

What is Technology-Based Economic Development?

This is excerpted from a 2004 "Economic Development Primer" by General Informatics, LLC (<http://www.generalinformatics.com/Primer1.html>).

Introduction

In 1999, the Milken Institute reported that two thirds of economic growth in the 1990s in U.S. metropolitan regions was due to high technology industry. As a result, today, more and more regions are attempting tech-based economic development (TED) initiatives.

A region's public and private technology infrastructure attracts the high-tech companies that create jobs. In turn, these companies contribute still more communications, health, education, transportation, and research infrastructure.

Various regions have made TED efforts spanning a spectrum that is roughly described in Table 1:

Table 1: Levels of Tech-Based ED Initiatives

Naïve 	Produce more patents, licenses, and journal articles. Try willy-nilly to attract technology companies. Over-emphasize military-to-civilian tech transfer.
	Target and pursue companies that might form a viable cluster and enhance a distinctive regional identity.
	Balance recruitment, retention, and entrepreneurship initiatives regionally.
	Balance self-investment in hard and soft infrastructure, university and federal-lab tech transfer, and marketing efforts to attract and build companies.
 V Sophisticated	"Integrate and partner the academic, business, government, foundation, and not-for-profit sectors... [to mobilize technology as] a means of attaining economic, social and cultural status for individuals, as well as a way of achieving institutional objectives and ensuring the general welfare of society." (Kozmetsky 2003)

Economic Development Defined

For effective ED, a locality must have a good product – sites, energy and water supply, schools, airports, optical fiber, and “business environment” – and sell it intelligently and energetically. This balance of hard infrastructure, soft infrastructure, and marketing is suggested by Table 2. Table 2 also details the assets and activities that comprise each of the three ED thrusts.

Good ED balances all three. However, technology changes with spectacular rapidity. Revolutions in genomics and nanotech closely followed the fantastic developments in computing that transformed industries in the last decade. Marketing follows technology commercialization without significant lag. Because the middle column of Table 2 involves attitudes, social (“soft”) infrastructure is the bottleneck limiting the pace of a region’s transition to a technology-driven economy.

Table 2’s “hard infrastructure” column indicates that ED is possible when companies have access to land, mobility, and reliable utilities, and the citizenry is productive by virtue of being fed, housed, healthy, secure, and connected to sources of information and education.

Parts of the Table’s second column also have to do with the education, security and health of the populace, or “human capital.” Other parts address social capital, i.e., people’s propensity to form civic, trade and professional organizations, agitate for change and follow through on it, and communicate with like organizations in other techno-regions for business exchange and data-gathering purposes.

Table 2: The Three Elements of Economic Development

HARD INFRASTRUCTURE	SOCIAL INFRASTRUCTURE	MARKETING
Transportation	Social capital	Outward marketing
Sanitation/H₂O	Associations	To companies
Telecomm	Cultural mindset	To individuals and groups
Voice	Demographics	Inward marketing
Data	Entrepreneurial environment	Targeting
Wireless	External networking	Leading industries
Building/Construction	Education / Training	Leading companies
Housing	Pre-K through 12	With technology products/processes
Corporate sites	Higher education	Green/sustainable
Buildable lots	Workforce development	Packaging/Positioning
Public spaces	Continuing education	Incentives
Architecture	Health Care	To companies
Hospitals	Government	Self-investment
Schools	Planning	Competitive intelligence
Laboratories	Land Use Policy	Support to existing businesses
Security/Anti-terrorism	Permitting	

HARD INFRASTRUCTURE	SOCIAL INFRASTRUCTURE	MARKETING
	Zoning	
	Tourism	
	Research	
	Law enforcement	
Taxation		

Government planning, zoning, and permit processes are an important part of the business environment that makes a locale attractive to companies. Tourism aids ED by bringing in dollars to local businesses, and by displaying the region’s attractions to outsiders (at their expense!) who may later bring more trade or businesses in. “Research” includes creating new knowledge, new technologies, new uses for recent technologies, and new ways to support the transfer, productization, marketing and use of the technologies.

Target marketing (see column 3 of Table 2) implies a regional strategy: Local organizations cooperate to identify industries that fit with the region’s strengths and aspirations and offer opportunities to capture company startups, relocations, and even headquarters. Targeting also means attracting new residents with desirable demographics, for example, families, retirees, affluent couples, or new college graduates. Competitive intelligence is the process of gathering and analyzing information to assess the fit, the opportunities, and the progress of rival regions.

Outward marketing means proactively reaching out to prospective companies, individuals and groups. Inward marketing means tracking and responding to incoming inquiries from prospects. Both are done well if they stick to a core message reflecting the “packaging,” competitive positioning, and branding of the region.

Competitive intelligence also reveals what other cities are ponying up in order to attract relocations and entrepreneurs. The region can then calculate the prospects for payback on an incentive package, the “price ceiling” on any given recruitment project, and the wisdom of joining any particular bidding battle. Incentives, as I’ve pointed out in other essays on this site, may be direct payments, variances or abatements to a company, or may be self-investment in university faculty positions, new university laboratories, new parks or roads, or airport renovations.

Marketing also includes the measures that governments and local organizations take to make startups and existing businesses feel welcome in the region.

Finally, taxation in the region and its component municipalities (and the states in which they are embedded) must, to the extent possible under many conflicting demands, finance all the above.

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This brings us to Table 3. It shows that every element of Table 2, without exception, may either be supported by technology or spur technological innovation. A region that mobilizes technology in most of the ways shown in red in Table 3 is a technology-based economy (“technopolis”).

I have mentioned the possibility that a region’s strategy may, admirably, target green and sustainable economic activities. This may lead to low-tech objectives, like more commuter miles traveled by bicycle rather than automobile, or it may lead to high-tech objectives like the manufacture of hybrid vehicles. In the present context, it is worth noting that the bicycle strategy is easily copied by other regions, and results in no comparative economic advantage, regardless of the real, absolute benefits of reduced pollution and a healthier population. Specializing in the innovative manufacture of a clean vehicle, on the other hand, yields a distinctive competence that is a sustainable advantage.

The red items in Table 3 support the view of economic development as *the collection of efforts a region makes to cultivate a healthy economy*. This is a general view of ED, but useful because it helps us avoid the tunnel-vision perspectives that ED is just recruiting or that ED is just infrastructure development. Again, a healthy economy requires a healthy, productive work force with access to information and education – the items in Table 3’s first column support this – as well as export-sector companies that are attracted by success in all three columns and in turn finance the three columns’ activities via taxes, payrolls, and donations.

Table 3: Technology-Based Economic Development (TED)

HARD INFRASTRUCTURE	SOCIAL INFRASTRUCTURE	MARKETING
<i>Transportation</i>	<i>Social capital</i>	<i>Outward/Inward marketing</i>
Intelligent vehicle/Hwy Systems	Social networking online	CRM systems
Maglev, TGV, other advanced public transp.	Online meeting spaces, master schedules	Technology-oriented conferences, conventions
Modern international airport	Smart physical meeting spaces	
<i>Sanitation/H₂O</i>	<i>Education / Training</i>	<i>Target companies having...</i>
Water treatment, waste-water treatment, sewers, pest control, water supply	Targeted retraining programs	Leading basic technologies
<i>Telecomm</i>	Enrichment programs, science fairs, science & tech museums	Green/sustainable technologies

HARD INFRASTRUCTURE	SOCIAL INFRASTRUCTURE	MARKETING
Proximity to trunks, switches	Distance learning	Health care technologies
Last-mile infrastructure	New academic programs	Technology products, creative/support services for export to emerging world mkts
Public access to Internet at libraries, kiosks, public wireless sites	University-connected newbusiness incubators	
Building/Construction	Health Care	Packaging/Positioning
Advanced/appropriate construction methods, tools, software, mat'ls	Telemedicine, home health maintenance	QOL, amenities for creative knowledge workers
Recently updated building codes	Teaching hospitals	Mathematical models for marketing analysis
Security/Anti-terrorism	Government	Competitive intelligenc
Monitors, screening devices/procedures, reporting, 911 response	Digital gov't, Intercity tech development alliances	Knowledge Management
Search & rescue	Public-private technology partnerships	
Vaccine supply	Tourism	Incentives
Computer security expertise	Reservation systems; multi-media tourist information	Data mining tools for pricing and effectiveness analysis
	Research	Support to existing business
	Advanced researchers	Electronic clearinghouses
	Online collaborative research technologies	

The meaning and significance of most of the red (non-bold) items are self-evident, especially in the first column of Table 3. Some in the other columns, however, want further explanation. Let us start with social capital. In Austin, a law firm maintains a pro bono web site listing all meetings of the city's technology-related organizations each month. This facilitates encounters between people who need to touch base with each other, and allows them to augment their project teams by meeting others with needed skills and interests. In Portland, project teams of OregonRAINS (Regional Alliance for Infrastructure and Network Security) meet in a virtual meeting space called eRoom. This records all proceedings automatically, reduces highway traffic, and makes meeting attendance easier for members of this alliance to build Portland's computer security cluster. When FTF ("face-to-face") meetings are needed, the cities' smart meeting spaces, with videoconferencing, decision groupware, multiple projection systems,

microphones and workstations at every seat, and other electronics make it easy to communicate complex ideas quickly. These spaces also make the city attractive for advanced research conferences and technology conventions that bring world knowledge leaders to the region.

Education is enriched by science fairs, student inventor and student entrepreneur competitions at the primary, secondary and collegiate levels. Guest speakers brought in via teleconferencing also enhance the learning experience, as do facilities for online experimentation at remote laboratories and online research collaboration. The benefits of university-connected technology business incubators are detailed at <http://www.generalinformatics.com/ous.htm>.

Teaching hospitals make your city known for the most advanced treatment modalities and surgical techniques. These tend to be in large cities, so a regional TED strategy will include telemedicine to bring the benefits of advanced medicine to outlying areas. As populations age, the medical monitoring and home health maintenance industries will boom, and pioneers in these products will gain competitive advantage.

“Digital government” is an umbrella term for the ways government agencies facilitate communication, compliance, security and other functions of governance using information technology. (Useful sources on this subject include the newsletter dgOnline, published for the National Science Foundation by the Digital Government Research Center at the University of Southern California, <http://www.dgrc.org>. View dgOnline online at http://digitalgovernment.org/news/stories/dgonline_latest.jsp.) Networking among techno-regions is essential for finding suppliers, customers, alliance partners, advice, companies that want to locate in a region like yours, and expansion sites for homegrown technology companies. This kind of networking is done through non-profit organizations like the Association of University Technology Managers, the World Technopolis Association, the National Business Incubator Association, and the Technopolity Network. Governments also do this directly, viz., the “technology alliance” between the cities of Austin (Texas) and Curitiba (Brazil).

S&T museums draw tourists and conventioners as well as students. Information services directing tourists to attractions and bargains advance the double-win: Tourists bring their own dollars to be exposed to life in your city. In what other industry do customers pay producers to watch their ads? Tourism applications are also a great way for the region’s technology and arts communities to work together.

Distinguished, leading-edge academic researchers are likely to draw the best graduate students, generate patents and attract licensees, and create (perhaps via their students) spin-off companies. When they publish in short-cycle online journals, use the latest electronics for collecting data and sharing lab notebooks, conduct experiments at distant laboratories via remote-control waldos, and allow distant researchers to do the same with their own advanced equipment, this further increases the velocity of innovation.

In some ways, localities are farthest behind on the technologies of Table 3's third column, because public and not-for-profit entities have been slow to adopt the sophisticated marketing techniques of the private sector. CRM systems track the progress of prospects through the sales funnel, do contact management and generate automated messages and reminders. They enable database marketing by preserving data on customer/prospect preferences and responses.

These databases can be linked to competitive intelligence and market research reports, and statistically analyzed to optimize marketing programs.

Regions want to attract companies that produce a steady stream of innovative products that are important to large, fast-growing, industries. Ideally, these products should be not only environmentally friendly and export-oriented, but should enhance the region's TED goals by enhancing the health, wealth, and happiness of the region's population. Electronic markets, electronic auctions, and electronic data interchange can connect to local small businesses, allowing them to be successful suppliers to larger companies.

This explains the individual elements of TED. The possibilities for creatively and super-additively combining these elements seem almost endless. We will close with just four examples of these synergies:

1. *Inter-sectoral cooperation* lets these technological facilities be used most effectively and in a way such that everyone need not, e.g., build his own smart auditorium. Sharing does not always amount to charity and need not be seen as a cost item. On the contrary, sharing allows people with different talents and similar goals to meet each other and get things done more efficiently. A regional development plan should anticipate and account for such synergies. (Without implying that it is a good example or a bad one, I refer the reader to <http://www.oregonbusinessplan.org>.)

2. Citizens and government officials who are *knowledgeable about technology, active users of technology, and creative about applying technology* in new ways to enhance their lives and their neighbors' lives, are important to this recipe. Examples include the legendary technopolis godfathers Mayor Lerner of Curitiba and Governor Hiramatsu of Oita, and former Austin Mayor Kirk Watson and former Austin City Manager Camille Barnett.

3. In the high-tech region, government agencies and businesses (even small businesses) *stay in touch with constituents through a variety of electronic means*. See (Phillips, Donoho et al. 1997) for a detailed treatment of multi-media e-commerce.

4. In this era of globalization, technology executives' daily focus is well beyond city limits, and it is difficult to get them to *make commitments to local community-building*. The few who are committed locally, and who say (as one of my Austin friends does), "When I wake up in the morning I ask 'What can I do today to make Austin the very best place in the world to live?'" are a terrifically valuable resource.

Different regions will use this TED recipe in very different ways. However, the items detailed in these tables are the basic ingredients of technology-based economic development.

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