Smart Communities: Digitally-Inclined and Content-Rich

John G. Jung

Many of the "wired cities" in the world are becoming infrastructure-rich, yet they remain content-poor. This is the assessment of Professor Toh Thian Ser, using as an example Singapore, a country renowned for the extensive wiring of its business and residential community with fiber optic cabling. While the city is extensively wired, the value-added intellectual property produced in Singapore is relatively limited. "We are good managers, not good producers," recounts the professor. The fact is that extensive wiring of a community is not enough to generate new intellectual property. A National Computer Board chief agrees: "That is why we are always looking for ways to improve our economic position and why we have started a campaign to change our culture to embrace information technology."

Fostering knowledge-based industries and businesses has become more important than merely deploying additional wiring to make the city even more "wired." So are encouraging research and development activities and advanced educational facilities, which create, attract, and help to retain knowledge workers. As well, integrated business applications and a supportive government that understand, encourage, and apply technology to manage the community are key elements to making a city "smart."

Clearly, the community must be connected, both with wireline and wireless technologies. It must also be seamless and transparent. Finally, it should be affordable, fast, and reliable. These are the minimum criteria for even playing in the "smart cities" game. But many of these communities differ on how they will utilize the technologies to help differentiate them in the highly-competitive and global marketplace. In other words, a city can be wired, but without determination and a clear plan for its use, it is of little consequence.

Why is this happening? The developed world, and increasingly even the developing world, has shifted to, or is aspiring toward, a knowledge-based economy. This requires high-capacity broadband networks and a well-educated population to be able to develop, market, and supply new products and services demanded both by other knowledge-based economies and by the developing markets moving in that direction. Competition among communities ranges from local to global, with several communities acting very differently from their national norm. It cannot be expected that every nation will have a national strategic approach in place, therefore one community's case may be different from the next.

The promise of a new infrastructure in the new economy will at least be the same as the promise of the roadway infrastructure back in the old economy: to provide improved access for its citizens to develop new ways to live, work, and play, and also to help attract new business and investment to the community. The principle is the same; the tools and way to deliver them are different.

These are challenges for all communities as they emerge from their twisted-copper

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past and move toward high-speed broadband environments. As the new millennium approaches, the private sector is quickly installing fiber optic lines and microwave and satellite services to accommodate nearly any application that anyone can develop and distribute, but most are still looking for that "killer-app" to send through the pipes.

Several telcos and cable companies are beginning to sound mighty disgruntled because they can't seem to get the profit they need from their infrastructure investments. Modified applications to viewing movies (such as video on demand), 24-hour digital music, and Internet shopping over the World Wide Web are not enough to sustain the level of investment needed to complete the infrastructure. Broadband Internet, which would replace the currently slow copper-based World Wide Web, may never be built if the private sector can't see a payback for its investment.

The original Internet infrastructure was created largely with government support. To develop a comparable broadband network would be expensive beyond our senses. The former was a result of using what essentially already existed, whereas the latter is dependent upon demand. The key questions are where will the demand come from? How will it be developed? The fact is that without demand, the broadband world will take years to achieve. However, with demand, the private sector will follow with infrastructure investment.

Demand Must Be Created

The concept of creating demand is more than developing interest in commercial video on demand trials. It must be pervasive throughout the community and systemic. It must be evident in the everyday business, residential, health care, educational, cultural, and recreational pursuits of a city. Through schools, students will engage in the use and application of telecom-related products and functions—if they are provided with the right tools and training. In theaters, local producers can digitize and resell theatrical, performance, and craft arts to help offset public funding—if there is an interest in

these products and if the facilities exist for users to become accustomed to these opportunities. Mass billing for toll traffic and metering for gas may already be commonplace, but many business and government applications are still considered exotic. Some of these "exotic" applications include:

- Shared health information among hospitals.
- Shared use of educational facilities on a 24-hour basis.
- Tele-voting on plebiscites.
- Teleconferenced applications development with community members.
- Other visually based multi-conferencing.

Without tangible local examples and community-wide application *and practice*, these will remain exotic business and government applications. By generating demand, the community networks and community use of ever-new applications can be developed to the fullest. This can help foster increased growth for the community, including economic growth and prosperity and increased quality of life.

Demand comes in a variety of forms:

- Direct learning of specific applications in specific sectors.
- Building awareness in and across sectors of the community.
- Developing applications among the sectors, providers, and users with a view toward achieving greater synergy, efficiency, and effectiveness.

Consumers being king, they demand high-quality and reliable products and services at affordable prices with a promise of delivery today, and better and more affordable products and services for delivery tomorrow. Building demand is really a unique process in reverse: The development of products and services is the end result of solutions developed to meet the issues and requirements identified to serve a community's needs. Often, however, before a community's needs can be assessed, a

process of identifying the issues, opportunities, and options must occur.

This is the reverse of typical network design practices where products and services have been built before real use and application have been determined: In other words, the "build it and they will come" syndrome must be overcome. Some form of awareness-building device or vehicle toward achieving a meaningful cross-sector needs assessment must reside in the community. This is necessary to break down barriers and bring potential partners together for the greater good of the entire community, not just for the benefit of an individual business or a specific industry sector. Demand will foster greater investment *only* if the sector becomes aware of the demand, and so on. Usage leads to greater demand, which can be measured using transactional indices. The end result will be a mutually beneficial synergy for both the end users and the providers.

"Smart communities" is both a concept and a vehicle for creating demand. It is also a vehicle for community improvement and advancement. Through partnership—the essence of what smart communities stand for—the community and business can both win.

Figure 1
Building Demand Model

(End-Users)   **(Providers)**

Demand
Awareness
Culture of Use
Champion
Use (practiced)
Needs/Uses Identified
Infrastructure/ Products and Services

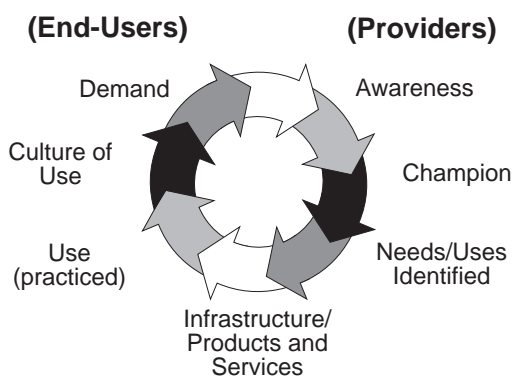*Source*: J. Jung

The Evolution of Smart Communities

In the early to mid-1980s, smart buildings, such as those in London, were being developed in response to the great financial promise known as the "big boom." These were typically internally networked via mainframes. Large amounts of text, data, voice, and video were being transmitted throughout the city and region, as well as nationally and internationally. Several of these smart buildings were linked with fiber optic cables and microwave transmitters. New York's financial center, for instance, was linked with the world through the first "Teleport" on Staten Island, developed by the Port Authority of New York and New Jersey. Worldwide changes were afoot. First came the development of high-capacity satellite systems through teleports; then, high-capacity fiber optic lines were laid as several nations pursued a national information infrastructure.

With networks extending beyond the research parks and financial centers, the beginnings of "intelligent cities" emerged. They were supported by sophisticated telecommunications systems, linking cities across the country and around the world, especially at the government and university level, where high-capacity broadband networks were in demand to transfer large volumes of data, text, and video. With increased deregulation, the infrastructure expanded to include fiber optic connections, complementing coaxial cable and twisted copper pair connections throughout many cities. New applications and uses emerged, most notably over the Internet, cable television, and through commercially-available teleconferencing. Local area networks expanded into wide area networks and ultimately these are evolving into metropolitan area networks linked to a fiber backbone connecting other cities and regions.

In 1995, 1,200 delegates in Toronto attended the first large international gathering organized by the community, in association with the World Teleport Association, to explore smart communities. This was

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followed in 1996 by a gathering in Silicon Valley (Connect96), and numerous other smart community gatherings throughout the world. Interest in these integrated communities, based on the application and use of telecommunications and advanced information technologies, extends beyond entertainment and business development. They are also being examined for use in:

- Participatory government.
- Coordinated delivery of health care.
- New forms of commerce.
- New ways to promote and deliver education and training, locally or worldwide.

In effect, it means looking at the whole palette of developing prosperity, including social and cultural development.

The Smart Community Concept

Smart communities are being developed worldwide in Rio de Janeiro, Kuala Lumpur, San Diego, Antwerp, Dublin, and Yokohama, as well as in smaller communities such as Grand Prairie, Alberta; North Bay, Ontario; and Celebration, Florida. Names have included *smart city, intelligent city, smart community, technopolis, infoport, media city, tele-city, cyber city,* and *teleport-town,* among others. For the purposes of this article, we will refer to them as *smart communities.* Some have even developed and utilized technology and applications to foster a whole new form of civic organization. The concept of smart communities in these instances is closely aligned to the notion of "city-states." These are regional economies with strong cities at the core, drawing upon precompetitive collaboration and cooperation among all people, institutions, and resources throughout the region to build ties among businesses, institutions, non-profits, and volunteers. *The success of both concepts relies on the power of cooperation, shared resources, and shared goals to increase the overall competitive ability to attract and retain people, businesses, and jobs in the region.*

New applications and uses of technology help to empower residents, institutions,

and businesses in the region as a whole—affordably and synergistically. It may even be able to help break down barriers, such as turf protection among members and agencies in the community, since its basic form takes on the major actions of sharing and collaboration. This has resulted in real benefits for communities that have undertaken this process. Communities in California, Virginia, North Carolina, New Brunswick, Washington State, Britain, Holland, France, Germany, and Singapore, are actively working at transforming themselves into smart communities. The result has dramatically increased their regions' economic competitiveness and quality of life. This, in turn, has attracted knowledge workers, value-added businesses, and investment resources, thereby ensuring that these communities are laying a solid foundation for the future.

Once the infrastructure is in place, smart communities turn to the development of on-line applications, which build on the existing Internet without replicating it. Smart communities develop community-based applications that tend to supplement the Internet's global information base with attractive and cost-effective data and applications pertinent to their specific community. These include:

- Local government resources.
- On-line government services (such as water bills and building permits).
- Community event listings.
- Local newspapers.
- Chambers of Commerce events.
- Visitors bureau information.
- Electronic commerce applications.

The convergence of TV and the World Wide Web, called Web-TV, is an example of a new application that is expected to help create demand in the community. *NowTV*, in Calgary, Alberta, has recently been launched over the city's cable network. Community news, Web browsing, broadcast quality multimedia information, and communications support, without use of a computer, are now available to all cable-TV subscribers on a 24-hour-a-day basis. As the fax proved

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over a decade earlier, Web-TV is positioned to become equally indispensable and part of everyday use. It will help create new forms of demand among a greater portion of the population, many of which do not have access to a computer.

At another level, the Canadian government has created *SchoolNet* and the *Community Access Program* (CAP). These Industry Canada programs have been developed to help provide Canadians of all ages and in all locations with affordable public access to the Internet, as well as to the skills needed to use it effectively.

SchoolNet is a joint federal, provincial, and territorial initiative linking schools and libraries across Canada to the Internet, providing educators, librarians, and students with access to valuable tools and services, as well as encouraging the development of information technology skills. SchoolNet will link all of Canada's schools, libraries, colleges, and universities by the end of 1998.

CAP established an initial national network of 1,200 community access sites through low-cost public locations, such as schools and libraries. Aiming to have 3,000 sites by 2000, it originally was targeted at remote and rural communities, but now extends to urban areas as well. The goal of the program is to provide more affordable access for the broader community, thereby raising awareness about the potential for creating jobs and growth. It is also expected to help stimulate the development of new electronic learning tools and services. The program will provide Internet training facilities for local entrepreneurs, employees, educators, and students interested in improving their information management and networking skills. It is also expected that this will stimulate the electronic delivery of government and other services.

These programs are a variation of the smart communities concept, all of which offer a new approach to community-building for the future. We must begin to define communities as being broader than those associated with municipalities. For instance, they can relate to groups of like interest or like-mindedness many miles or even continents apart. For the purpose of this article, however, it will continue to relate to the physical entity referred to as a town or city.

Sharing to Gain Competitive Advantage

Using advanced information infrastructure, communities are connecting schools, universities, hospitals, government departments, and institutions, as well as producers, facilitators, and consumers. Through this act of connecting one group to another, it is assumed that the community, as a whole, will be able to deliver a special and unique strategic position that makes it more capable and competitive than other communities.

The expected benefit is economic prosperity. This will further lead to enhanced private sector and government services and improvements to delivery of educational opportunities. It will also provide access to superior and coordinated health care. All of these actions will result in an overall improvement in the quality of life. In today's global environment, these advantages become increasingly tangible offerings in the competition to attract businesses and knowledge workers to communities. They also become increasingly important reasons for being able to retain them.

With a smart community in place, coalitions representing people, businesses, governments, and institutions can take advantage of advanced technologies to foster new forms of business activity and engage in the new processes representing commerce in the future. The new economy, based on sharing information and transacting business through new ways of exchanging and delivering services, is poised to deliver these new forms of commerce. All the tools, the knowledge of how to utilize them, and the awareness of the opportunities to meet identified needs must surface together in an integrated and comprehensive fashion. Then, a community is poised to make the necessary changes to become competitive in a global environment and to succeed, based on community expectations.

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There appears to be some common threads that run throughout many of the existing North American smart communities:

- They were born out of a community-wide need or threat.
- They attracted support from the community (businesses, government, and community interest groups).
- They developed through tangible, project-focused activity.

Smart Valley and Smart Toronto are good examples of this. Early in the 1990s, both areas felt the threat of potential economic decline from perceived competition with other centers where competitive advantages could be identified. In the case of Smart Toronto, the fact that CANARIE[1] was potentially going to overlook the Greater Toronto Area was indeed a shock for civic and technology leaders. Soon, they had developed a coalition of leaders from the public, private, and institutional sectors and developed a plan to place the Toronto region in the forefront of information technology, telecommunications, and research excellence. It also focused on electronic commerce, multimedia applications, and the burgeoning film industry in the region. Today, Toronto has positioned itself as a knowledge-based center and is poised to emerge as one of the chief smart communities in North America.

Factors for Success

In surveying North American communities, the five key factors for developing a successful smart community can be summarized as follows:

A community issue or threat must exist, or potentially exist. This raises the sense of urgency to do something. In the case of several communities, the threat of knowledge workers leaving for other centers has been identified as a critical measure of the future of a community. Industry closings or the repetitive loss of potential relocations or investments to other centers should push community leaders to action. While an

emergency or disaster aren't necessary, they will make it easier to focus attention, set goals, and galvanize support more quickly.

A community champion or coalition of leaders must emerge and take ownership and provide leadership for others to follow. While a natural leader is preferred, a delegated leader with proven support can take the position.

Specific community needs must be clearly identified, and the champion or coalition must heighten awareness of the issues throughout the community. The champion or coalition must be able to clearly and simply articulate and promote the opportunities and potential options.

Best practices and priorities must be investigated. Other communities or organizations may be able to help provide a prototype or standard by which the community can compare itself, although no two communities will be alike and often ideas and practices of one community cannot be transferred to another. Once a course of action is determined, benchmarks should be established. Smart communities must set achievable targets, benchmark them, and then evaluate the achievements.

A single project that coalesces the interests of all those involved in championing the cause must be found. This can be a piece of missing infrastructure needed in the community, such as a fiber link to create a community integrated network, an information technology center of excellence, or an awareness building exercise such as local seminars or a larger conference.

With these actions in place, the beginnings of a smart community can be developed. However, the community must be continuously and further nurtured to be receptive to the development of a smart environment. Following deployment of infrastructure and application of specific products and services, community use and extended familiarization can lead to the creation of demand. Once the cycle has begun, there is a high chance that it will sustain itself.

Strength in Numbers

Smart communities are possible anywhere and everywhere. In fact, the more that communities of like interest are able to find each other, are able to link up with one another and begin to share information and resources, and are willing to exchange services and products among them, the more likely they will collectively strengthen each other.

This is precisely the main purpose of the International Smart Cities Institute (ISCI), affiliated with the World Teleport Association. ISCI aims to address the desire of people around the world to share ideas and develop ways to effectively collaborate for social, cultural, and economic benefit and mutual progress. This interest in creating enhanced communities, based on the use of existing and emerging information technologies and telecommunication infrastructure, crosses all sectors and disciplines.

There are also other vehicles being developed to support this notion of information sharing. Following the International Conference on Economic Development in a Global Information Society,[2] organizers discussed forming a world forum as a means to exchange ideas and information on the most significant applications and innovations across the public and private sectors.

The Internet is also full of city-to-city linkages, such as CityLink USA, the European Tele-city initiative, and linkages among like-minded organizations where partner "hotlinks" have become increasingly commonplace. However, the principles and practices that can be followed from community to community are not necessarily transferable from one to another. At the root of the smart community process must be the willingness and opportunity to change. A paradigm shift in attitude is needed for the community to identify and address their needs for the new millennium and to set a course of action to effect this shift. This includes:

- Government deregulation.
- Investment in computer hardware and software in schools and community access centers.
- Reduced transmission and communication fees.
- Potential relaxation of municipal easement fees to stimulate local infrastructure development.
- Development of model users.
- Among other incentives, reduced red tape and promotional mechanisms.

In surveying communities worldwide that call themselves smart communities (or some variation), the key challenge seems to be the ability to deploy sufficient and affordable infrastructure and applications to entice use. Furthermore, generating enough demand to utilize the computer and communications infrastructure to its fullest is a challenge that few cities seem seriously prepared to meet today. In time, as the benefits of the smart community approach become more evident or competitive threats force communities to consider this approach more seriously, the ideas will become commonplace and little reference to this evolution will be necessary.

It's a Digital World

There is an assumption that the knowledge society already exists. Yet, many will argue that it's still a figment of the imagination. It's possible that terrific marketing on the part of multinational corporations helps generate this assumption. It does suggest that there is great potential in the digital world, which is represented by information technologies and telecommunications. Just as the automobile, telephone, and airplane did earlier in this century, it can offer further removal of physical distance. Add to that the creation and manipulation of information and knowledge, which can now be shared for the greater good of society and for mutual gain among partners at great distance. Distance no longer will pose an

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obstacle to health care, business transactions, or cultural and social experiences. The new technologies and information infrastructures can make all of this possible. The real obstacle will be our willingness to deal with challenges related to facilitating its deployment, access, and use.

Information infrastructure will contribute to economic growth and prosperity only if government, institutions, and especially businesses are in the position to use it and sustain it to the fullest. Critical to its success will be the development of demand. Its best measurement of success will be through eventual procurements and transactions which will engage business to develop further infrastructure, processes, and enhancements.

Conclusions

Transactionable information and knowledge-based products and services in an electronic commerce environment, with desirable content and secure service arrangements, must both be offered and purchased in sufficient amounts to warrant its continuation. This is not done overnight. It is nurtured. Smart communities can help to nurture this environment. They can:

- Help to develop the infrastructure.
- Ensure access at reasonable costs.
- Encourage the pursuit of the best in content and service offerings.
- Promote its use.
- Ensure secure systems to encourage transactions and maintain privacy.
- Encourage business and industry to enhance the infrastructure and processes necessary to keep the momentum going.

By providing electronic services to its citizens, the public sector has done a terrific job of acting as a model early user, laying a significant foundation for a smart community. Government's role as facilitator and nurturer is crucial. But without business and industry sector support, the creation of

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knowledge worker jobs—the foundation for a sustainable smart community—will never be accomplished. The smart community process, therefore, *must* be led by the private sector. ntq

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[1] CANARIE stands for the Canadian Network for the Advancement of Research, Industry, and Education, and is Canada's equivalent of the National Information Infrastructure.
[2] This conference was held in Nice and Rome in September 1997, and its theme was "Smart Communities: Shaping the Future."

To better understand the state of the Smart Community, look for John Jung's companion article in NTOnline at www.ntq.com.