadership (DellaFlora, 2002). Therefore, to influence economic development, regional leadership training programs have been argued as important activities to produce visionary leaders (Weisenfeld, 2003).

In Ennis, the Information Age Town Project played a major role in initiating these changes. It can be argued that this project acted as a catalyst to propel the town towards the learning and use of information technologies for the respective purposes of various economic actors. In San Joaquin Valley, the Regional Jobs Initiative was a key initiative to create jobs and develop nine industries in the valley to reduce the reliance on agriculture.

In Singapore, various development and learning initiatives were executed to ensure the nation's competitiveness as a knowledge economy amidst global competition. In 1989, Singapore launched an Electronic Data Interchange (EDI) system to facilitate efficient electronic transfers of trade documents among trading communities. According to a report by the United Nations Social and Economic Commission for Asia and the Pacific (2006), this process enabled government bodies (such as the Singapore Customs)

to process electronic documents (such as permits) and return relevant approval documents to the sender(s). More than 35 government institutions were linked to a single transaction node in the system. With its launch, the Singapore Trade Development Board (STDB) redeployed relevant staff in its import and export office. New departments to support backend services and export certification were created. Existing staff were sent for further training to obtain new skills necessary as they were deployed into the new divisions. Rather than a retrenchment of staff, training initiatives created a new workforce capable of handling the new system. As a result, the STDB was expanding in its scope of operations (United Nations Social and Economic Commission for Asia and the Pacific, 2006).

The empirical findings in this research highlighted the relevance of regional economic leadership and development initiatives in generating continuous learning. These two themes are directly related to public policies and how they are relevant to the sustainable knowledge economy. The following sub-sections interject these findings within the literature to discuss the theoretical importance of public policies.

Directing Development Efforts

Public policies play an important role in directing development efforts. In the case of Ireland, their industrial policy shifted with the primary objective to create new employment opportunities. It was proved to be successful in the creation of its information economy (Trauth, 1996). According to Rodrigues (2003), public policy can facilitate the development of a knowledge economy by:

- Improving access. This is done by liberalizing the market of telecommunications in order to reduce the prices for using the Internet and to spread the connections to broadband and the use of new generations of mobile phones
- Fostering the supply of hardware, software, contents, and services by private initiative by setting basic standards and regulations (concerning for instance competition, e-commerce, privacy, security, cyber-crime) at national and international levels
- Developing education and training in order to close the skills gap in information technologies
- Expanding the demand and encouraging innovation in information technologies in connection with major public or semi-public markets, education, health, transport, public administration

To improve access, the U.S. telecommunications industry was deregulated due to the technological convergence between telecommunications and computing, the increasing recognition of the industry, and a transition towards a market-driven economy (Trauth & Pitt, 1992). In the process, there was increasingly competition in Internet, broadband and mobile information services. San Joaquin Valley, as a part of the U.S., benefited from this in terms of its available information infrastructure. The existence of T-1 lines, as discussed in chapter Four, shows the impact of these policies.

In Singapore, although the telecommunications industry is government-owned, the IT industry was liberalized through competition among local firms to nurture innovative services at competitive costs. Information service providers are subject to

strict laws and regulations that govern mediated content and quality of service, among other areas.

Policies are also critical in developing education and training programs for the sustainable knowledge economy. The discussion in Chapter Four on the Regional Jobs Initiative (RJI) in San Joaquin Valley is a good example of how policies determine subject areas of training. A developed workforce in these areas may in turn, support the respective industries, leading to sustainability through human capital. The training programs initiated by FAS in Ennis also served the same purpose. These programs were IT-specific and tailored to different segments of the population, as discussed in Chapter Four. Similarly, the policies serve to lay the foundations for human capital development, although in a smaller scale than the RJI.

Singapore's IT-related policies are geared in part towards increasing the demand for IT services and encouraging innovation. In addition to technological and human infrastructure, and innovation (Marburger, 2003), entrepreneurship is a concept closely related to innovation. Technological innovation is a mechanism through which the novelty and dynamism of entrepreneurial ventures are expressed. This process contributes to economic growth. New market entrants are important catalysts of technological innovation even though they are business failures (Hart, 2003).

Public Policies and Entrepreneurship

On a societal level, the failure of a knowledge-based business does not imply that no value was generated. Rather, failures tend to become integral parts of subsequent successive entrepreneurial activities (Holbrook, Cohen, Houndshell, & Klepper, 2000). Entrepreneurship policies play a crucial role in strategic management because

entrepreneurial activity forms the conduit between investments in knowledge and economic growth (Hart, 2003). Looking at the findings, the political leadership reflected in Singapore's top-down initiatives to develop entrepreneurship, was best observed where International Enterprise Singapore played a pivotal role in pushing companies to venture outside Singapore. In this regard, according to Low (2005), Singapore and Ireland share similarities in their recognition for innovation in entrepreneurship. Their respective governments have intervened under their political regime to provide entrepreneurship training for sustainable growth. These have come directly in the form of top-down leadership (Low, 2005). On the other hand, the findings show that San Joaquin Valley has a political culture of conflicting interests and lack of collaborative development efforts among decision makers. As such, the push to develop entrepreneurship was low as conservative businesses continued to rely on labor-intensive workers.

Public policies also play a major role in directing foreign investments, which are crucial to the development of a knowledge economy. According to Harney, Ireland's open-trading international protocol framework promotes, encourages and facilitates trade among countries (Harney, 2002). It operates a non-restrictive regulatory policy framework which relate to capital flows, trade-facilitating and investment-supporting double-taxation agreements with various countries, and a mature and competitive financial services industry. This led to key investments in the electronic and engineering, pharmaceuticals and healthcare, international services, and financial services sectors. Similarly, the Singapore government's efforts through IE Singapore to push local companies overseas, encourages foreign investments indirectly. Here, these efforts can be seen as both facilitating entrepreneurship and directing foreign investments.

In three regions, development initiatives were tailored in different degrees to knowledge work. In San Joaquin Valley, the Regional Jobs Initiatives sought to upgrade the skills of workers in nine non-agriculture industries. In Ennis, the Information Age Town Project was the largest community IT project in Ireland aimed at changing business practices, education, household computer usage and communities. In Singapore, several programs, such as TradeNet and BackPack.Net were geared at enhancing Singapore's competitiveness as a knowledge economy.

One of the challenges of emerging efforts for the knowledge economy is whether they can improve methods for learning and competence building in education and training institutions, as well as companies. This is a basic condition for innovation (Archibugi & Bengt-Ake, 2001). According to Rodrigues (2003), policies in the knowledge economy must continue to facilitate the development of new types of enterprises as key actors in the economy. They must also be poised to develop and sophisticate knowledge-intensive services and markets to develop knowledge as a main driver of innovation (Rodrigues, 2003).

Along with the development of the United States' (U.S.) knowledge economy, industrial policy shifted from supply side to a balance of both supply and demand of technological innovation. In other words, policies became focused on both government research and development efforts as well as enhancing competitiveness of the private sector (Vonortas & Tolnay, 2001). This shift sustained the technological innovation that was necessary in the knowledge economy.

Also, technology research tends to have high failure rates especially in the early stages. Hence policy frameworks must be sufficiently adequate to support industry-

government collaborations and provide the necessary technological infrastructure for industries in order for the knowledge economy to sustain itself (Tassey, 2001). Ultimately, the sustainability of a knowledge economy depends on whether these policy frameworks (and hence innovation systems) can be governed to facilitate effective coordination of public policies at the national and regional levels (Rodrigues, 2003). This theoretical argument is similar to the empirical findings, which show that regional economic leadership is important in ensuring regional coordination for continuous learning.

Development Efforts and Political Cultures

In addition, regional political cultures may influence the effectiveness of policies. The details of political ideologies are beyond the scope of this dissertation, as they fall within the political science domain. For purposes of this dissertation, it is more important to discuss issues related to the political contexts surrounding the regional economies.

For example, even though Boston's Route 128 and California's Silicon Valley have similar agricultural roots and technology availability, these two regions have different industrial systems. According to Saxenian (1996), Route 128's concentration of independent and self-sufficient businesses facilitated its relative decline compared to Silicon Valley. On the other hand, the latter has a cooperative, but decentralized industrial system. This system played an influential role in its sustained economic growth because businesses could form social networks in formal and informal ways. These networks among businesses, universities and institutions are similar to clusters whereby production is organized around these relationships (Saxenian, 1996).

As a part of the U.S.A., San Joaquin Valley follows the nation's political system. It is a democracy and political discussions and debates are carried out in the same way as

with other states in the nation. San Joaquin Valley has top down initiatives initiated by the local governments to develop its regional economy towards knowledge-based production. At the same time, the freedom in its political culture allows the activeness of grassroots establishments, such as non-profit organizations to play active roles in the development efforts. In its complex social fabric, the region experiences a challenge from a lack of collaboration among different organizations that represent different interests.

Ireland is a parliamentary democracy. Ennis, as a town in Ireland, enjoys the mix of top down initiatives and bottom up efforts. There is evidence of liberalism because of the reliance on government-directed efforts. However, the town is much more dependent on the top down efforts rather than the market forces. Results in Chapter Four suggest that business owners are reliant on the Information Age Town Task Force for directions. When the project was completed, many business owners expressed their concerns about a lack of directives. Some however, continue to apply lessons learned from the project to their businesses.

Singapore constitutes a different case. It relies heavily on top-down initiatives. Economic development is largely initiated through government-led policies. In Chapter Four, this approach was argued to play a pivotal role in Singapore's economic development. However, the extent of this reliance has led to a similar cultural outcome whereby some individuals developed a passive approach towards innovative thinking.

In sum, development initiatives in San Joaquin Valley, Ennis, and Singapore faced challenges imposed by cultural factors, as discussed in Chapter Four. As such, it becomes useful to consider not only the initiatives, but also the respective contexts in which these initiatives were executed. In this way, an in-depth social and cultural

understanding of the structure of the knowledge economy can be obtained. The political culture of a region has an influence on development initiatives. Therefore, the influence of policies does not function in isolation. Consideration for the economic and social contexts may influence their effect.

Economy

As a central idea of this research, the knowledge economy has considerable implications on a region. The structure of the economy changes with the advent of the new economic dynamics. From the empirical findings in this study, there are structural changes that underlie this economic shift.

In the case of Ennis, businesses learned about new business practices using information technologies. In San Joaquin Valley, machinery was slowly adopted to replace labor-intensive work in agricultural work. In Ennis, the Information Age Town project heightened awareness of IT among businesses. Some of whom have adopted e-commerce practices. In Singapore, e-commerce was a characteristic of the market place with the advent of the Internet since the mid 1990s. These changes were at least partially motivated by isomorphism. A consequence of isomorphism is the uniformity of an organization or region. However, uniform adoption of IT in a region may suggest broad-based motivations towards learning and receptivity to development initiatives. For instance, the isomorphism leading to increased participation in the Information Age Town Project among Ennis' businesses became a sign of success for the Project. It also meant that businesses participated in organized learning about information technologies and their applications. Although there are isomorphic motivations, these changes may

have impacts on continuous learning by encouraging individuals and businesses primarily, to engage in knowledge work and create new knowledge in the process.

While the actual implementation and adoption of these technologies were constrained or facilitated by social and cultural factors, the nature of work was changed towards knowledge work as innovative practices are adopted to replace labor-intensive and less productive and less efficient practices. In addition, continuous learning was involved to keep up with new technological changes.

In these cases, up-skilling was involved as individuals and businesses learned new knowledge. The knowledge economy can be characterized by this economic shift towards jobs that demand and value formal education and knowledge, rather than manual labor (Drucker, 2004). Furthermore, tacit human skills such as management are more relevant for knowledge work than work in an industrial economy (Houghton & Sheehan Peter, 2000). As an example, Japan was able to sustain its competitiveness in the 1960s and 1970s because of the country's industrial shift towards higher value production whereby the labor force increased in the quantity and quality of skills (O'Malley, 1985). The following sub-sections discuss the relevant implications on the economy.

Challenges with Information Technology

In the three regions, upskilling and isomorphism were found to occur against a backdrop of information technologies (IT). New skills were needed and developed, and businesses adopted new technology-based practices. Along with these changes, new challenges emerged in the economy. The following paragraphs discuss the challenges in regards to technologies in the economy.

According to Pavlou (2002), the development of the Internet has played a major role in accelerating the process of globalization. It links businesses and individuals around the world into a global e-marketplace. It increases interconnectedness of the world through electronic information flow (Pavlou, 2002). Following this argument, one of the potential drivers of e-commerce adoption in organizations is the international competitive pressure that includes pressure to reduce cost and expand the market amidst globalization (Gibbs, and Kraemer, & and Dedrick, 2002). Countries with high wages such as Germany, Japan and US have pressure to adopt e-commerce aiming to save money on labor cost (Gibbs et al., 2002).

With this in mind, information technology infrastructure was actively built and utilized to support businesses and other functions such as education and e-government. As shown in Chapter Four, the actual leverage of information technologies may be restrained by contextual issues. In San Joaquin Valley, the use of machinery in farm work means increased costs because machine labor was more expensive than manual labor. With the availability of manual labor then, farm owners see little motivation in incorporating technologies in farm work. In Ennis, high speed Internet services are available for subscription, given the infrastructure. However, the metered use of the services may possibly discourage heightened usage. In Singapore, technologies are perceived as trends. The pursuit and use of new technologies can be explained culturally, at least partially.

The use of information technology in a knowledge economy is important. Factors that support information and communication technology superiority in the U.S. have shifted from the computing capacity necessary for higher-level operations to the tacit

knowledge and system integration information needed to convert highly advanced computer operations into productive tools for civilian and military industries. These trends underlie the transformation towards the knowledge economy (Srivastava & Gehlaut, 2003). In addition, product innovation and development is mostly commercialized.

In the private sector, competition drives constant upgrades and newer applications for the global market. Thus, the government and military are forced to cut costs and buy the more efficient and more innovative commercialized information and technologies. With the commercialization and increased access and demand in the knowledge economy, the military are no longer the institution that buys the most high technology products and services (Srivastava & Gehlaut, 2003).

Information technologies and e-commerce are recognized as the most powerful transmission mechanism for exploiting competitive advantages (Schneider & Perry, 2000). E-commerce activities underlie an IT sector that constitutes the information economy. Thus, it is imperative that companies functioning on the industrial mode of production adopt business practices of the knowledge economy by developing business models that offer information and knowledge products and services. With intensified global competition, it is important for businesses to anticipate and create new market opportunities, encourage product innovation, and reconfigure production processes efficiently (Angel, 1994). Therefore, while information technologies play an important role in the economy, their extent of their use can be influenced by contextual conditions.

Developing Human Capital and Upgrading Skills

Information systems are useful only if they are perceived as useful (Taylor, 1996). The finding from San Joaquin Valley about machinery adoption reflects this argument. Farm owners can lower costs by utilizing the available manual labor rather than the more expensive machine labor. Since the use of machinery in farm work requires more machine labor, these technologies were not perceived as useful to the farm owners. Hence, adoption was slow. However, for the business organization, the pressures to adopt e-commerce may come from competitors, international business partners and the company's image rather than the needs that initiate from its own business processes (Taylor, 1996). A part of this adoption can be seen as isomorphism, where businesses are motivated by peer influence. In Ennis, some business owners indirectly commented that a large part of their initial motivation to participate in the Information Age Town Project was to join their fellow businesses in the community.

If the organization business culture does not support the learning and use of new technology, it is likely that firms are reluctant to change (Gibbs et al., 2002). A readily available supply of products and services that have no consumer demand is not likely to be fully utilized. Thus, strong policies focus on both supply and demand of technology as well as information and knowledge products and services (Vonortas & Tolnay, 2001). In conjunction with this development, regions execute initiatives to develop their human capital.

As discussed in Chapter Four, the Ennis case can illustrate these push and pull characteristics. The Information Age Town project can be seen as a pull effort to encourage businesses to use the Internet to support their businesses. The Task Force

helped with the implementation and explained the importance and usefulness of these information technologies for their businesses. At the same time, the workshops in schools and programs at the Clare Education Centre, such as the Online Newspaper Program and the Meet the Musician Program, help develop IT literacy among students and residents. In this way, the programs created a push factor to develop an IT workforce. In sum, on the one hand, the business environment was encouraged to adopt IT practices, thus creating a market demand for IT workers. On the other hand, students were trained to be prepared for the market demand.

The Singapore case also shows a similar example with its National Information Technology Literacy Plan (NITLP). Such programs represent structural changes that respond to market needs of the knowledge economy, and are aimed at creating a sustainable relationship of supply (of workers) and demand (marker). They are also aimed at facilitating continuous learning by creating opportunities for up-skilling. The motivation to participate among individuals however, may be triggered by isomorphism. Culture as a contextual condition may influence continuous learning. As shown in Chapter Four, the case of farm workers in San Joaquin is a good example to illustrate this. Despite having access to non-farm jobs that pay higher wages, half the farm workers remain in their farm jobs, despite their long hours of labor engagement and lower education attainment. Therefore, the themes of upskilling and isomorphism can be further interpreted from cultural angles such as learning contexts and political culture.

Challenge to Hierarchy

With the adoption of information technologies and the development of new skills, new organizational structures are formed. The implementation of TradeNet in Singapore,

the first countrywide electronic trade documentation system that system enhances efficiency and effectively lowers costs for the trading community, shows the creation of new job categories as a result of IT implementation (United Nations Social and Economic Commission for Asia and the Pacific, 2006). As a result, these new organizational structures may lead to new challenges in the knowledge economy. Challenge to hierarchy therefore, is an extension of the preceding discussion on issues in the knowledge economy.

The adoption of information technologies may not only bring about positive ends. It was predicted that the information economy could put an end to organizational activities (Brown, 2000) and egalitarian social structures would prevail (Bell, 1973). However, in the knowledge economy, power is conferred upon those who possess information and knowledge. Power shifts from one class to another but hierarchies are still present.

According to Hamelink (1986), industrialism hindered competition through limited players, infrastructural constraints, and finite economic environment. With effective policies that promote entrepreneurship, the knowledge economy increased competition through more players, higher expectations, heightened communication among players, removal of infrastructural constraints and infinite economic environment (Hamelink, 1986).

The ability to compete is therefore determined by access to information (Hamelink, 1986). With the commoditization of information, culture, and communication, it represents a shift from one industrial mode of organization to another mode of

industrial organization, that is, from Fordism to Gatesism (Tremblay, 1995) and to networked collaborations of knowledge work (Stehr, 2002).

On the positive note, this will boost innovation and development of new business models. The development of e-commerce, as a general business model, diversifies ways in which business is conducted by. It accelerates the diffusion and adoption of technological changes and increases the level and reach to the global economy. Fordist methods are no longer the fastest way of producing at the lowest cost. Instead, electronic coordination or supply chain integration through collaborated information and knowledge work becomes more efficient (Bryson, Daniels, & Warf, 2004).

On the negative note, this creates a natural monopoly, which is defined economically as an industry where the fixed costs of capital goods are high such that it is not profitable for a second firm to enter and compete (Foldvary, 2004). Businesses which had an economic advantage in the post-industrial era could leverage IT infrastructure to provide richer information products and services to a greater reach of targeted consumers that constitute an upper class in the hierarchy. For instance, small and new mobile telecommunication operators have difficulty in penetrating the barriers of entry because of the lack of access to the infrastructure and the lower efficiency of building another network infrastructure. In this case, small-scale ownership would be less efficient than necessary for service provision. This leads to the extension of post-industrial class relations as discussed earlier. One solution to natural monopolies is government regulation. This justifies the need for policy changes in the knowledge economy. Heightened collaboration between the industry and government can also support innovation (Tasseey, 2001).

Culture

A Culturalist Approach to the Economy

Market activity, as constituted by economic actors, can be interpreted using cultural perspectives. According to Callon, this approach sees economic theory as a cultural or cognitive framework that supports economic action (Callon, 1998). In the analyses of social networks in markets, economic actors are not independent and instrumentally rational. Instead, their actions are embedded within interpersonal relationships, which constitute their interests and actions (Callon, 1998).

Through an analysis of the Chicago Board of Exchange, MacKenzie and Millo (MacKenzie & Millo, 2003) showed the reliance on suggestions from economists to price stock options. This facilitated a fit between market behavior and economic models. Furthermore, Zelizer (1983) looked historically at how cultural factors such as attitudes towards the monetary evaluation of human life, and the cultural understandings of gambling and risk affected the life insurance market. In addition, her examination of children's insurance showed how the perception of children as priceless entities gave the valuation a moral basis rather than an economic one (Zelizer, 1987), thus underlying the cultural significance of economic behavior. Knorr-Centina and Preda (2005) examined interaction patterns among traders in global financial markets, who communicated via information technologies (Knorr-Centina & Preda, 2005). They showed that traders maintained a set of rules and codes of behavior. These helped to maintain order in the global markets.

Taken together, this culturalist approach can explain market activity, and hence economic activity through social construction. It constitutes another explanation in addition to rational self-interest

Cultural Factors and the Knowledge Economy

Information technologies (IT) do not exist in social or technological isolation (Kling, 2000). Their interactions with institutional and cultural contexts play an important role in understanding important elements in the use and the effects of these technologies. This includes for example, the lack of understanding of social and organizational contexts and the lack of understanding of users' behavior and needs because it assumes that IT applications have the same meaning for all users and provides the same consequence across all cases (Kling, 2003).

The adoption of IT in different contexts therefore, may have different results. In Ennis, the Information Age Town project led to increased adoption and leverage of these technologies among businesses. However, with the small scopes of operation in many local businesses in Ennis, owners did not feel the need to utilize complex systems. In addition, the high importance placed on family time also explains their preferences to keep business operations small. As a result, IT implementation in their businesses was influenced by both economic and cultural factors.

In the case of San Joaquin Valley, farm owners preferred to employ low wage manual workers because it was cheaper to employ workers offering low wages than to invest heavily on technologies, and thus, increasing the need for more expensive machine workers. It was difficult for development organizations to encourage farm owners to change their practices, especially when there is also an isomorphic trend for low wage

manual farm workers to remain in their jobs despite their access to higher wage non-farm jobs.

In Singapore, technology adoption occurs as a pull rather than a push factor. The high penetration rates of the Internet shows a high degree of adoption. This can be partially explained by the race towards new technologies. The habit of desiring the latest technologies is a characteristic of their culture. As such, the National IT Literacy Program was targeted at the older segments of the population who were not trained in using computers.

According to Basu (2003), the development of a knowledge economy must be supported by the national culture, because it is closely related to the success or failure of the economy. As an example, Japan's successful economy was shaped by its traditional values – cooperation, lack of self-achieving drives, tradition, stability, and shared knowledge. Its economic supremacy is based on stability rather than quick results. In addition, the Japanese philosophy emphasizes knowledge and the learning process. Hence, they imitate other countries and adapt them to their own economic context (Basu, 2003). Population attitudes towards higher education are therefore, important consideration in a study on the knowledge economy.

At the same time, there are challenges. Communication dynamics through information technologies in the knowledge society brings about risks of segmentation among citizens, companies and regions (Rodrigues, 2003). Following this argument, social cohesion becomes less possible. In view of increasing cultural diversity in the knowledge economy, trends towards segmentation may lead to social problems whereby some segments of a population may be left behind. There appears to be a digital divide

between those who have access to the Internet and those who do not in San Joaquin Valley. Refugees seeking help from social work organizations may not have access to the information resources that allow them to communicate their needs. As shown, the websites do not have discussion forum for public participation. Therefore, it may be said that this possibly limits the reach of these organizations to their targeted population.

Learning contexts were also found to be important to the sustainable knowledge economy. Learning is a tool for the knowledge worker because it is the means for him or her to acquire new skills and knowledge (Drucker, 2004). This feeds the process of continuous learning. Linkages promoting learning are complementary assets for firms in the knowledge economy (Houghton & Sheehan Peter, 2000). Rodrigues (2003) argued that the sustainability of a knowledge economy is based on a continuously productive human infrastructure. However, from the findings, these depend at least partially on attitudes towards learning. These attitudes are not consistent across and within regions. For example, in San Joaquin Valley, the attitudes towards social mobility affects the mobility of workers from lower paying manual jobs to higher paying non farm jobs.

In Trauth's (2000, p.56) study of the information economy in Ireland, she found that older workers tended to be conservative and more expensive. They were perceived as more difficult to influence and unwilling to embrace new ideas. The younger portion of the labor force were perceived as more open and flexible and thus more suitable for IT work in the information economy. They were more excited about new technology trends and were more apt to adopt and use new technologies (Trauth, 2000, p.56). In Ennis, it was found that learning attitudes vary with age. The population in their mid-thirties tended to be more open to learning regardless of their educational levels. Although they

were found to be skeptical about information technologies, their positive attitudes were an embedded cultural trait.

In Singapore, these differences in attitudes were found across levels of educational attainment. As discussed in Chapter Four, working professionals who were less qualified had more positive attitudes towards training programs in general. They saw a greater need to consistently upgrade their skills, so as to compete in the job market. These findings suggest that attitudinal differences occur across different demographics and psychographics. Therefore, continuous learning in a region becomes more than a challenge on the infrastructure (training programs). It comprises the contexts of learning (individual attitudes towards learning) as well. These attitudes are important requirements for the flexibility of organizational learning in the knowledge economy (Houghton & Sheehan Peter, 2000).

Following the preceding discussion on attitudinal differences, the concept of diversity is also applicable to both demographic and psychographics attributes, which refer to various ideas, values, and skills (Trauth et al., 2006). Through the inclusion of different perspectives, diversity lays the foundation for innovative work (Foldy, 2004). Workforce diversity can help an organization or team achieve a competitive advantage in the marketplace, as a result of its increased sensitivity to a range of psychographics and demographics (Elmuti, 2001). As an example, the ability to promote tolerance and diversity in universities is the key to their ability to develop clusters (Florida et al., 2006). Florida et al. (2006) argued further that the creative class favors diversity, as shown by the common presence of both high tech engineers and artists within the same regions. Taken further, their openness to ideas forms a critical foundation for the knowledge

economy. The global outsourcing of information technology work is becoming increasingly diverse. Participants are also becoming diverse when supply chains of services are complemented by individual specialists (Trauth et al., 2006). It can therefore be argued that diversity is a valued entity in the knowledge economy.

According to Salomon and Scork, evidence from previous studies show that the level of diversity, in terms of age, ethnicity, and gender, among senior management teams, is positively correlated with performance levels (Salomon & Schork, 2003). Therefore, diversity can be argued to improve productivity and creativity in an organizational context. In all three regions, diversity was seen as an asset to the regional economies. The economic value of foreign labor in San Joaquin, the recognition of foreign talents in Ennis, and Singapore's reliance on expatriates as human capital, all attest to the value of diversity.

However, scholars have argued that diversity can also inhibit efficiency. This occurs when differences are not effectively managed. For instance, different individuals have different working styles. Without effective management of this diversity, efficiency in the group can be reduced (Kochan et al., 2002). As another example, Trauth et al. (2006) cited a study on information system project failures conducted by Klein, Jiang, and Tesch (2002) to argue that a combination of diversity among information systems professionals, including socio-political orientations, can minimize the risk of system failures (Trauth et al., 2006). Therefore, the effectiveness of diversity management becomes a key to making diversity an asset.

This argument can be extended to the societal level (Trauth et al., 2006). Knowledge workers create value, based on their diversity in terms of experience, and

skills, as well as their diverse socioeconomic backgrounds. To develop a global market amidst globalization, it becomes critical to serve a wider range of information needs. Information technologies can be leveraged to address this diverse market of producers and consumers. Therefore, this focus on diversity becomes a key characteristic in the new economy (Trauth et al., 2006).

The economic transitions from agrarian to the knowledge economy brought changes to characteristics of the labor force. In the agrarian economy, physical labor was valued due to the heavy concentration of agriculture. In the knowledge economy, ideas are valued more than physical labor. From the preceding discussion, it follows that existence of ideas is tied closely to the existence of diversity. According to Florida, the U.S. has imposed stringent laws to restrict innovation by limiting the number of immigrants – a source of creative talents (Florida, 2005). In addition, there is a possibility that local talents are leaving the country for other regions that give better recognition to their abilities. Florida (2005) recognized the innovative capacity among diverse individuals which is not leveraged by the U.S. in view of its policies. He argued that the U.S. may lose its competitive edge as a result of its policies. This value placed on diversity may address the need for ideas in the knowledge economy and will thus, increase the quantity and quality of IT services and products.

For purposes of this dissertation, an empirical measure of the effectiveness of diversity is not within the boundaries of this study. However, it is important to note that diversity arose as part of the findings. Hence, to develop a research agenda from this dissertation to focus on diversity, it may be worthwhile to consider and investigate both the opportunities and challenges presented by diversity at the societal level. This is a

relevant an important research agenda due to its relevance in the knowledge economy (Trauth et al., 2006)

With increasing migration of workers from rural areas to metropolitan areas where information and knowledge work thrive (Castells, 2001), it is likely that there will be increased diversity in the knowledge workplace. In addition, outsourcing efforts by information and knowledge businesses add to the diversity in the global work place. Therefore, knowledge economies may face the challenge of sustaining this global and culturally complex human infrastructure.

Implications

In the preceding sections, the 12 themes were further abstracted and discussed under the four factors from the Influence-Impact Model. The discussion highlighted the theoretical significance of the 12 themes using the Model. The 12 common themes are not meant to be universally applicable across all cases in practice. The evidence of up-skilling for example, may not manifest in the same way in other regions because the contextual conditions, such as culture may be different. However, it is possible to discuss these themes at a higher level of abstraction or generalization to build the foundation for further theoretical discussion and empirical investigation. Based on the themes, there are three implications on the sustainable knowledge economy: (1) transition to knowledge work, (2) the structure encompassing knowledge work, and (3) social challenges. These implications represent areas where the focus of future research can be guided.

The transition to knowledge work refers to how work among economic actors changed along with the dynamics of the economy. Its structure involves a consideration of policy and economic challenges that impact knowledge work. Finally, these two

implications can be situated within the social domain, whereby social challenges can play substantial roles in the sustainability of the knowledge economy.

Knowledge work constitutes an important component of the sustainable knowledge economy. The shift towards the knowledge economy encompasses changes in the dynamics of work. This argument was established in Chapter Two. Knowledge work is directly and closely related to infrastructural factors – both physical and human. These factors affect how knowledge work is carried out.

Since innovation was used as a proxy for the knowledge economy, human infrastructure becomes a key factor in this new economy. Furthermore, the reliance of information technology in this new economy is reflected in its dependence on telecommunications infrastructure. Also, industrial infrastructure forms the basis of any industry because basic necessities, such as water, continue to be essential to economic production.

Taking the TradeNet system in Singapore as an example, the availability of the complex information system created the necessity for knowledge work, as well as the re-deployment of existing workers to carry out knowledge work in new divisions. At the same time, training programs determine in part the extent to which workers acquire the necessary skills to carry out knowledge work (United Nations Social and Economic Commission for Asia and the Pacific, 2006). Therefore, knowledge work is contextual. This argument is similar to the understanding continuum or information hierarchy discussed in Chapter Two (Cleveland, 1982). Thus, it is useful to take into consideration the contexts in which knowledge work is carried out.

This context can be seen as a structure that facilitates or impedes knowledge work. There are economic and policy issues, which are less tangible entities in comparison to knowledge work. For instance, a policy initiative to train and develop human capital in information technologies facilitates opportunities for information technology work. At the same time, new industries in the knowledge economy create new job categories, and therefore, generate new opportunities for knowledge work.

The dynamics of this structure can be seen as the interactions between top down initiatives (public policies and development efforts) and bottom up activity (market forces). Political contexts influence activities in the economy because not every region allows markets to completely take over. With respect to the sustainable knowledge economy, top down efforts play an important role in pushing this development. The nurturing of human and physical infrastructure appears to be substantially led by initiatives. However, grassroots efforts are also relevant, depending on the tolerance available under each political system.

Finally, social networks can also affect knowledge work through communication channels. The political culture of a region also affects the execution of policies. Thus, social challenges encompass the structure and work of the knowledge economy. These comprise of the cultural context which influences the effectiveness of development efforts, market development, and the actual people working.

These three implications show further, how the four factors of the Influence-Impact Model are inter-related in practice. While the four factors may be used independently in fieldwork and the organization of findings, theoretical discussions

require a consideration of their relationships. Hence, the three implications can be used as three layers to understand the themes and the sustainable knowledge economy.

In summary, in a knowledge economy, the knowledge and skills among a region's workers is a determinant of its economic growth. This in turn facilitates its ability to maintain a competitive edge. As argued in Chapter Two, the knowledge economy is reliant on ideas in addition to physical capital. Therefore, innovation and learning become foundations for productivity and competitiveness. On a micro level, workers' knowledge and skills determine their social mobility. Therefore, access to learning opportunities and training programs create a cycle of continuous learning which forms the basis for continuous innovation. This is the foundation of the knowledge economy (International Labour Organization, 2002).

CHAPTER 6. CONCLUSION

Summary and Findings

The sustainable knowledge economy is a fairly new concept. There are variations in the way it is defined. From the literature review, continuous innovation and learning were used as proxies for the sustainable knowledge economy. These are reasonable indicators because of the reliance on human capital in the knowledge economy. In taking a contextual approach, Trauth's (2000) Influence-Impact Model was an appropriate Model to study the sustainable knowledge economy. This approach allowed the researcher to take a broad perspective and explore related concepts given the wide variations in the definition of the sustainable knowledge economy.

An interpretive case study method was used to investigate the factors that influence the sustainability of a knowledge economy. In addition, the interpretive lens allowed the researcher to understand how these factors affected sustainability. Using the concept of theoretical gaps (Golden-Biddle & Locke, 1997), this research elaborated Trauth's (2000) Influence-Impact Model to study the sustainable knowledge economy. Three regions were used and the research was prospective.

Trauth's (2000) Influence-Impact Model was used as a guide for data collection. It was used to develop the interview guide, and as a basis for observation and document analyses. This allowed the researcher to test the Model's applicability to study the sustainable knowledge economy. The findings included 12 common themes across the three regions. The Model was found to be a useful tool and is applicable across different regions.

In Chapter Five, the 12 common themes were discussed as four factors relevant to the sustainable knowledge economy. They were further generalized and discussed in terms of three broad implications – knowledge work, structure, and social challenges. This was done to provide an overview of how the themes were inter-related as the four factors, against a backdrop of continuous innovation for the sustainable knowledge economy. Based on the preceding discussion, social challenges encompass the structure and work implications, and structure encompasses knowledge work. Taken together, the 12 themes and three implications provide a high-level semantic and integrated perspective of the sustainable knowledge economy.

Contributions

This study makes three theoretical contributions to the literature on the sustainable knowledge economy. As the first theoretical contribution, this study addressed the theoretical differences between Trauth's (2000) research and my dissertation research to elaborate the applicability of the Influence-Impact Model. In this elaboration, the Influence-Impact Model was applied to the sustainable knowledge economy and to three different regions. In the process, this study elaborated the applicability of the Influence-Impact Model and shows the means and validity of the adaptation.

The second contribution is the integration of the four factors in the Influence-Impact Model for the sustainable knowledge economy. The discussion in Chapter Five showed the inter-related nature of the four factors. The three layers of implications constitute different perspectives and approaches researchers can take to study the knowledge economy or specific themes in more detail.

As the third theoretical contribution, this study developed a dynamic research on the sustainable knowledge economy. It took a social approach to study the knowledge economy in its dynamic form. Although it has macro level implications, the research method employed and the guiding framework (that is the Influence-Impact model) allowed the researcher to consider micro level definitions to develop an integrated understanding of the knowledge economy through empirical findings. These theoretical contributions are discussed in the following sub-sections.

In addition, this research makes a contribution to policy making. The findings suggest areas where policy makers can focus their efforts to better understand the local contextual conditions. This is based on the “fit” approach whereby policy making is dependent on unique local conditions, rather than a universal blueprint. Following the discussions of the theoretical contributions, I discuss how this research can be used to support the “fit” approach to policy making.

Theoretical Elaboration of the Influence-Impact Model

There are three theoretical differences between Trauth’s (2000) research and this study. Trauth’s (2000) research was focused on the development of an information economy, using the whole country of Ireland as her study site. Her approach was also retrospective. In contrast, this study was focused on the sustainable knowledge economy, using three case studies – San Joaquin Valley, Ennis, and Singapore. These three regions are also from different continents. Furthermore, this study was prospective as the regions are developing sustainable knowledge economies during the course of the study.

By addressing the focus of the study, this study elaborated the Influence-Impact Model to the sustainable knowledge economy. In addition, an objective of the study was

to test the Model's applicability to the sustainable knowledge economy. The number and type of study sites, as well as the time orientation provided grounds to test its applicability in different contexts.

The results of the study showed that the Influence-Impact Model can be applied to study the sustainable knowledge economy, in addition to an information economy. The 12 common themes from Chapter Four were abstracted to the four factors for discussion in Chapter Five. The Model was also proven to be a useful tool in understanding how factors contribute to economic characteristics. In interpretive research, this Model can serve as a guide for data collection, theoretical discussions, as well as empirical applications in policy making. It shows the relevance of infrastructure, public policy, economy, and culture, in studying the context of a regional economy.

Integration of Four Factors in Influence-Impact Model

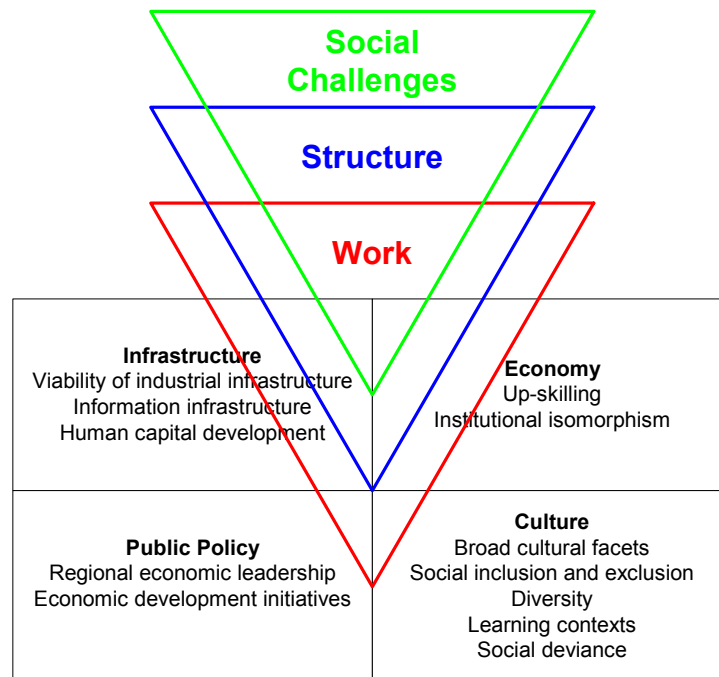
Following the theory elaboration, the second theoretical contribution of this study is the integrated relevance of the four factors in the Influence-Impact Model. Upon elaboration of the Influence-Impact Model using the sustainable knowledge economy as a research focus, the discussion in Chapter Five showed how the four factors are inter-related. The four factors were used independently to frame the study. However, when comparing the results from the three regions, these factors were shown to be inter-related. Issues related to infrastructure, public policy, economy and culture can be discussed in relation to each other. For example, a theoretical discussion on education involves training programs, learning attitudes, and how it can lead to industrial changes.

The introduction of three implications – knowledge work, structure, and social challenges, are layers on which future research on the knowledge economy can use to

understand how these four factors are inter-related. This integration shows the complex nature of the sustainable knowledge economy. It also explains the difficulty of developing a universal definition of the knowledge economy. However, its complex nature can be captured by this approach, which is my third theoretical contribution

The three implications also represent a higher level of abstraction or generalization, by suggesting that regions do not follow the same trajectory of development towards the knowledge economy. The following figure provides a graphical representation of the integration of themes, factors, and implications of the sustainable knowledge economy, with the 12 themes categorized under the four factors, and superimposed with the three implications.

Figure 18: Integrated Themes, Factors, and Implications



The three implications represent three layers to understand the four factors. They show the complexity of issues related to the sustainable knowledge economy. The social challenges layer encompasses the structure and work layers to show that the knowledge economy is a situated one. Hence, it is useful for an analysis of its characteristics to take into account its social context, in terms of the issues that may result. The structure layer encompasses the work layer to show that the dynamics of work in the knowledge economy is dependent on structure imposed on them. Policies and economic issues influence the development of knowledge work.

Finally, the 12 themes, categorized under the four factors, add empirical relevance to Trauth's (2000) Influence-Impact Model as applied to the sustainable knowledge economy. While her model was the result of empirical work in Ireland, this research shows the relevance of the four factors – infrastructure, public policy, economy, and culture, on the sustainable knowledge economy. Further empirical investigation of these themes through generation and testing of hypotheses in relation to the sustainable knowledge economy may enhance the quality of the research.

A Dynamic Study

The concept of the knowledge economy is a fairly new one, as argued in Chapter Two. Researchers have used different approaches to study the knowledge economy. The knowledge economy is different from a resource-based economy because of the intangibility of its inputs – innovation. Therefore, new methods must be used to understand the knowledge economy (Houghton & Sheehan Peter, 2000).

The concept of knowledge, and hence knowledge work, is also dynamic in nature. As discussed, knowledge is intangible and tacit. Therefore, knowledge work, and

therefore the knowledge economy, becomes intangible and dynamic. A third theoretical contribution to this literature is the construction of a research of the sustainable knowledge economy that accounts for the dynamic and abstract characteristic of knowledge.

The construction of this dynamic research of the sustainable knowledge economy was taken by using innovation as a proxy, and continuous learning as a basis for innovation. In the process, 12 common themes were generated and integrated into the four factors of the Influence-Impact Model. They were further discussed using the three layers of implications in Chapter Five. This dynamism allows further research on the knowledge economy while capturing the abstract and non-static nature of the concept of knowledge.

The 12 themes generated and subsequently categorized under infrastructure, public policy, economy, and culture are useful in understanding how various contextual conditions facilitate continuous learning, which forms the basis for innovation. These are also useful because researchers can subsequently attempt to quantify these themes to be included in large econometric models for standard measurements.

The use of continuous learning as the basis for innovation, which in turn is a proxy for the knowledge economy, allows the researcher to study the knowledge economy in its dynamic form. Continuous learning is an on-going process that reflects the creation process involved in knowledge work. Furthermore, it is accentuated by the velocity of information and knowledge transmission, as individuals internalize artifacts to create new ones – knowledge work. In this transmission, although the viscosity of knowledge is lost, the concept of continuous learning captures the internalization process

on the receiving end. This underlies the creation process and is reflective of knowledge work. Hence, in this research, the use of continuous learning as a target object of investigation allowed the researcher to account for the dynamism and abstract qualities of knowledge, and knowledge work.

Contributions to Policy Making

This research also makes a contribution to policy making. According to Houghton and Sheehan (2000), effective development policymaking pays attention to the production structure in an economy (Houghton & Sheehan Peter, 2000). With respect to development policies aimed at creating a sustainable knowledge economy, they must be assessed based on the structural impact before implementation, so as to ensure that they can contribute positively towards the increase of knowledge work (Australian Business Foundation, 1997). However, the structure of each region can be uniquely different.

Therefore, regions must find ways to adapt development initiatives to their own unique cultural settings. The Influence-Impact Model does not imply that the categories under the four factors found in Ireland are applicable across all regions. But the Model can be useful in theory elaboration, such as in this research whereby it was applied to study the contextual conditions influencing the development of a sustainable knowledge economy in three regions. According to Mukand and Rodrik, these specific settings that policymakers must adapt to include characteristics such as history, geography, political economy, and institutions (Mukand & Rodrik, 2002). On an application level, these implications therefore, serve to provide a theoretical foundation for investigating these unique characteristics for policy making in different settings.

Furthermore, in policy implementation, there may be intended and unintended consequences resulting from these policies (Trauth, 1996). These consequences were illustrated as the impact of an economy on the societal context in Trauth's (2000) Influence-Impact Model. Therefore, Trauth (1996) recommended that ongoing investigations for policy making are important in a region's attempt to develop its information economy. According to Trauth (1996), the aim of these assessments is not to re-create the experiences from another region. Rather, they are designed to strategically adapt policies to local contextual conditions.

Trauth's (1996) recommendation can be applied to the sustainable knowledge economy as well. This is especially so because knowledge work is not defined by industry types, but by continuous learning, as explained in Chapter Two. Knowledge work also involves accumulation and collaboration. The skills acquired can be applied to a wide range of industries. Therefore, in the knowledge economy, isolated policies are no longer appropriate (Houghton & Sheehan Peter, 2000).

Policies for the knowledge economy will need to focus on human capital, skills, and learning competencies (Houghton & Sheehan Peter, 2000). For instance, workforce quality, knowledge, culture of entrepreneurship and infrastructure, among others, are mutually related and have broad-based implications on general policy directions (Branscomb & Florida, 1997). In Chapter Five, the integration of factors involved in these aspects for a sustainable knowledge economy was discussed. It is therefore reasonable to argue that human capital, skills, and learning competencies, as well as other themes, are dependent on unique characteristics of each region.

Taken together, the findings in this study do not imply that there is a uniform approach towards the development of a sustainable knowledge economy. They do not represent a generalization of the themes across all regions as a universal blueprint. In other words, the four factors of the Influence-Impact Model and 12 themes discussed in this research do not represent a single configuration across all regions. Even among the three regions, the same theme manifested differently in each case. The interpretive lens adopted in this study advocates that social units have unique attributes. As such, this study supports idiographic, rather than nomothetic theorizing in its generalization (Lee & Baskerville, 2003).

With an idiographic generalization of the results, the themes can be used as a guiding framework for future studies. They suggest areas for further investigation and issues and implications for discussion. Based on the results, different regions have unique characteristics that may require different development routes towards the knowledge economy. According to Trauth's (2001) research, the development of Ireland suggests that regions must be able to exploit their unique competitive strengths for growth. In Ireland's experience, policymakers were adapting information sector work to the unique cultural characteristics of Ireland (Trauth, 2001).

In addition, according to Feldman (2005), localized creation of knowledge creation and deployment can lead to higher productivity (Feldman, 2005). It therefore follows that local adaptation is important and different regions present unique challenges to development, despite having similar goals. This consideration given to local sensitivities is more effective in economic development because institutions function differently in different regions (Rodrik, 2000). For instance, the top-down approach taken

by Singapore in its development strategy may not be suitable in San Joaquin Valley, given its complex and conflicting decision-making climate.

To apply this study to policy making in different regions, the themes can be used as guides to direct empirical investigation. As argued, consideration for the unique production structure of an economy is critical to policymaking because these local sensitivities make each region different. Therefore, these themes can be further investigated with respect to different regions to understand how the different regional characteristics influence the manifestation of these themes. The findings can then form a basis for regional policies.

Furthermore, according to Veugelers (2005), structural reforms are complex and require consideration to many local factors. Some of these factors are not easily captured by statistical indicators (Veugelers, 2005). Therefore, the theoretical framework and method can be used to understand contextual conditions in different regions. The interpretive lens allows future research to go beyond the macro level statistics to understand the unique localized contextual conditions for policy making.

Reflections on Research

Evaluation of Research

As discussed in Chapter Three, three criteria were used to evaluate my research. According to Trauth (2000), this is especially important in interpretive research because of its subjective nature. Therefore, I used triangulation to achieve the three evaluative criteria – authenticity, plausibility, and criticality (Golden-Biddle & Locke, 1993), so as

to increase the believability of my research. The following paragraphs explain in detail how I achieved these three criteria.

To achieve authenticity, I showed my connection to the study sites (Klein & M. D. Myers, 1999). Trauth (2000) explained that an authentic account comes across to the reader as genuine...” (Trauth, 2000. p.392). Therefore, in my discussion of each of the three cases in Chapter Four, I used descriptive and narrative accounts to give readers a sense of my presence in the sites. I also used quotations to enhance the depth of my findings. These were methods used to establish authenticity in Trauth’s (2000) research on Ireland (Trauth, 2000, p.392). These were also supported with citations from my document reviews and observations. This process is called triangulation, where one set of data is checked with others to provide supportive evidence (Yin, 1989).

To achieve plausibility, I relied on member checking and triangulation. In member checking, I obtained feedback from follow up interviews with key informants. These comments on my interpretations were obtained from interviews with key informants as well as others who were familiar with the field. For instance, among my first experiences in Ennis, I learned from my initial interviews that people were open to diversity. In Ireland’s history, the Irish accepted leadership from foreign talents. However, my subsequent experiences suggested that there may be some variations in people’s reactions to diversity in Ennis, which may not be applicable to the whole Irish culture. When I discussed my findings with other key informants, their comments helped me understand that diversity was new in Ennis, especially since it was a largely rural town prior to the Information Age Town Project.

My reflections on my field experiences also helped me perform better member checking exercises. For example, when I first arrived in San Joaquin Valley in 2003 to conduct a project on the information economy in the region, I was astonished at the low quality of living. In contrast to the cultural vibrancy and urban landscape of Los Angeles, I saw desert-like rural landscapes. In addition, the people I first encountered were not as friendly as those I first encountered in Los Angeles. At that point, I was sure that quality of life was low in San Joaquin Valley.

However, I later learned that quality of life is a subjective concept. One of my key informants explained that his wife enjoys the family-oriented culture in the region. She also enjoyed the laid back lifestyle compared to the fast-paced coastal cities. He added that he does not see the region in a similar fashion but stayed because his wife wanted to live there. At that point, I realized that I took it for granted that everyone likes and dislikes the same regions for similar reasons.

Triangulation also helped me achieve plausibility. I used three kinds of data – interviews, document, and observations. Inferences from each data set were checked with another to increase the plausibility of the findings. In this way, I was able to use corroborating evidence to support my interpretations. This is important in interpretive research because the research is an instrument in the research process.

Finally, to achieve criticality, I discussed in Chapter Five, how the 12 themes were related to infrastructure, public policy, economy, and culture at the same time. For example, in my discussion of infrastructure, I showed how human capital development, policies, and learning contexts are inter-related. In addition, I also showed how the 12

themes were replicated across the three cases, although they were manifested differently. Hence, in this way, I created impetus for further examination and research.

Strengths and Limitations

A primary strength of this research is its wide coverage of study sites with a broad social perspective on each one. San Joaquin Valley, Ennis, and Singapore are markedly different in their social, political and historical make up. They are also at different stages of economic development, but have generated government interest in developing their respective regional economies towards the sustainable knowledge economy.

Furthermore, this research provides an in-depth theoretical and empirical understanding of the sustainable knowledge economy. The empirical findings were obtained using a triangulation of observation, documents, and interviews. These led to an interpretive understanding of themes and how they present challenges through three implications to provide a theoretical foundation for a research of the sustainable knowledge economy.

In this research, researchers can develop hypotheses and execute further investigations to understand the sustainable knowledge economy. The structured characteristics of the research also show the methodological approaches and the layers of analyses necessary in this understanding. For example, in trying to understand human capital in the knowledge economy, a researcher can take into account the challenges to human capital through changes in work. Furthermore, these changes occur amidst structural challenges presented from the economic and policy framework shifts. Finally, the social context presents social challenges to these changes, and can be used as a backdrop for analysis.

These were also discussed using scholarly literature in Chapter Five. Therefore, hypothetical statements can be developed from a single or combination of themes for further empirical investigation or testing. For example, in Trauth (1996), she focused on culture and economy in her Influence-Impact Model to discuss how the multinational firms in Ireland's IT sector exert economic and cultural impact on the Irish society. In this study, she focused on a combination of economic and cultural factors, rather than her entire Influence-Impact Model.

Researchers can also adopt both qualitative and quantitative methods to test these hypothetical statements. For instance, a researcher can investigate the extent of influence of human capital development on the knowledge economy. In this case, the researcher can employ statistics that describe the level of human capital in a region and economic output statistics on various knowledge industries, as defined by the North American Industry Classification System (NAICS) system, or any other system. An example of measurement of the level of human capital is the human capital dimension of Milken Institute's Science and Technology Index. This dimension comprises variables such as the concentration of advanced degree holders and state appropriations for higher education (DeVol, Koepp, & Fogelbach, 2002; DeVol, 2002). Based on the NAICS system, examples of knowledge industries include software publishers and pharmaceutical and medicine manufacturing among many others (DeVol et al., 2004). In addition, based on the discussion in Chapter Five, researchers can identify additional relevant variables for investigation, analysis, or control. Some examples of these variables include learning contexts and diversity because culture is relevant to the work and structure of a knowledge economy, as discussed in Chapter Five. In this way,

researchers can develop further empirical understanding of the extent to which and how human capital development can influence economic output in a knowledge economy, with considerations given to these other variables.

At the same time, this study is limited in its lack of comparative data across the three cases. Raw employment, wage, and economic output data were not readily available for Ennis and Singapore for the analysis. These data require additional resources that were not available during the time of the research. Furthermore, these resource limitations did not allow the researcher to engage in longer periods of field immersion in these regions.

Having lived in Singapore for 25 years, I have a better understanding of Singapore's culture than San Joaquin Valley and Ennis. My physical residence in California for about two years helped develop an insider understanding of California's culture. I am also aware of information sources and how development organizations work. For the case of Ennis, I tried to live like the local residents by making friends and engaging in local activities. My advisor's in-depth knowledge and extensive contacts in Ireland also enhanced my understanding of its culture tremendously. She also recommended several books and documents, which helped me gain insights to its history and economy. In addition, I took on specially guided tours to understand the culture and history. While these have helped me understand Ennis a lot more than just secondary readings, my insider understanding of Ennis, although sufficient to analyze its economy, is inevitably less comprehensive than the other two regions.

As another limitation of this research, each of the four factors – infrastructure, public policy, economy, and culture, involves a wide coverage of potential themes in the

three regions. The application of the Influence-Impact Model for theory-guided coding showed the relevance of elaborating the model to the three regions. The generalization from the findings to the theoretical level for discussion was also a legitimate step to show the theoretical relevance and empirical depth of the findings. However, the 12 themes do not cover the entire spectrum of possible themes in these three regions. There are possibly other themes that can be coded and categorized under the four factors.

As I began writing the initial draft of my dissertation, I reflected on my experience and the lessons learned in this process. I thought about what I did along this eventful and long journey and realized that this research topic is a highly ambitious one. The scopes of coverage for each region were wide, and I faced the challenge of covering the regions and themes as much as possible. But it was extremely difficult because each theme opened up new areas for investigation.

For example, under the theme of social tension, I learned about the concept of social deviance (definition). Originally, I called the theme social deviance, but was later advised by one of my committee members that social deviance is a whole body of literature in Sociology. To completely explore social deviance as it relates to the sustainable knowledge is to extend the research into the field of economic sociology. The same can be said of human capital development, whereby it can be further explored in macro economics. While this research has the strength of a wide coverage of themes from different disciplines, they are also exploratory in the sense that they open up avenues for further research.

Although this constitutes a limitation, according to Golden-Biddle and Locke (1993), this characteristic also adds to the level of criticality in a case study. The 12

themes discussed in Chapter Four, along with the issues, implications and challenges discussed in Chapter Five, serve as areas for further investigation and analysis. In addition, the theory elaboration of the Influence-Impact Model in this study adds theoretical relevance to the themes. This is one of the ways to develop criticality in an interpretive research (Golden-Biddle & Locke, 1993).

Future Research Directions

The preceding discussion discussed the evaluation and major strengths and limitations of this study. Following that, this section provides two future research directions to capitalize on the study's strengths and address the limitations at the same time. These are useful in strengthening this research on the sustainable knowledge economy.

The first direction takes a similar interpretive lens to develop a further understanding of the sustainable knowledge economy. A researcher can use the findings to further investigate the influence of the themes empirically through new interviews. Furthermore, new themes can be investigated using the same theory-guided approach to further enhance the robustness of the Influence-Impact Model. In this way, the relevance of the themes can be further tested empirically, using the three foci that constitute three layers of interpretation. It will also be useful to see if a different researcher can reach similar findings. In this way, the theoretical contribution of the research can be enhanced.

The second proposed research direction takes on a quantitative approach. Similarly, using the themes generated in this research, a researcher can develop statistical indicators for the themes and test their influence on economic output of knowledge industries empirically, using econometric modeling. Although this may not lead to the

depth of understanding as with the interpretive lens, it serves to suggest empirical relationships through the use of time series data. Furthermore, the three implications can be used to understand the results. For example, the statistical significance of diversity on innovation in a region can be further discussed to show how knowledge work, policies, and social networks are affected. As such, this direction also adds to the theoretical contribution of this research of the sustainable knowledge economy to the field of information sciences.

Contributions to Information Sciences and Technology

The graduate program at the College of Information Sciences and Technology at the Pennsylvania State University is an inter-disciplinary field involving various disciplines. This section comprises a discussion of how this research can be situated within the discipline of Information Sciences and Technology through an integration of the information (I), technology (T) and people (P) constructs, which define the domain of the program. This approach is conveniently referred to as I-T-P analysis.

In the I-T-P analysis, the information construct (*I*) refers to organized data that are situated within a context for access and utility. The technology construct (*T*) refers to an assortment of information technologies (IT). The people construct (*P*) refers to characterizations or organizations of people individuals. It includes human-related processes and discourses (Sawyer & Chen, 2002).

The information construct (*I*) in this research refers to information and knowledge work and services. These include online bill payments and e-commerce, for example. Information and knowledge work support production processes in the economy. The technology construct (*T*) in this study refers to technological infrastructure that

support information and knowledge work. The people construct (*P*) in this study refers to facets of public policy, economy, human infrastructure, and socio-culture. These include the information and knowledge workforce, policy makers, economic development authorities, technological development authorities, businesses, labor force, educational institutions, and employment.

In this dissertation, the conception of the information construct (*I*) was embedded. Information (*I*) was studied as information services in a knowledge economy. It was embedded because the questions related to the information construct were embedded within the technology (*T*) that supports it, like enterprise systems, and its human context (*P*), such as the context of economic actors. The technology construct (*T*) in this research took an ensemble view because technology was embedded within its social context. It was therefore, not explicitly defined independently. As argued, knowledge work involves more than just technology-based work. It is characterized by innovation, which can be argued to be accentuated by technologies (*T*). Within this view, the technology construct (*T*) in this dissertation is similar to Trauth's (2000) conceptualization in her Influence-Impact model. It was not explicitly defined, but underlies the analysis and discussion of the problem, which in this case is the knowledge economy. Similarly, the information construct (*I*) in this research was not analyzed independently. This research did not include the study of algorithms and the design of information retrieval systems. The focus of this research was on the social context of information (as in information services) and technology within the economy.

The technology construct (*T*) exists as a black box in this research because it was embedded within the research context and was not studied explicitly and independently.

In the knowledge economy, information technologies are not substitutes for human labor. Rather, the skills required will increasingly be complementary with information technologies (Houghton & Sheehan Peter, 2000). Knowledge work as a productive economic activity is a determinant of economic growth because of the creativity involved. However, in order to accentuate the productivity of knowledge work, knowledge itself must be transmitted to be internalized by other knowledge workers. The velocity of the transmission can be increased through the use of information systems (*T*). Therefore, there are challenges involving the efficient use of these technologies for transmission.

At the structural level, these technologies may lead to the evolution of new industries. New jobs may be required to maintain and develop these systems. These new jobs may involve knowledge work as more innovative ways increase the efficiency of the transmissions – increasing velocity and with a proportionately less reduction of viscosity. At the same time, policies may be needed to govern the use of these technologies because more efficient systems may threaten the existence of professional circles – it may be possible to receive medical diagnosis over the Internet rather than a professional consultation.

Finally, social challenges exist and may facilitate or impede the efficiency of these systems. Political and regional cultures may influence the rate of adoption of these systems. These include individual and organizational attitudes towards upskilling and isomorphism. For instance, a positive attitude towards upskilling and isomorphism may encourage learning these new technologies. Furthermore, there are other challenges such as potential threats to privacy and sovereignty. These are outside the scope of discussion in this dissertation.

The people construct (*P*) in this research was a hybrid of both the individual attributes and the social entity views. As individual attributes, the research looked at people's attitudes towards technology and their perceptions of the knowledge economy. Cultural attributes of the population in each of the study sites were also studied. As a social entity, the regional economy in general was studied with a social and cultural lens. Public policy and development initiatives were also included in this domain.

Taking all three dominant constructs together, this research used the Influence-Impact Model as a basis for future research to address the following questions:

- How does *P* leverage *T* to develop *I* to develop relevant economic processes in the knowledge economy;
- How can the growth of *I* be sustained through continued leverage of *T* in view of changes in *P*.

The demand, penetration, and hence success, of *I* depends on the value attributed to it by *P* and the support from *T*. By the same token, the development of *T* depends on its attributed value by *P*. The advent of *T* also changes the societal economics with the introduction of a knowledge workforce, work, to support the industries.

In summary, this research of the sustainable knowledge economy comprises empirical findings, relevant implications and theoretical contributions. As a dynamic research, this study is useful in helping researchers and analysts understand the sustainable knowledge economy from a socio-cultural perspective, without compromising the intangible nature of the concept of knowledge. It also lays the foundation for further enquiry on the subject through additional hypotheses and research questions. As part of the dissertation requirements, the I-T-P analysis in Chapter Six

situated this research within the field of Information Sciences and Technology. By looking at the information, technology, and people constructs, researchers can develop a better theoretical understanding of their relevance to the sustainable knowledge economy.

Appendix A: Interview Guide

Initial Interview Guide

These points were pivotal points for interview questions. They were constructed based on preliminary data collection prior to the dissertation, and Trauth's (2000) research. They were categorized into the four categories based on Trauth's (2000) research as follows:

Infrastructure

- Current state of technological infrastructure
- Available IT products and services available
- Industry sectors or target populations of these IT products and services
- Current state of human capital in terms of availability, quality, quantity, types of industry
- Roles of these infrastructure in the economic development and in what industries
- Social/Cultural factors that facilitate and impede infrastructure development
- Recent and important developments

Policy

- Technological initiatives that were implemented. Effectiveness? How? Public reactions?
- Human capital initiatives. Effectiveness? How? Public reactions?
- Industrial or economic policies that facilitated or inhibited the development of the information sector. How were they implemented to support the economy?

- What policies boosted its economy? Milestones? How were foreign investments attracted? Which were the key sectors?
- How were local companies pushed overseas? What were the key sectors?
- What are some initiatives that boost the development of local labor? What about foreign labor?
- What are some of the driving forces behind policies (information, industrial, economic, cultural)?
- Government emphasis on entrepreneurship
- Social/Cultural factors that facilitate and impede effectiveness and execution of public policies/development initiatives
- Recent and important developments

Economy

- Was there any major economic re-structuring in Singapore's/Ireland's/California's history of economic development? How did the local economy shift (change)?
- Are there any specially emphasized industrial sectors? What about the information services sector?
- Economic development strategies – What? How? When? Why?
- Industrial/Business practices – What? How? When? Why?
- Social/Cultural factors that facilitate and impede the knowledge economy
- Recent and important developments

Culture

- Work ethic. How does it compare to foreign labor? How does it facilitate or impede economic development?
- Are there any cultural traits that facilitate or impede the acceptance of IT among the local population?
- What is the local perception of training (education), re-training, and social mobility?
- Are there any entrepreneurial traits? Social emphasis?
- Are there any major/significant cultural changes in the recent history (past 10-20 years) that relate to the economy? What are they? Which industrial sectors? In what ways do you think they are significant?
- Recent and important developments

Final Interview Guide

These points were pivotal points for subsequent interview questions, after data were collected. Similar to the initial interview guide, they were categorized into the four categories based on Trauth's (2000) research. Several points were added as a result of preliminary interview data.

Infrastructure

- Current state of technological infrastructure
- Available IT products and services available
- Industry sectors or target populations of these IT products and services

- Current state of human capital in terms of availability, quality, quantity, types of industry
- Roles of these infrastructure in the economic development and in what industries
 - o Water – What role does water play?
- Social/Cultural factors that facilitate and impede infrastructure development
 - o Is the role of learning attitudes important? Why? How is it relevant?
- Recent and important developments

Policy

- Technological initiatives that were implemented. Effectiveness? How? Public reactions?
- Human capital initiatives. Effectiveness? How? Public reactions?
- Industrial or economic policies that facilitated or inhibited the development of the information sector. How were they implemented to support the economy?
- What initiatives boosted its economy? Milestones?
- What are some initiatives that boost the development of local labor? What about foreign labor?
- What are some of the driving forces behind policies (information, industrial, economic, cultural)?
 - o Role of regional leadership – How? Issues?
- Government emphasis on entrepreneurship
- Social/Cultural factors that facilitate and impede effectiveness and execution of public policies/development initiatives
 - o Political context – implications on development initiatives

- Recent and important developments

Economy

- Was there any major economic re-structuring in Singapore's/Ireland's/California's history of economic development? How did the local economy shift (change)?
- Are there any specially emphasized industrial sectors? What about the information services sector?
- Economic development strategies – What? How? When? Why?
- Industrial/Business practices – What? How? When? Why?
 - o Changes in values of skills – What new skills? Why?
- Social/Cultural factors that facilitate and impede the knowledge economy
 - o Isomorphism – Why do people adopt new business/market practices?
- Recent and important developments

Culture

- Work ethic. How does it compare to foreign labor? How does it facilitate or impede economic development?
- Are there any cultural traits that facilitate or impede the acceptance of IT among the local population?
- What is the local perception of training (education), re-training, and social mobility?
- Are there any entrepreneurial traits? Social emphasis?
- Learning contexts – How do people learn? Do they want to learn? Why?
- Diversity – implications on the economy

- Social deviance – implications on the economy
- Are there any major/significant cultural changes in the recent history (past 10-20 years) that relate to the economy? What are they? Which industrial sectors? In what ways do you think they are significant?
- Recent and important developments

Appendix B: Internet Services in San Joaquin Valley

Service		Speed	Cost	
Type	Description	Per Sec	Per Mth	Installation
Telephone	Common telephone service Analog dial-up connection usually used for voice, fax, and model traffic	Up to 56KB	\$15	\$70
ISDN	Integrated Services Digital Network (ISDN) Used for home and small office connections to the Internet, video conferencing, and high-end voice Centrex phones	128KB	\$40	\$225
DSL	Digital Subscriber Line (DSL) Usually for home or small businesses, and used for Internet connectivity or remote LAN access	5MB	\$49.95	\$250
HiCap/T-1	High Capacity Digital Transport (HiCap) Usually used in medium to large businesses for LAN, WAN or PBX connections	1.544M B (P2P)	\$350	\$1,300 ²⁸

²⁸ Additional cost for mileage may apply. Contract pricing is available

WAN	Wireless LAN Used to connect LAN/WANs when an alternative to trenching and conduit is preferred	11MB	Varies ²⁹	Varies ²
DS-3/T-3	Digital Signal (DS) Level Three Used by large businesses to connect computer and/or voice networks	45MB ³⁰ (P2P)	\$2,675 ³¹	\$4,000 ⁴
OC-3	Optical Carrier (OC) Level Three Used in large businesses to connect computer and/or voice networks	155MB ³² (P2P)	Varies ³³	Varies ⁶
OC-12, 48 & 192	Optical Carrier (OC) Level 12, 48 & 192 Used in large businesses to connect computer and/or voice networks	9.953 GB ³⁴ (P2P, OC-192)	Varies ³⁵	Varies ⁸
GigaMAN	Used in large businesses to connect 2 customer Gigabit Ethernet LAN switches together	1000MB ³⁶ (P2P)	Varies ³⁷	Varies ¹⁰

Note: These services are also readily available in Silicon Valley.

²⁹ Wireless PCMCIA (802.11b) cards typically cost ~\$60-\$90, and 802.11b access points cost ~\$120. Dual access points (802.11a/b or 802.11g) cost ~\$180.

³⁰ Equivalent to 28 T-1s or 627 standard voice channels

³¹ Additional Cost of mileage may apply

³² Equivalent to 3DS3's or 84 T-1's

³³ Available under contract Tariff and Contract pricing

³⁴ Equivalent to 192 DS-3's or 5376 T-1's

³⁵ Contract pricing is available

³⁶ 1000 Base SX optical digital fiber connection

³⁷ Both Tariff and Contract pricing are available

Appendix C: Targeted Industries of Central California's Regional Jobs Initiative

Targeted Industry	Description
Advanced Manufacturing	Agile Manufacturing refers to highly flexible, short-to-medium run production, as opposed to high-run assembly line production. The San Joaquin Valley is poised for growth in its manufacturing sector.
Construction	The Construction Cluster is comprised of designers, contractors, suppliers, building trade organizations, apprenticeship programs, home builders, industry associations and educators, all representing both public and private aspects of the Construction industry.
Food Processing	The "food technology" industry cluster encompasses the public and private organizations in the region that are engaged in research, development, manufacture, and/or delivery of goods and services related to the production, sales, marketing, and distribution of food.

Healthcare	This cluster consists of a network of hospitals, training centers, clinics and other health-related service providers
Info Processing: Call Centers	"Information Processing" represents a group of interrelated occupations that share similar training and skill requirements that cut across several industries, namely back office operations, call centers, third party administrators and information technology.
Innovative Energy	The Innovative Energy project is the first initiative undertaken in the creation of a local Renewable Energy/Clean Tech cluster. It is designed to help reduce energy consumption and generate clean, renewable power where possible in order to improve the local economy and benefit the environment.
Logistics and Distribution	Advanced Logistics and Distribution refers to the transportation, storage, and allocation of products. The Logistics Cluster focuses on the industry that provides these services.

<p>Tourism</p>	<p>The Tourism Cluster consists of all businesses, such as hotels and motels, tour operations, and restaurants, related to the various aspects of tourism that can be found in the Fresno Region. Agri-tourism, amusement parks, gardens, historical sites, casinos, museums, nature tours, three national parks, performing arts, outdoor recreation, parks, planetarium, shopping, sports venues, golf, snow skiing, water sports, and zoos are among the many tourist attractions in the Fresno Region.</p>
<p>Water Technology</p>	<p>The International Center for Water Technology is an industry-university partnership housed at California State University, Fresno that focuses on the manufacturing and deployment of technology that enables water reuse, conservation, energy efficiency, lower cost innovations, improved water quality and water exploration.</p>

Source: Regional Jobs Initiative, 2005.

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