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Regional Economic Development Indicators for a Knowledge-Based Economy with Knowledge Deprivation

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Abstract. A three tier regional economic indicator framework has been created to address the transition necessary for economic regions moving from a manufacturing-based to a knowledge-based economy. The proposed framework responds to a basic weakness of a knowledge deficient region. The framework is consistent with a set of five regional strategies adopted by the leadership of the regional economic initiative. The goal is that the unique set of outcomes offered will become a critical part of the distinctive strategies for economic development, as well as a tool to facilitate communication with the legislature and the general public. Early findings based on current use of the framework are reported. The findings illustrate the simplicity and robustness of the framework. The framework is divided into three complementary frames of measures and indicators: the regional framework, the sub-regional framework, and the clusters framework. The framework of indicators uses the system approach of inputs (assets, enablers), processes, and outcomes. The regional framework includes the following aspects: cultural enablers, physical and administrative infrastructure, quality of life, education, renovation, human, process, market, and financial capital. The framework also includes the need to assess the cultural readiness of the region to adopt the new economy's realities. For the indicators to be simultaneously valid and helpful, they had to identify measurable variables and be operational (i.e., to be affected by the policies and decisions of the driving actors). Where possible, the region was benchmarked against national averages to allow for external observation as a meaningful comparison. Where the national average was not available, the region was benchmarked against the state (Wisconsin). Sub-regions were also identified to provide depth to the regional indicators. The rationale for this proposal is that in a large and diverse region (e.g., the 18 counties in the Northeast Wisconsin (NEW) region that is a mix of rural and urban communities with very diverse demographics), there are specific sub-regional idiosyncrasies. In the case of the Northeast Wisconsin region, four sub-regions were identified. It was also clear that by monitoring the major industrial clusters, the unique aspects that are more appropriately measured at the cluster level of analysis might be captured. Twelve major clusters were identified.

1. Introduction

In 2003, Northeast Wisconsin (NEW) became aware that a "new economy" had formally arrived. A number of events and studies indicated that there was public awareness of, interest in, and perhaps more importantly, a willingness to respond to the new economic opportunities and threats (e.g., Cahalan, 2003; Hildebrand, 2003; Ryman, 2003; Stern, 2003; Wegenke, 2003). In the business and economic academic literature, the discussion about the new economy (OECD, 1996) started when the discrepancy between market value and book value of companies in the late 1990s reached new levels (Shepard, 1997; Cohen et al., 2000). This was driven largely by the revolution in information and communication technology and globalization (e.g., Farrell, 1998; Houghton and Sheehan, 2000; Pohjola, 2001) and could only be explained by the existence of the "difficult to measure" knowledge assets or Intellectual Capital (IC) (e.g., Harris, 2001; Lev, 2001;

Blair and Wallman, 2001; Brooking, 1996; Nakamura, 2001). For the economic development professional (e.g., Helmsing, 2001), the discussion became real when the economists declared the end of the recession in 2001. However, the job market did not respond as economists had predicted based on historic trends, and the jobs lost in the recession did not come back as anticipated. In fact, the economy responded in an unexpected way when more and more high-paying jobs moved overseas (e.g., Schmid and Chaptman, 2003; Austin, 2005).

In the NEW region, the result was a regional initiative for economic renewal. One thing that makes the NEW case different is that the response was broader in its geographical scope (regional and not municipal). In this case, the local leadership quickly determined that only by collaborating at the regional level would they realize any chance for success. Such regional collaboration was new in the state of Wisconsin (e.g., Hildebrand, 2004). Also, the region lacked a natural geographic hub/leader (e.g., SWRDA, 2004). There are a number of smaller cities in the region, but no one city was a clear standout. Such interpretation of the economic results reflected the realization, by the regional leadership, that due to the nature of the knowledge economy, the characteristics of the economic threats and opportunities were uniquely different, and therefore, unique responses to the issues were required. For example, the definition of success in the new economy has become associated with bringing more high paying, knowledge-based jobs to the region (e.g., New North Economic Development Summit, 2006). In this paper, the authors use the concepts of "new economy" and "knowledge economy" interchangeably. The definition of the "knowledge economy" used in this paper is consistent with the OECD (1996) interpretation and the authors used the systems approach similar and consistent with the proposed framework of measurement proposed by OECD (1996).

Wisconsin is known for its agriculture and is still heavily dependant on manufacturing (ranks 2nd in the US concentration-Wisconsin Department of Commerce website, 2006) with international companies such as Harley Davidson, Johnson Controls, and many others headquartered in the state. The NEW region economy was historically dependent on a very successful paper industry cluster. Even today this region contains the highest concentration of paper mills in the world (Northeast Wisconsin Economics Opportunities Study, 2004). The service industry (e.g., insurance, banking and health services) is also heavily represented in the regional economy (Northeast Wisconsin Economics Opportunities Study, 2004). What the region seems to lack is corporate research and development, research universities, and large corporate headquarters (AAAS, 2002). To complicate matters, the region is also suffering from major "brain drain" (e.g., Huebscher, 2003) and aging of the population (Northeast Wisconsin Economics Opportunities Study, 2004). This may suggest what the economic development literature traditionally refers to as an unfavorable or peripheral regional environment (e.g., Vaessen and Keeble, 1995; Desaulniers and El-Mellahi, 2004). Economic environments such as this pose unique challenges to business as well as to policy makers, but does not prevent business from achieving success nor does it necessarily prevent the region from becoming a center of innovation and success (Vaessen and Keeble, 1995). For example, successful companies in a peripheral region might be forced out of their home environment earlier than similar companies in a region that have resource munificence, which could prepare them well for future geographic expansion, network building and innovation in satisfying customer needs (see example in Paterni, Russ and Faro, 2008). This requires development of a unique set of skills and knowledge base as well as a set of supportive public policies. In this case, the supportive public policy involves acquiring knowledge and training from outside the region (Vaessen and Keeble, 1995; Arthur and Moizer, 2000).

One of the unique aspects of the knowledge economy is the challenge of measurement (e.g., OECD, 1996; Raspe and Van Oort, 2006). The traditional manufacturing economy had 300 years to develop the appropriate accounting system, but the knowledge economy is far behind in developing appropriate measurement systems (Blair and Wallman, 2001). A number of examples of frameworks and indicators were identified in the popular and academic literature. For example, one can find examples of frameworks for major urban areas (e.g., Philadelphia, PA), counties (e.g., Harford County, MD), regions (e.g., Roanoke [VA] region) states (e.g., Massachusetts)[1]; or countries (see survey at Roessner et al., 2002; and an example in Raspe and Van Oort, 2006). What seems to be lacking is an example of frameworks for peripheral regions that presents a unique array of challenges and that can support a specific assortment of strategic initiatives.

The academic literature of IC and its indicators was initially developed by leading practitioners at the company/organization level (Sveiby, 1997; Edvinsson and Malone, 1997) and was later extended to the country, region, and city level (e.g., Pasher, 1998; North and

[1] see example survey of indicators at www.ssti.org/Digest/2002/110102.htm

Kares, 2005; Viedma 2005). Additionally, the scope of IC was broadened by academics from the field of accounting (e.g., Lev, 2001) and strategy (e.g., Kaplan and Norton, 2001, 2004; Roos et al., 1997). Two basic approaches to measuring IC were identified; one based on accounting and another based on strategy. The accounting-based approach focused initially on explaining gaps in valuing the firm, enhancing the firm's annual report, and helping in managing the capabilities, competencies, and processes aspects of the firm by providing a more detailed view from the "bottom up." This approach is more past oriented and appears to prefer a standardized view of IC by suggesting common variables/indicators that need to be identified and measured. As such, this approach may be more appropriate for companies (e.g., Meritum Project: Guidelines for managing and reporting on intangibles, 2001), regions, or countries (e.g., Raspe and Van Oort, 2006) where standard databases can be developed and maintained easily. This approach is commonly viewed as less relevant for supporting a regional economic development initiative that includes a specific and unique sets of strategies (Viedma, 2003). The alternative strategic approach takes the "top-down" perspective, is more future-oriented, and is driven by the unique strategy of the organization designed to deliver a specific selection of outcomes as measured by a specific set of indicators. This approach has the advantage of flexibility by allowing the indicators to be tailored to specific users and their unique context. It does require the user to have the knowledge of the tools and the understanding of the strategy and the context, and it was seen as more appropriate for this case of regional economic development.

The framework of indicators and the early findings reported in this paper describe an early stage of the regional Economic Development (ED) initiative in a knowledge deprived region. One aspect that makes this framework unique is the explicit account for the change in culture required to take place for the economic development initiative to succeed. The other contribution of this framework and early findings is that at this early stage some specific recommendations for specific action can be recommended and actions can be (and actually are) taken. The process that took place when the framework and the indicators were developed will be the focus of the discussion in the next section of this paper. This will be followed by a brief discussion of methodology used to develop the framework and the indicators. Next, a brief summary of the theoretical background and the framework and its components will be presented. This will be followed by a brief description of the details of the regional set of indicators. The findings for the region and three illustrative examples of regional categories will then be reported. A summary and conclusion section will complete the discussion.

2. Process

The original goals of the project were to: 1) Provide a clear and specific set of regional economic development outcome indicators; 2) Inform and train business leaders of the regional economic development initiative to use these newly developed indicators; and, 3) Share the learning in this region (North East, WI) with UW-Parkside's faculty and Economic Development officers who are conducting a similar project in Racine, WI.

The intent of introducing a compilation of indicators was to gauge the progress of the regional economic development collaborative initiatives, assist in driving the process, align partners, and improve fact-based communication with the public. The major goal was to create a unique set of outcomes that would become a critical part of the distinctive strategies for economic development and to develop a tool to facilitate communication internally with the legislature and the general public. By using results rather than subjective personal agendas (i.e., politics, egos, hidden agendas and opinions) to drive the strategic change initiative, the economic indicators will provide facts, establish a history, and assist in identifying and determining trends. As mentioned earlier, this approach was preferred to the standardized approach (e.g., Raspe and Van Oort, 2006) since it was expected that such an approach would allow for a more effective strategy implementation process in the future.

Following the late 2003 events in the region, a number of regional initiatives were started (e.g., Lyons et. al., 2005). One of them was a three phase economic opportunity study (Northeast Wisconsin Economics Opportunities Study, 2004). This opportunity study was conducted by NorthStar of Northeastern Wisconsin analyzing the current economic situation in the region (Northeast Wisconsin Economics Opportunities Study, 2004). The data collected by the study provided a background for, as well as triggered, the authors' initiative.

NorthStar's study suggested five regional strategies (Northeast Wisconsin Economics Opportunities Study, 2004, p. 5), which were used as guidelines for this proposal:

1. Move to a New Economy Construct
2. Move to a Collaborative Economic Development Construct

3. Change Social and Cultural Mindset to Risk and Collaboration
4. Change Regional Image
5. Promote Industry Cluster Development

Conceptually, the authors designed a collaborative planning process to increase the face validity for the final users, the external and internal validity, and to increase the possibility of buy-in by the local leadership team (see example at Diez, 2001). A full description of the process can be obtained from the authors (Russ, 2006).

3. Method

The authors could not identify, in the academic literature, a guideline for developing a methodology for selecting criteria and indicators for a regional economic development initiative. Quite to the contrary, it seemed that the contemporary IC literature was suggesting tying the set of criteria and indicators to the specific context and strategies of the region. This approach would basically suggest a unique set of indicators and, as such, a unique process for every level (Viedma, 2003). At this early stage of indicator development, the intent was to propose an initial set of indicators that, if adopted, would provide the basis for future modification, validation, and enhancements. Developing and validating a new set of measures for such a complex phenomenon as regional economic development is a profound task and could take years (see example in Reynolds et al., 2005).

For the indicators to be valid and helpful they had to identify measurable variables as well as be operational (to be affected by the policies and decisions of the driving actors). The authors used the subcommittee, the two planning commissions, the marketing research department, and colleagues from UW-Parkside to improve on the validity and the future reliability of the frameworks and the indicators. The rationale for this approach was that for successful implementation the authors might need to repeat the process of measures and indicators identification a number of times for different sub-regions and for different industry clusters.

Where possible, the authors decided to benchmark the region against the national average to allow external observers a meaningful comparison. Where the national average was not applicable, or available, the authors benchmarked against the state (Wisconsin). Benchmarking the region against the state was done for two reasons. First, state policy makers have impact on some aspects of the economic and legislative environment, which in turn impacts the regional economy. Second, Wisconsin appears to be representative of an average state in the nation at important aspect levels (e.g., Preston, 2006). Therefore, Wisconsin would serve as a good proxy for the national average. Future use will allow for benchmarking against the past.

4. The proposed framework

4.1. Theoretical background

There is fertile academic literature discussing regional economic development going back to the early 20th century. Marshall (1920) suggested that externalities can be generated by firms concentrated in geographic proximity through agglomeration and localization. This regional clustering effect seems to be driven by a common labor pool, by knowledge spillover (or information exchange), and by the networking relationships the firms have in the local market (Porter, 1990; Krugman, 1991). This economic academic literature got much attention from ED professionals (e.g., Waits, 1998) and from policy makers trying to copy the success of Silicon Valley (e.g., Chen 2006, p. 191). In addition, regional economist (e.g., Johansson et al., 2001) trying to better understand the key success factors, the actors, and roles of national and regional policies as relevant to the endogenous regional growth in the new-knowledge economy found the literature of value. The relationship between industry clusters and entrepreneurial activities at the regional level are recent topics of academic theoretical and empirical research (e.g., Sternberg and Litzenberger, 2004; Sternberg and Wennekers, 2005). It is clear that clusters and sub-regions are influenced and operate in unique dynamics due to industry distinctiveness and idiosyncrasies (e.g., Malecki, 1994; Keeble and Wilkinson, 1999; Virkkala, 2006). The ED literature and the practitioners had to make a quantum leap in order to respond to the new knowledge based economy (e.g., Keeble and Wilkinson, 1999; Farrell, 1998). The realization that the traditional policies that were appropriate for ED in the manufacturing based society might not work well was not easy (e.g., Johansson et al., 2001), and many successful manufacturing clusters could not make the transition despite realizing the need for such a change (e.g., Pittsburgh, Curid, 2002). However, others could (Manchester, Garcia, 2006). This literature was extended recently by focusing on the competition for talent and the focus on the creative class as the driver for such success (Florida 2002, 2004, 2005).

To capture the complexities partially described above, the proposed framework assembles the three complementary frames of measures and indicators: the regional framework, the sub-regional framework, and

the clusters framework. A thorough discussion of the complementary aspects of the three frameworks is beyond the scope of this paper.

4.2. Regional indicators

Four prominent contemporary research streams were initially considered for the theoretical framework to be used in this initiative. First, Porter (1990) popularized the discussion about industry clusters in the context of national and regional economic development focusing on competitive advantage. There is very little agreement about the specific definitions, above and beyond the basics, of clusters (Jacobs and DeMan, 1996), and the appropriate public policies in respect to industry clusters and their success indicators (LeVeen, 1998). Vertical and horizontal relationships between the actors are almost always mentioned (Porter, 1990). Factors such as spatial proximity (Doeringer and Terkla, 1995) as well as use of common technology, labor pool, central research center, and quality of the social network between the actors (Jacobs and DeMan, 1996; Rosenfeld, 1997) are also frequently mentioned. Clusters need to be seen as a dynamic and complex system and the supporting public policies role is to fill the gaps identified in the strengths and weaknesses of the clusters (LeVeen, 1998). The authors identified a number of cluster initiatives incorporated into economic development programs in states (e.g., Arizona) and regions (e.g., Research Triangle, NC) but few examples of policies and specific indicators (see a rare example at Cassidy et al., 2005). The authors are using Porter's regional approach to clusters in this paper.

Second, the BSC approach was developed in the early 1990s as a tool to measure the intangibles crucial to company success that were not captured by accounting and financial indicators (Kaplan and Norton, 2001; p. vi). The BSC focus is at the company or subcompany (department, individual) level, using the indicators as a driver for strategy aligning processes. The methodology ties the strategic objectives and indicators to a specific business model and strategic initiatives. Kaplan and Norton (1996) identified four areas that required measurement: financial, customer, internal business processes, and learning and growth. A number of states (e.g., Oregon) and cities (e.g., Charlotte, NC and Seattle, WA) used this framework successfully (Kaplan, 2001; Arveson, 2003; Chan, 2004).

Third, building and expanding on the literature discussing corporate intellectual capital (e.g., Edvinsson and Malone, 1997), ICC (referred as Meso-perspective by Bounfour, 2005, p. 100) incorporates micro and macro economic data at the community (country, region, city) level. Focusing on managing the invisible knowledge aspect of the community from the accounting/financial perspective, the literature on ICC identified a number of components including human capital, market capital, organizational renewal capital, and process capital (Edvinsson and Malone, 1997; Choo and Bontis, 2002; Bontis, 2005). This approach was used to measure IC for countries (e.g., Bontis, 2005; Pasher and Shachar, 2005), regions (e.g., North and Kares, 2005; Karlsson and Martinez, 2005), and cities (e.g., Viedma, 2005; Garcia, 2006). Complementary to the regional approach to measuring ICC, the authors identified a similar approach at the firm level. One significant example of this approach is the Meritum Project (2001) that proposes guidelines for ICC within the European Union. Those guidelines were taken into consideration when the framework presented in this paper was developed.

Forth and finally, if knowledge is the most important asset, then learning and regional networks of knowledge development are of critical importance. The tacitness and stickiness of knowledge imposes new characteristics on public policy toward economic development (e.g., Keeble and Wilkinson, 1999; Koschatzky, 1999, 2005; Johansson et al., 2001). For example, the need to support collaborative relationships between different actors within the region (Fedderke and Klitgaard, 1998; Stough, 2001), or the need to develop strategic foresight as a governance process is new to many policy makers and/or economic development practitioners (Koschatzky, 2005). In addition, the need to support "brain circulation" by promoting supportive venture capital policies (Saxenian, 2005) that might at first appear contradictory to political or cultural traditions was something unique.

The accepted framework of indicators (see Figure 1) uses the system approach of inputs (assets, enablers), processes, and outcomes (see another example at Bounfour, 2005, pp. 97-112). The framework includes the following aspects: cultural enablers, physical and administrative infrastructure, quality of life, education, renovation capital, human capital, process capital, market capital, and financial capital. The framework also includes the need to assess the cultural readiness of the region to adopt the new economy's realities.

The regional indicators are detailed and initial findings are described in the following sections. The data was collected using a framework developed to comply with the recommendations suggested by Neely et al. (1997). Their recommendations, which were adopted by and slightly modified from Goffin and Mitchell (2005), were used in data collection. Because of the new nature of this approach, the first effort resulted in some missing data points.

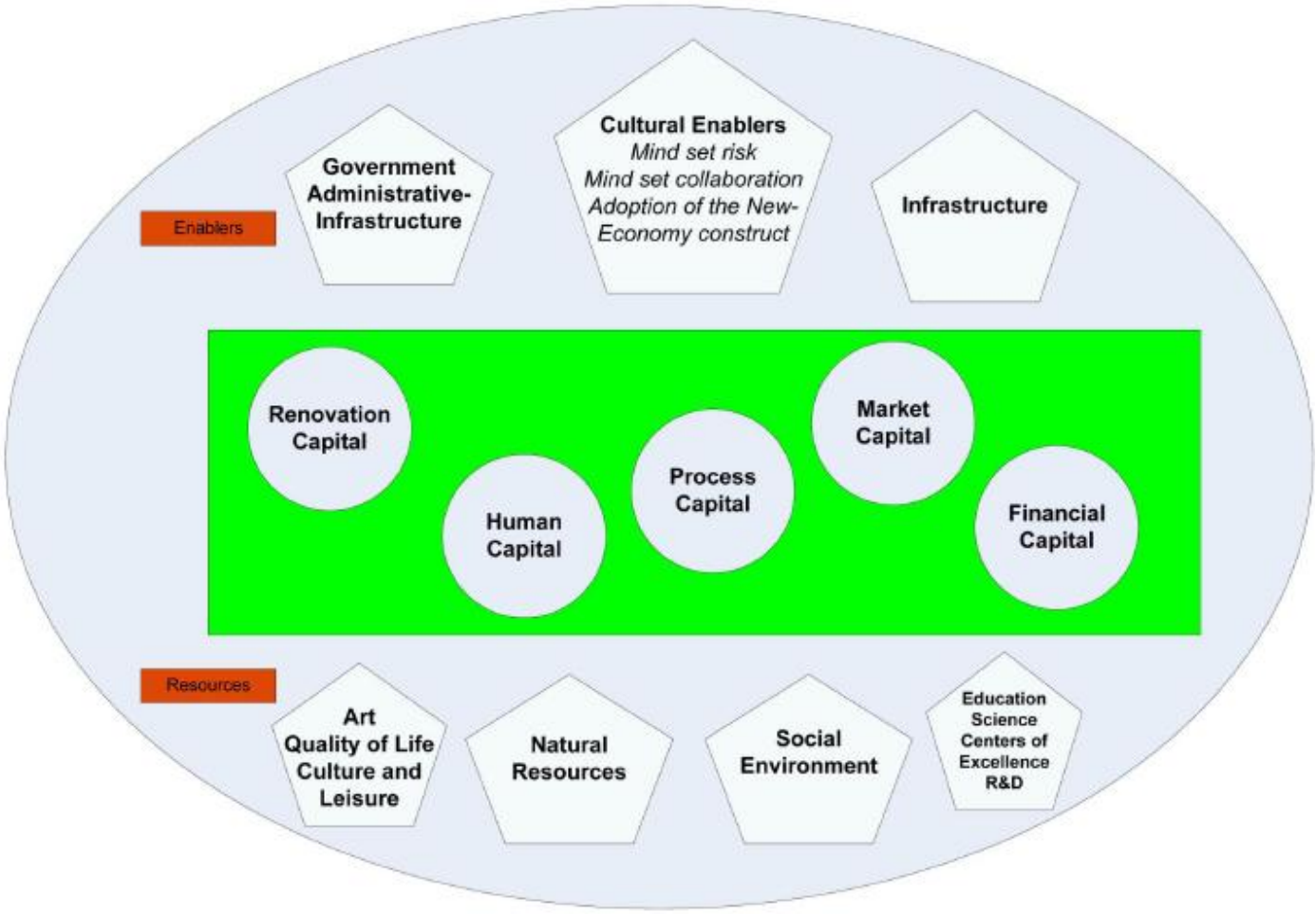

Figure 1. Economic development framework: Regional Indicators - International Virtual Mega Region (IVMR)

The data sources used include the US Census, Fortune 1000, State of Wisconsin web sites, among many others. The sources and additional examples are reported in Russ (2006).

4.3. Sub-regional indicators

The authors also suggested identifying sub-regional indicators, above and beyond the regional indicators. The rationale for this proposal was the reality that in a large and diverse region, as seen in the 18 counties in the NEW North, there are certain sub-regional idiosyncrasies. For example, the tourism and water sport sectors are much more important in the economies of Sheboygan, Manitowoc, Kewaunee, and Door counties (e.g., NorthStar Economics and Grant Thornton, 2005) than in the 41 corridor counties (see below), in which the paper cluster and service industries are stronger. Also, the unemployment rate and higher education rates in Florence and Menominee (which Rosenfeld, 2001 would identify as less favored regions) counties is much higher and lower respectively than in the 41 corridor counties. Because of limited time and resources, the authors only identified the sub-regions (see below) and not specific indicators for each sub-region. This proposal for sub-regions differs only slightly from the earlier proposal offered in the Northeast Wisconsin Economics Opportunities Study (2004).

The authors recommended to the leaders of the regional economic initiative to take this proposal one step further, and together with the constituencies in each sub-region, identify those indicators that are important for them and that reflect the unique aspects of their sub-region, within the regional context. The sub-regions identified are:

1. Southern Lake Shore (Sheboygan, Manitowoc, Kewaunee, and Door counties)
2. The 41 Corridor (Brown, Calumet, Fond du Lac, Outagamie, and Winnebago counties)
3. Northern Inland and Lake Shore (Florence, Marinette, Menominee, Oconto, and Shawano counties)
4. Southern Inland (Green Lake, Marquette, Waupaca, and Waushara counties).

4.4. Cluster indicators

It was also clear to the authors that monitoring the major economic clusters was of vital importance and that the geographically-based regional (or sub-regional) indicators may not capture some of the unique aspects that are more appropriately measured at the cluster level of analysis. Because of limited time and resources the authors identified only the framework for the clusters.

The authors recommended to the leaders of the regional economic initiative to take this framework one step further, and together with the constituencies in each major cluster and major players identify those indicators that are important for them, while taking into consideration the larger context of the regional aspects of economic development.

Ryan (2004, p. 38) suggested a number of criteria for a valid methodology when dealing with knowledge intense business clusters and the authors adopted Ryan's recommendations when developing the proposal for the set of indicators (see Table 1):

a. the measures should take into consideration the evolutionary nature of clusters;
b. the measures should take into consideration the complex adaptive system character of the cluster;
c. the measure should account for the social/human capital aspect of the cluster;
d. knowledge should be identified and measured;
e. the networking aspects (links) of the cluster with the environment should be identified & measured;
f. activities as well as institutions should be identified and measured; and
g. funding should be identified and measured.

Additional sources used for developing the indicators were Cassidy et al. (2005), Porter (2001) and Taylor and Raines (2001).

Table 1. Cluster Indicators (modified from: Cassidy, et al. 2005; Porter 2001; Ryan 2004; Taylor and Raines 2001)

Constructs	Sub-constructs	Indicators
Cluster Firms	Linkages between firms	Partnerships and alliances within cluster's firm Involvement in regional clustering activities Linkages within the cluster network
	Cluster Life Cycle	Stage of cluster life cycle Need for restructuring New technologies that might revolutionize the cluster
	Internal awareness	Internal awareness of cluster members
	External representation	Existence of shared representation Involvement in National Trade Associations
External Factors	Human Capital	Access to qualified personnel* (QP) Sources of qualified personnel Distance of QP sources
	Social Capital	Innovativeness relative to competing regions Quality of local lifestyle Economic inequality
	R&D Capacity	Contributions of local institutions to ideas, knowledge and innovation Availability of Technology Transfer capacity

Table 1 (continued). Cluster Indicators (from: Cassidy, et al. 2005; Porter 2001; Ryan 2004; Taylor and Raines 2001)

Constructs	Sub-constructs	Indicators
External Factors (con't)	Infrastructure	Quality of local transportation infrastructure Connections to national/international transportation systems Availability of specialized form of infrastructure
	Information Infrastructure	Access to key business information Quality of communication infrastructure
	Financial and business climate	Business costs (cost of living, cost of doing business) relative to competing regions
Supporting Organizations	Federal and State policies and programs	Contributions of Fed. and State institutions to ideas, knowledge and innovation Provisions for venture capital for New Product Development Targeted inward investment promotions
	Community Resources and Support	Adequacy of regional development support
	Academic Resources and Support	Adequacy of academic (K-12, vocational schools, colleges, universities) regional support
	Suppliers	Local availability of materials and equipment
	Services	Local availability of business services
	Capital	Local availability of capital
Related Clusters	Linkages between clusters	# of related clusters Partnerships and alliances between clusters Involvement in Inter-clustering activities Linkages between cluster networks
Competitors (competing clusters)		Distance of most important cluster's competitor # of most important cluster's competitors
Customers		Distance of most important cluster customers # of most important clusters of customers
Performance	Size	# of Firms Size of Firms
	External reach	$ Sales % of Export
	Innovation inputs	R&D spending Business Dev. Capabilities Product Dev. Capabilities
	Innovation outputs	$ revenues from NPD
	Dynamism	# of new firms within the cluster
	Social responsibility	$ donation
	Recognition	External recognition by others Collective marketing initiatives to attract external actors

* QP - Skilled employees, Experts, Inventors

The major clusters identified in the report (based on Northeast Wisconsin Economics Opportunities Study, 2004, see http://www.neweconomyproject.org/Docments/NEW%20Strategy%20Report%20SR%20Breakouts.doc) were:

Paper and Nonwoven
Tourism and Art
Forest Products; Agriculture and Food Processing; Specialty Crops
Printing and Publishing
Maritime Vessels and Equipment
Insurance Products
Production Technology; Automated Manufacturing Technology; Machine Tool Design
Education and Workforce Training Services
Healthcare and Nutraceuticals
Small Engines Technology
Others

5. Regional indicators

The categories of the regional framework are briefly described below. For each, the authors identified the specific indicators suggested. A detailed discussion of each indicator is available in Russ (2006).

A. **Cultural Enablers**. Cultural enablers are seen as a prerequisite, as well as an indicator, for many of the changes required by the knowledge-based, creative economy. Both the NorthStar's opportunity study of Northeastern Wisconsin, as well as the practitioner and academic ED literature suggest that a change in attitude is required for the new initiative to have a chance of success once in implementation. Three complementary cultural themes are identified.

   A1. *Mind set – risk*. The first cultural theme identified is an attitude toward self-employment, starting a business, and overall positive acceptance of risk and change as a permanent characteristic of the new economy.
   A2. *Mind set – collaboration*. Planners see collaborative planning as the new primary planning paradigm. Such planning allows for multiple constituent inputs (knowledge), improved communication, and supports accelerated implementation. Effective collaboration (the 2nd cultural theme) should be deliberately designed and explicitly structured, while allowing for flexibility and opportunistic actions.
   A3. *Adoption of the New Economy construct*. A new economy construct can be seen as an increased impact of networked information technologies in the marketplace, globalization and growing competition (resulting from reduced tariffs and government regulation), and the service and creative sector, which combine to impact supply and demand.

B. **Infrastructure**. Physical infrastructure is a critical enabler for the knowledge and creative economy. Ease of movement, both physically and virtually, on a global scale is a "must have" aspect for every region that wants to compete in the global economy.

C. **Government and Administrative Infrastructure**. This infrastructure is a process enabler, or inhibitor, and has a critical impact on (or is an indication of) the role government plays in support of the business and educational activities in the region.

   C1. *Government*
   C2. *Administrative Infrastructure*

D. **Art, Quality of Life, Culture, and Leisure**. These aspects are both indicative of, as well as a critical environment for, the creative and young constituencies that are such a crucial asset of the knowledge and creative economy.

   D1. *Art*
   D2. *Quality of Life*
   D3. *Culture and Leisure*

E. **Education, Science, Centers of Excellence, R&D**

   E1. *Education, Science* - Education and science as assets are inputs to human capital as well as indicative of its potential.
   E2. *Centers of Excellence, R&D* - These are outcome and input indicators for the human capital aspect of the region.

F. **Social Environment**. These indicators illustrate the diversity (or lack thereof) of the region and are indicative of the social environment aspect of the region.

G. **Natural Resources**. These are inputs into the quality of life aspect and illustrate its potential.

H. **Renovation Capital**. Renovation assets are those that reflect on the region capabilities for renewal or an actual indication of an investment that is mostly future oriented.

I. **Human Capital**. Human capital is an asset that belongs to or benefits individuals in the region. It is the engine of the knowledge and creative economy and has a critical impact on an individual's personal well-being.

J. **Process Capital**. Process capital is the cost related to the different processes used by the different economic constituents, and the cost of the infrastructure that is related to and supporting of the different processes.

K. **Market Capital**. Market assets enable or are embedded within the diverse relationships that the different regional players have with external constituencies, or indicate the potential for such relationships, or their success.

L. **Financial Capital**. The indicators of financial capital are the lagging indicators that allow for comparison with other regions' well-being. They are indicative of the regional business potential.

6. Findings

Table 2 summarizes how this region performed on the major categories described above. The measure represents how the indicator compares to the national average (or median where appropriate). For the sake of comparison, a number above one (1) indicates an improvement on the national average, and a number below one indicates how far the region lags behind (or *performs worse/below*) the national average (see Qiu, 2005, p. 234 for a similar approach). For example, a measure of 0.685 indicates that the region performance is 31.5% below the average (see cultural enablers), and a measure of 1.32 indicates that the region performed 32 percent better than the national average (see infrastructure). All the sub-categories were equally weighted (unless otherwise noted). Factors which lacked data (no data-ND) were excluded from this analysis. In all the calculations there was an assumed linear relationship, unless specified otherwise. All data is reported using the latest available information (detailed description of method and data sources are found on an unpublished report submitted to the leaders of the regional economic initiative – NEW North on July 25, 2006; Russ, 2006).

Table 2. Region performance by major categories, 2006

Characteristic	Measure *
A. Cultural Enablers	0.685
B. Infrastructure ****	1.32
C. Government & Administrative Infrastructure ****	1.054
D. Art, Quality of Life, Culture and Leisure ****	0.7295
E. Education, Science, Centers of Excellence, and R&D	0.6547
F. Social Environment	1.089
G. Natural Resources ****	0.809
H. Renovation Capital	0.5106
I. Human Capital	0.8386
J. Process Capital	1.03
K. Market Capital	1.2337
L. Financial Capital	1.044
Overall **, ***	**0.9165**

* One indicates the US average. Higher than one indicates percent better than the US at the most recent time available.
** Assumes equal weighting unless specified otherwise.
*** Assumes linearity in calculation unless specified otherwise.
**** Compared to WI

The findings suggest that the region's performance rate is slightly below the average of the U.S. This conclusion was supported recently by data submitted by a third party, private consulting company (Policom Corp.). The recent data was presented to the region's leadership in December of 2006 (Fruth, 2006). But this is a simplification of a much more complex picture. In some areas, the region is performing significantly better than the average. For example, the region has the benefit of a solid infrastructure and a better than average market capital. These areas can be defined as the region's strengths. On the other hand, the region is underperforming on a number of aspects, chief among them are renovation capital, education, and human capital. These weaknesses are typical of a knowledge deprived region, and indeed they validate the assumptions the authors had going into this study.

Below is an example of three categories (D, E &I; See Tables 3-5) broken down to their building block foundation. The examples illustrate comparison to US national average and where data was not available to Wisconsin. The example also illustrates the knowledge deficiencies of the region as well as some other characteristics of a peripheral region.

Table 3. Region performance for Art, Quality of Life, Culture and Leisure, 2006

Characteristics	Measure *
Overall (D1, D2 and D3)**, ****	**0.7295**
*D1. Art****	0.4965
a. Number of theaters	ND
b. Number of Museums (private Art Galleries)****	0.887
c. Number of orchestras, opera, companies	ND
d. Number Events (% of population never visited a theater)****	0.106
*D2. Quality of Life****	1.441
a. Number of public recreation areas/Trails	ND
b. Number air pollution Index****	1.654
c. Number personal crime risk ****	1.228
*D3. Culture and Leisure****	0.251
a. Number of movie theaters****	0.152
b. Number of restaurants****	0.218
c. Number of public golf courses****	0.451
d. Number of libraries ****	0.183

* One indicates the US average. Higher than one indicates percent better than the US at the most recent time available.
** Assumes equal weighting unless specified otherwise.
*** Assumes linearity in calculation unless specified otherwise
**** Compared to WI

Table 4. Region performance for Education, Science, Centers of Excellence, and R&D, 2006

Characteristics	Measure *
Overall (E1 and E2)**	**0.6547**
E1. Education, Science	0.6945
a. Student to teacher ratio	1.08
b. Number of colleges, universities, etc.****	0.141
c. Percent of population with 4-year degree	0.987
d. Number science & technology degrees granted	0.57
E2. Centers of Excellence, R&D	0.615
a. Number of federal grants	ND
b. Dollars of federal grants/capita	0.059
c. Number of patents/1,000 people	1.17

* One indicates the US average. Higher than one indicates percent better than the US at the most recent time available.
** Assumes equal weighting unless specified otherwise.
**** Compared to WI

As might be expected from a first time experience with a new set of indicators, a significant number of data points were missing. For four out of twelve major characteristics, the authors were able to compare only with the state and not with the national average. Also, none of the characteristics had all the indicator data available. The smallest number of data points missing was one (see Table 4 above), and the highest number of data points missing was nine (out of eleven – for "A" cultural enablers). By average, the authors had data for about 50 % of the indicators available.

The authors used the latest data available for all the indicators. The most recent data was from 2006, while the oldest was from 1997. In every case, the data for the region and the benchmark was for the same time-frame.

Table 5. Region performance for Human Capital, 2006

Characteristics	Measure *
Overall (I. Human Capital)	**0.8386**
a. Percent of skilled employees	0.8112
b. Percent of spending on T&D	ND
c. Growth of higher paying jobs	ND
d. Percent of population with master's or higher degree	0.809
e. Number of scientists and engineers per capita	0.7243
f. Employer health coverage****	1.01
g. # "brain" gain/drain	ND

* One indicates the US average. Higher than one indicates percent better than the US at the most recent time available
** Assumes equal weighting unless specified otherwise
**** Compared to WI

As mentioned above, the overall assessment of the region, as well as the specific indicators, illustrates some of the characteristics of a peripheral region, while also presenting some surprises. For example, for "art, quality of life, culture and leisure" the overall measure for this aspect is far below the average (about 27 % below), but this is masking a significant strength in the quality of life in the region (about 44 % above average) and an enormous weakness in the region in culture and leisure (about 75 % below average). Or for another example, see "education, science, centers of excellence, and R&D", where the region is about 35 % below the average. However, this is masking significant differences within this aspect. For example, the extremely low score of dollars of federal grants/capital and the number of universities is consistent with the expectations from a peripheral region. The number of patents per capita or students to teacher ratio contradicts such an expectation.

A similar picture can be seen in the human capital aspect where almost all the indicators are significantly

below the average, while the health coverage is at par with the rest of the U.S.

These findings can serve not only as benchmarks for the future, but also as triggers for action from the local leadership, the local legislators, and the federal and state representatives. For example, the lowest indicator found in this study was dollars of federal grants spent on R&D in the region. This suggests that the leaders and the representatives should be doing everything in their power to channel more federal dollars into R&D to this region. Local legislators can enhance this process by providing funding for grant writing capabilities to local universities.

7. Summary and conclusions

This research adds to the young academic literature of creating and managing IC for regional economic development initiatives. The unique aspect of this case is the development of a framework and set of indicators for an economically peripheral region that is knowledge deprived. This presentation describes and proposes a systematic approach to determining the most important ED indicators given the set of strategic imperatives. Such a process, where strategy is adopted by the leading team and is driving the selection of the indicators, is increasing the probability of buy-in by the leaders for adopting the measurement framework. The framework proposed in this study demonstrates the applicability of a simplistic summary measure as a driver for a complex ED regional initiative. Using this summary measure, this research revealed that the overall scores for the region are comparable (slightly below) to the national average. This finding was (at least partially) validated recently by a third party independent study (see Fruth, 2006 above). The framework also demonstrates the crucial importance of cultural change as a prerequisite for accumulating intellectual capital in a knowledge deprived region. The proposed framework can also perform as an important part of the internal and external communication process and can support the ED initiative leadership with valuable, reliable, and valid information.

The process of developing the framework and the indicators described here revealed that collaborative involvement and cross learning of multiple constituencies enables each participant to contribute their relative different perspective and strengths. The authors' experience in this initiative reinforced the importance of regional leadership and trust building needed for success, yet there is no clear indication if the leadership of the regional economic initiative intends to adopt this proposal and use the framework and indicators. The authors hope that the framework will be adopted, and that more data will be collected in the near future. If this would be the case, a follow-up study and an impact analysis would need to be put in place.

The framework developed for the Northeast Wisconsin region is made of measures and indicators that represent multiple and complex performance perspectives. One advantage of this complexity appears to be that the framework and measures developed are very robust, while at the same time can be summarized by a simplistic and single value indicator. A major weakness of a specifically tailored and complex framework is the difficulty of receiving the needed data. Despite that, the authors recommend using a uniquely tailored framework as it should support the idiosyncratic goals and strategies of the region adopted. This approach can be taken one step further and be more tightly connected to the strategies by modifying the weights of the different measures. The basic framework assumes equal weights for the different measures, but as strategies change, or goals are achieved, the weights can be modified to accommodate changing needs.

Even though only about half of the data points were available, the authors recommend using this framework and the score as a benchmark for future measures to drive strategy and support internal and external communication purposes. In such a case, the authors recommend the following:

A. Use one (or both) of the planning commissions as the main data collections agencies.
B. Identify the most critical indicators that are still missing (the cultural enablers recommended) and get the data, even though this might be the most difficult and subjective data to collect.
C. Start an annual reporting routine. A good option for that would be to report the indicators at annual meetings taking place during the last quarter of the calendar year that are becoming a tradition in NEW.
D. Use the NEW North and the indicators together with the strategies as an anchor to a process that would energize, formalize, and legitimize the move toward the new economy in the region. One example would be to create cluster councils to develop an agreed upon set of indicators for their industry cluster. Another example would be to use sub-regional initiatives toward a similar end.

A final recommendation suggested to overcome the lack of knowledge assets in the region, would be to participate in developing an international virtual mega-region (extend the example in Figure 1 to three or more regions). Such an approach might compensate

for the lack of the critical mass of knowledge assets by bringing together multiple regions, each one with complementary assets. An example of that might be the collaboration initiative now under way between a region in Northern Italy (Pisa-Lucca) and NEW. Some early identification of successes might be business, municipal, and academic relationships being developed.

For academic readers, the framework represents an important addition to the regional ED literature by capturing the complex and circular interdependencies within a knowledge deprived regional economic system that include the explicit need for a cultural change. It is anticipated that the proposed framework will allow researchers to examine the complex nexus of the relationship needed to support economic revitalization in a knowledge deprived region. Ogburn (1964) suggested that when technology and material advancements occur faster then cultural or social change, a "cultural lag" will take place. Bowan and Schwartz (2005, p. 314) suggested that such gap within a regional economy can be closed by importation and dissemination of new social norms and values, in which they see the local universities playing a major role. The case described in this study suggests that cultural changes might be required (at least in the case of peripheral regions) prior to a successful attempt to implement policies that will attempt to address and affect the complex environment (e.g., "Smart Infrastructure" Smilor and Wakelin, 1990; Stough, 2001) of regional economies. As such, models of endogenous regional economics growth should take explicitly into account the cultural aspect/stage, maybe by incorporating it into the concept of regional absorptive capacity (Abreu et al., 2006), above and beyond the entrepreneurial and leadership aspects that should also be covered (e.g., Rees, 2001).

This research also suggests that a more in-depth discussion of the four streams (described above in the theoretical background part) might be needed, to allow practitioners to pick and choose the appropriate aspects of the framework as applicable for their unique context and strategies and move a step closer to creating a comprehensive, multi-perspective mid level (meso-perspective) theory of regional knowledge based economic development.

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