Community Innovation and Community Informatics

Building National Innovation Capability from the Bottom Up

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Introduction

"Innovation” has in very recent times come to be a central concern for many countries, regions and communities looking to maintain or improve their position in the Information Economy. This is particularly the case in areas where there is a broad acceptance of the role of Government in helping to stimulate and support industrial and technological development.

For the most part however, “innovation” is seen as being exclusively concerned with the development of new knowledge, products or processes on a global scale that is, “innovations” which are novel for all rather than novel within specific contexts or environments. What this means in practice is that those who have been concerned with “Innovation” and who have followed this emphasis with resources, have been exclusively concerned with the activities of global level enterprises, globally significant Research and Development centres, globally competitive researchers and university laboratories, and so on. The current emphasis in many countries is thus on the creation of “Highly Qualified Personnel” (HQP) along with the social, technological and institutional contexts which nurture and enable their activities. The notion is that through this type of directed investment it is possible to create an innovation culture and technological innovations which can make a direct contribution to the competitive position of industry and national economies. The intention whether explicit or implicit is to clone so much as is possible the success of locales such as Silicon Valley in California which is widely seen as the basis and birthing center for much of the technology and thus commercial success that the United States has recently experienced.

The notion here is that “Innovation” should be seen solely within a context of creating the capacities and the outputs which will allow for successful competition in global advanced technology markets. The consequence of this somewhat narrow and highly focused approach to innovation however, is that in many countries and regional jurisdictions pursuing an “innovation strategy”, there is a very significant allocation of resources and support to a relatively narrow segment of the population (and the overall economy) and particularly toward elite academic institutions and research centres, primarily urban and overwhelmingly from those with existing highly advantaged economic and social status. The justification for this is that these individuals and institutions are creating knowledge and technologies which once translated into products will provide jobs and wealth for large numbers.

However, while it is certainly the case that significant technology innovations will render a company and even associated companies and regions internationally competitive with the attendant creation of wealth and highly paid jobs, it is also the case, that such significant individual technology advances are relatively few and most countries, regions and populations
will, on this criteria be excluded from the opportunities and resources that are associated with
investments in “innovation” and “innovation strategies”.

In practice it is possible, even desirable to take an alternative approach to “innovation”, where
innovation is a change or introduction of new processes or products which are novel in the
context into which they are being introduced and where such an introduction has the effect of
stimulating a localized adaptation and change. In this case innovation can be seen as something
which is fairly widespread in society and something which can occur under a very wide set of
circumstances. In this context innovation can be understood as having significant impacts and
benefits not only through the effect of a “trickle down” from elites and high performers but also a
“trickle up” from local adaptations and community based novelty and change which, because it is
locally based and potentially very wide-spread, can have very significant and broadly distributed
impacts and benefits. In this latter case bottom up approach to innovation, the benefits as with
the innovations themselves can be seen as being widely dispersed and contributing to general
well-being directly rather than indirectly and solely through the creation of competitive advanced
technologies and the participation in the benefits of this competition by a relatively limited
number of individuals.¹

Definition

A standard definition of Innovation is “the introduction of something new”¹, or “the act of starting
something for the first time; introducing something new”¹ that is beginning or initiating something
which hasn’t been done before within a particular context.

A definition from the Canadian Government is also of interest here:

"Economic Concepts: Innovation"

"Innovation occurs when a business introduces new products or services to the
marketplace, or adopts new ways of making products or services. The concept may refer
to technical advances in how products are made or shifts in attitudes about how products
and services are developed, sold and marketed.

Innovation implies creativity and dynamism. It means enterprises are looking for better
ways of producing and marketing products and services. When an economy is more
innovative, it is more open to new ideas and technology. This increased flexibility can
lead to improved productivity and competitiveness and will result in a higher standard of
living."²

Many countries including Singapore, Canada, and the European Union have adopted national
strategies directed towards stimulating the innovative capacity of their industries. Innovation has
become of increasing importance because it is now in many respects the dominant single factor,
it is widely accepted, for being able to effectively compete in international markets. Also, and
related, the capacity to innovate has come to be seen as one of the central requirements for
achieving the ultimate goal for modern economies which is to be knowledge and technology
Intensive. Canadian economic and even social policy for example has as a significant goal to
courage businesses to be more innovative and to pressure other social institutions such as
universities, colleges, schools, to support this overall goal³. In February 2002 the Government of
Canada launched an innovation strategy aimed at expanding investment in technology and in
Canadians’ learning, skills and knowledge. Allan Rock, then Minister responsible described it this
way:
We need to find ways to support the Canadian research teams that make groundbreaking discoveries; our companies that have captured new markets with innovative products and services; our traditional industries that continue to innovate, proving they can compete globally; and the Canadian communities that have attracted world-class expertise and entrepreneurial talent.⁷

Among the common elements of these strategies is a focus on scientific research and development, the training of highly qualified personnel, the creation of an environment of incentives to support the creation and growth of knowledge/research intensive enterprises, the re-orientation of the educational systems towards science and mathematics and the creation of an element of the national culture which is supportive of these areas, and so on.

It might be noted however, that the definition quoted from the Canadian Government website identifies “innovation” only in terms of “business” practices and developments and seems to ignore other types and sources of innovation and those who might both contribute to and benefit from the variety of innovations which might occur. The argument presented in the Canadian document is that Canada to be internationally competitive must innovate. Innovation is something done by the private sector and by high performers within that and if we harness all of our resources to support this, somehow (it’s not really explained how) this will “benefit all Canadians”.

If we succeed, the reward will be an improved quality of life for all Canadians. We will need a partnership among all levels of government, researchers, academia, businesses and all Canadians.⁷

However, such a narrowly focused approach to innovation is almost certainly too narrow and limiting and both unrealistic in terms of how society (and innovation) actually operates and highly discriminatory in its implications in that it suggests that resources in support of innovation should only flow to those who, by these very selective and restricted definitions are understood as the “sources” of innovation.

In practice innovation can be understood as a social or even a community process and can be found to be occurring in many venues and with the support and participation of a range of social actors. In fact one might argue that such a broader approach to innovation inclusive of social or community innovation reflects a more realistic understanding of how innovation actually occurs and will lead to strategies which will in the longer term be more likely to succeed not only in providing more equitable distribution of the resources and opportunities for innovation but also as providing a firmer and more sustainable foundation for the narrower form of innovation which the Minister and his Government so clearly favour. The likelihood is that this broader distribution of innovation and innovation capacity can be seen to be a crucial pre-condition for both the narrower and the broader interpretation of innovation by providing the cultural and knowledge context out of which high performance innovation could be said to arise. Focusing exclusively on “business” as the locus of innovation, even in the area of advanced technology is to ignore such innovations as Open Source software, the World Wide Web, and the Internet itself which was product of government and academic research and development rather than business or corporate development. It is equally to ignore the range of talents and skills that go into any intellectually rich and productive context and to systematically undervalue and under support the pool of existing human resources and capacities out of which high performers emerge or are selected.

One of the differences moreover, in innovation in the broader social or community sphere is that as compared to the narrower and more “elite” or corporate focused definition, innovation is very much about context, that is it is about the introduction into and application of information and knowledge into novel circumstances and social or community contexts. Thus, for example, in
many (even most instances or contexts) "innovation" is not strictly "novelty", as for example, how the term is used in patent law, but rather about "novelty here", in "this particular social/cultural/economic context" thus the pre-conditions for innovation are not necessarily the highly capital intensive provision of advanced equipment or highly specialized knowledge sources, rather it may be through the availability of relatively low level information sources or knowledge providers who can feed their content into contexts where the interaction between content and context will have the effect of producing a locally novel outcome.

The "what" of a new product or process can or needs to be only developed or discovered once and it can be reproduced endlessly and presumably flawlessly. The "how" of effectively using that product or process will vary, and will need to be redeveloped and even "rediscovered" over and over again, from community to community, from culture to culture and from economic context to economic context. Supporting the "how" of implementation and use is a basic challenge for communities and governments concerned with effective use of technology and with ensuring that there is a widespread distribution of the benefits that technology can provide.

**Innovation as a Social Process**

There has in recent times been an increasing interest in "innovation" and particularly in the outcomes of innovation in new products and processes. Part of that attention has been to focus on the pre-conditions for innovation and to attempt to identify and reproduce factors which are understood as being necessary to support and foster an "innovation culture" or "climate". National governments throughout the world have been investing large amounts of money into university teaching and research laboratories as the source from which the Highly Qualified Personnel who are understood as being the source of innovation are produced. In addition, governments have supported the creation of mini-Silicon Valleys throughout the world – places where high technology companies and personnel are encouraged to concentrate (as for example through tax incentives, creation of new technology “campuses”, special immigration regimes and so on). Some of these have been more successful than others.

More recently there has been attention paid to the cultural environment from which innovation is understood to spring, or perhaps alternatively the elimination of environments which are understood to stifle innovation. Thus for example, Richard Florida talks about the “creative class” and the types of urban environments which attract (or repel) these individuals. The notion here being that a broadly based innovation environment is in part created through the fostering of such an environment including a significant proportion of those understood as being in the creative classes.

However, what is often overlooked in these types of analyses is that the processes of change and adaptation, of integration of new ideas and assimilation of different perspectives is an on-going and widely distributed social process. Communities are in a continuous state of responding and adapting to changes in their external environment and to new elements in their internal activities and methods of operation. New external requirements such as taxation or regulation, new market opportunities (or threats), new technologies (in recent times perhaps particularly new technologies) provide the fulcrum around which communities big and small are required to adapt and change.

These processes of adaptation may in some cases be defensive, resisting change and finding ways of avoiding or eliminating the external stimulant. In other cases the adaptation may be one of simple assimilation, taking in but not responding, with activities and internal processes being more or less as they had always been. However, in still other cases, the response may be one of “innovation” i.e. one where there is the creation of novel responses to external environments,
new processes enabled or creatively adapted to external requirements/opportunities, or the
development of local adaptations of external stimuli.

While these types of local "innovations" may not be such as to create new opportunities within
global markets they may have quite significant and important and beneficial impacts locally,
regionally and nationally.

Innovation and Social Learning

There is a clear and central relationship between Innovation within a community context, but
influencing broader social and high performance, and notions and strategies for "social learning".
"Social Learning" i.e. the recognition that learning is at least in part a social process has come to
the fore most recently in the context of diffusion of information and knowledge around the
applications and implementation of technologies within community contexts and also and
importantly in the use of ICTs within communities as the basis for skills and human capital
development. The direct link between technology implementations at the local level and broader
processes of social learning are only beginning to be identified along with an increased
awareness of, and attention to broader community based knowledge creation and knowledge
management processes.

Research into social learning and community based knowledge management is also just
beginning but there would appear to be particularly strong connections between these and the
capacity at the local level to be innovative and to sustain innovative processes as they might
occur. Social learning is one of the elements of and both an input and an outcome of effective
knowledge management; and innovation as a characteristic and a process within communities
both enables social learning and is in turn enabled by social learning processes.

Similarly the relationship between social learning and ICTs is a complex, iterative and interactive
one. ICTs provide a stimulant to and a platform for social learning and community knowledge
management. In this way ICTs are part of an on-going stimulative framework for community
learning and community innovation and when regarded as such can become the focal point for
intervention (or enabling) strategies towards communities and in this way promoting community
innovation and community innovation processes. This interaction is particularly important as will
be discussed more fully below, where efforts have been made to provide community technology
implementations in otherwise lagging (and non-innovative) communities. In this context, these
installations, as for example in Canada through Community Access Centres, in the US through
Community Technology Centres or elsewhere through local technology centres and the like, can
become the entry point through which opportunities for the development of community
innovation capability and community innovation systems may be introduced.

Innovation as a Technology Process

While at one level, innovation can be seen as a social process, at another level, it can also be
understood as being both a response to and an assimilation of new technologies and particularly
at the local or community levels. Technology is understood as being an enabler of innovation at
a national or global level and particularly currently when there is a significant emphasis on the
highest of high-speed data links; high quality integrated platforms for knowledge storage, sharing
and assimilation; and very powerful tools for information sorting and analysis. The notion is that
the better-faster-more powerful the information, knowledge and communication management
the more effectively will high quality personnel be able to acquire and assimilate the range of
knowledge and information available globally; integrate and process that internally; and, with
their research and development colleagues redevelop, extend, or re-contextualize this knowledge into new knowledge and thus “innovation”. This process of new knowledge creation is understood as being integrally linked to the high performance technology platforms that support these and extensive resources are being invested to create and support these platforms in the context of innovation and research strategies.

Equally however, though on a more modest scale, similar processes as can be found at the level of elite knowledge communities, can also be seen to be at work within local communities. Just as the elite communities need ways of accessing relevant information from external colleagues as a way of enhancing their own activities and finding new information and methods to extend those activities, so those in communities need and can make use of new methods of information acquisition, knowledge management and communications for their own internal purposes. The process by which local communities acquire and assimilate new knowledge most often as transmitted through various media is an important one and is crucial to the process by which local communities can adapt and respond to changing external conditions.

The use of information networks, the Internet, the access to websites and digitized information bases is as important for community use in attempting to respond to new challenges and opportunities as they arise locally as are the high performance systems for elite researchers and scientists. And to a considerable degree the same type of skills are needed locally and the same limitations may be found locally in accessing and using such resources—skills at identifying information appropriate to specific requirements, skills at determining the authenticity and validity and applicability of information coming from third party sources, the ability to “translate” information from such sources into the new context of language and concepts within which it must be applied and so on. These knowledge processing and management skills are of equal importance as a support to local innovation systems as they are to elite innovation and equally they have become even more crucial and even more in demand with the increasing and widespread availability of information distributed through electronic means.

**Innovation as a Community Process**

At the community or local level there is the opportunity to "innovate", if only in the form of developing new (for the area) types of businesses, production processes, and markets. Similarly to other forms of "innovation systems", the Community Innovation System (CIS) requires access to advanced levels of information and skilled knowledge workers for assimilating and implementing the knowledge being identified. In the community context of course, the scale and level of the information being assimilated is of a more modest nature than for regional or national systems.

An important element of a CIS in addition to the knowledge from which the innovation springs, is the capacity of the local productive and cultural system to absorb and make effective use of the information which is being made available. In the community context, this capacity is closely linked into the local cultural practices and norms. Many communities, particularly smaller and more isolated ones are often characterized by an unwillingness to experiment or to absorb new information or ideas. Strangers or outsiders, often the source of new information or ideas may be treated with suspicion and even hostility, preventing the local economy from taking advantage of the information which the outsiders might bring or have access to.

In addition, many communities and particularly those without a tradition of knowledge based industries or considerable numbers of locally based knowledge workers may be suspicious of new information and indifferent to themselves or their children obtaining the education and particularly advanced education from which innovation can spring.
An effective Innovation System is built on a foundation of information including a set of procedures and practices for scanning the environment for information of use in localized innovation; and a means for acquiring and assimilating this information as for example, through specialized agencies with trained staff and the means at hand (meetings, briefings, publications, newsletters, informal and formal contacts), to inform those responsible for products and processes of information which may be of use.

Corporate or regional innovation systems have elaborate and frequently expensive systems for accomplishing the above tasks. The challenge at the community level is to ensure that such processes also are in place in the much more limited financial environments of most communities. A significant component of elite innovation systems particularly as conceived by strategists concerned with developing such systems are more or less formal networks of researchers concerned with similar research questions able to interact and share information and knowledge through a variety of communications networks. In fact, it was precisely to support this type of networking that Arpanet, the origin of the Internet was developed.

Built into this notion of the research network is a clear understanding of the role that social contact and connection plays in providing a supportive framework through which ideas and information can flow and find a context of ready acceptance and appropriate recipients/providers. These types and processes of social networking are to be found equally if not more intensively within local and community contexts where such informal associations and networks provide the very substance of connection between individuals. While at the community level such networks are primarily the basis for social inclusion and adhesion, there is little except inertia and tradition which prevents these from becoming a basis for local innovation and the foundation for community innovation systems. In fact, it is precisely these types of connections which have provided the platform and mode of operation for some of the most economically successful and innovative of local communities through the integrated use of local social networks as networks for managing local production and distribution in what is generally referred to as “flexible networks”.

Innovation is the capacity to develop commercially competitive products or ideas. A CIS is a pre-condition or platform from which innovation can occur within a local community. It is a catalyst and provider of certain of the ingredients essential for local innovation.

**Innovation and Community Informatics**

What role does community technology play in support of community innovation? Many communities find the process of innovation difficult. They may lack the internal financial or knowledge resources to take on new activities or develop or implement new processes. There may be social or cultural constraints against change or changing practices. There may be a fear of the unknown or reluctance by, for example, community leaders, to “rock the boat”.

Technology as an exogenous, i.e. external factor which enters into the community but may not be controlled by the community or where the community may have only limited control over its acceptance or implementation may in many cases be a support for innovation (in other cases it may be a factor in community disruption as well).

The opportunity with a Community Informatics (CI) approach is for the community to have some direction and responsibility i.e. “ownership” in the innovation and the innovation strategy. The use of a CI technology strategy ensures that “innovation” is done by, with and in the community and not simply something that is done “to” or “for” the community. By adopting a CI
approach, there is a degree of assurance that the process of innovation will become an on-going element of community life and activity rather than a once for all investment in for example a single high profile “innovating institution”.

It is one of the crucial activities for Community Informatics to design appropriate strategies and technology supports for these processes of knowledge acquisition, assimilation and processing. Similarly the provision of technical supports to communities in their processes of knowledge management may be one of the most significant arguments in support of community focused ICT strategies in that the fostering of innovation and innovative capacity at the local level is a major source of advance and a prime basis for economic and social development locally as well as a powerful contributor to national strategies for innovation.

Thus the availability of technology supports at the local level can be seen as a significant contributor to the opportunities for local innovation and from the perspective of national governments the investment in the development of local technology infrastructures may be seen within the overall context of a contribution to a national “innovation strategy”.

Within this context it should be recognized however, that it is not sufficient simply to provide access to the technology. Simple access in the absence of an appropriate contextual set of supports and linkages may not necessarily lead into effective use. Equally, since the intention is not simply to link the local to the global or the national, but rather to provide the means for those at the local level to respond at whatever level and in whatever means makes the most sense in a particular context (of product, process, service etc.) it is crucial that the technology be not simply accepted, but rather “appropriated” i.e. integrated and assimilated by those locally so as to be amenable (provide the pre-conditions for) effective use in the manner most desirable.

Social Learning and Human Capital Development

Countries globally are looking for methods of creating or enhancing local human capital i.e. the capacity of individuals locally to learn and to undertake more or less complex productive tasks and to contribute to economic activity, particularly economic activity with a high skill or knowledge component. The development of “Human Capital” particularly in the context of advanced economies (or those who wish to become advanced economies) is a significant priority for government investment.

One of the primary reasons for emphasizing human capital development is to provide a basis for innovation at the local level recognizing that this innovation is often a necessary concomitant or co-existing factor with innovation at the regional or national levels as well. One of the most effective strategies for human capital development is through processes of social learning; that is, where means are developed to support learning within a population not only through formal institutions such as schools and colleges but also through informal processes such as through non-governmental organizations, friendship groups and informal social groups.

The relationship between human capital development and innovation is a complex one, in that learning as a basis for human capital development, the capacity to accomplish a wider range of more skill intensive tasks for example, may in turn lead to local innovation as the accomplishment of those tasks may be “novel” within the local context—think about the anticipated impact of leadership training within a relatively closed and static community where the leader is suddenly enabled with skills at accessing and processing a suddenly much wider range of knowledge which may have immediate application within the local economic and social environment.
But similarly, innovation may itself be the source of human capital development where for example, the development or implementation of a new product or process locally requires or stimulates those locally to acquire new skills or to find a means to adapt existing skills and knowledges to the newly emerging sets of opportunities.

In this context then, innovation is a "social" as well as a "technical" process and "innovation" can occur and be fostered to occur in communities as well as in say Universities or research labs. Innovation understood in this way is in turn linked to local economic and social development (and Human Capital Development).

Similarly it can be understood that in this context technology supports human capital development at the local level through training, knowledge creation/distribution, and also as a support to innovation which in turn is linked both as a cause and an effect to local human capital development. This kind of argument can then provide a whole range of (politically useful) rationales for local investment in technology and can also suggest a number of fairly specific program activities and identifiable/measurable outcomes--something will probably be required since these are being provided as a public service.

Communities can thus be seen as the focal points for learning, for skill development for network building, and for resilience in life long learning and knowledge acquisition. The challenge and opportunity that has recently emerged is that Information and Communications Technologies (ICTs) provide dramatically enhanced means for supporting these types of developments. Where previously those locally had to rely simply on available physical or human resources to support their learning or skill development, with the availability of very low cost Internet access this is no longer the case and while appropriate content may not be immediately available the overall opportunity exists to enhance local learning with global resources based on an ICT technical platform.

However, as has been noted elsewhere simply making a facility available or accessible is not sufficient to ensure that it will be "effectively used" i.e. implemented and made use of. For this to happen there is the need for a number of elements to be in place in addition to the physical infrastructure of "access" and including an appropriate and appropriately designed and presented content, and a welcoming and supportive social infrastructure sufficient to the application or in this case the "learning" that is being provided.

A Community Informatics approach to local technology implementation emphasizing as it does the articulation within the community of community goals for technology, community ownership and deployment/management of the technology; the design and implementation of locally responsive strategies for implementation, training, content design; and the creation of a suitable social/community context and institution building to support the applications being presented through the ICT infrastructure all will contribute to an effective process of community learning and community human capital development as a specific ICT community application.

Social Efficiency/Social Effectiveness

The introduction of digital systems has had dramatic impacts on the efficiency and productivity of conventional enterprise and the dramatic restructuring of Corporations and Governments redeveloped on digital platforms—enormous gains in efficiency, new products and in the "effectiveness" of existing products, new "business" (government) models. The argument is being made that the current very dramatic improvements in productivity in, for example, the economy of the United States are a direct product of the introduction of such systems as digital
supply chain management, electronic purchasing, bar coded and now RFID logistics management and so on.

Overall, Management Information Systems (MIS) as a discipline and a practice has been of very considerable support in the research, design, development and implementation of these systems and thus a significant contributor to these efficiency gains. Currently through the introduction of systems to support knowledge creation, management, and distribution similar productivity gains are being achieved in the area of services within the corporate economy. In addition, and notably, not only have there been significant gains realized as a result of technology in the area of efficiency, there have also been parallel and equally substantial gains in the redesign and redevelopment of products and services incorporating as a constitutive element the opportunities that advanced technologies afford. One need think only of the redesign of automobiles to incorporate sensors, dynamic processors, and new materials and so on to make the modern automobile more energy efficient, safer and more streamlined, as an example.

Overall however, services directed toward supporting individuals and communities outside of the corporate environment have lagged considerably in their achievement of productivity. Even more significantly human focussed social services have lagged in their redesign so as to reflect the new opportunities which technologies present. As publicly supported human services suffer as a result of changing government funding priorities, rather than look to technology as a means of maintaining or even enhancing these services through an effective redesign and redevelopment to achieve efficiencies and enhanced effectiveness, these services are being allowed to whither through a lack of investment and attention.

It may be time to “flip the argument over” and rather than looking for the means to continue to provide increasingly expensive services from the context of central management, organization and delivery (the industrial model) with productivity oriented investments directed only at enhancing the capacity at the point of central management perhaps it would be more useful to think of these services from the perspective of the end user and his or her family and community as the focus for additional investment and to identify means by which these services can be made available more efficiently and presumably as or more effectively to end users within the context of an “effective use” approach.

There are dramatic gains/benefits to be found in both efficiencies and in effectiveness for communities and for society as a whole in Effective Use/Community Informatics applications – e.g. Community based e-health, community based resource management, community governance and locally based community watch/security programs. Think for example of the development and implementation of ICT enabled programs for community support of an aging population. Rather than relying solely on “professionals” as care givers, a program could be designed to inter-link with the variety of requirements for senior care-giving including local sensors and diagnostics, smart analytical tools for integrating diagnostics, on-line community support tools for chronic or critical care-givers, social support tools for isolated individuals and isolated care-givers. Additionally programs for an aging population could provide technology supports for community participation, community response to emergency and routine health/monitoring activities for seniors, information programs to support care givers and semi-independent seniors and so on.

As another example there is the redesign of health services, based on providing support to individuals, families and communities to deliver the range of health service that can be easily accommodated and provided in a self-care mode. This would almost certainly have a significant effect both on the efficiency (and thus on the overall cost of the provision of health) as well as on the effectiveness of the health care system by making service(s) much more widely available than currently to those unable to access services either because of cost or location.
The creation of a suitable context at the local level for such a transformation would require very extensive developments in the creation of a local supportive technology social infrastructure as for example, through the build out of existing community technology facilities through Community Access sites, local technology centres, and broadband management organizations, and so on. The introduction of these types of applications would require a very extensive capacity for innovation and adaptation at the community level as there would be a very broad range of new skills required and novel responses to traditional activities and services. The creation of “community innovation systems’ as the basis for the introduction of such strategies would appear to be the most effective approach. The effort and expense involved in such developments would almost certainly be warranted and cost justified given the increase in service delivery productivity and effectiveness which would result.

For these purposes there would be a significant up-front cost, but these costs would quickly be amortized over large numbers of users and the resulting savings for social support costs and including health support costs could be highly significant perhaps on the scale of the kinds of cost-savings achieved through the implementation of electronic platforms for commercial supply chains.

The requirement to implement these types of systems at the local level and including achieving the kinds of social, organizational and behavioural change/acceptance required for effective use would be substantial but should be seen as an element and an out-growth of the creation of an innovation capacity at the local level. The capacity to absorb and utilize technology and technology mediated information and services will be a central element in achieving the kinds of social efficiencies and increased program/service delivery effectiveness which is possible, but achieving the capacity to realize these types of innovation at the local could and would have highly significant benefit in terms of overall social costs and social well-being.

**Social Equity, Inclusion and the Digital Divide**

ICTs are the production tools of the Information Society. "Innovation” is one of the motors that are driving the use and application of ICTs and in this way driving the creation of value within the New Economy/Information Society. Clearly the primary sources of the innovations that are occurring within the Information Society are being largely driven by private sector research, development and commercial interest and competition. However, a large amount of the research and development on which this innovation is based comes from publicly supported research labs, universities, and ultimately is based on a background in the public domain of existing knowledge, culture and language.

An almost irrefutable argument can be made, therefore, that access to the resources and tools which enable innovation – the technology infrastructures, the learning and knowledge, the social frameworks – should be accessible to those without the backing of commercial resources so that they may also derive benefits from the application of ICTs toward the resolution of local and community concerns equally with commercial applications.

The notions and discussions around the “Digital Divide” have largely focussed on issues of “access” and particularly access to ICT tools and infrastructure. However, it could well be argued that the more serious “divide” is not between those with and without “access” but rather between those who have available the means to “innovate” and apply/effectively use ICTs in their local circumstances and linked to local issues and concerns, and those who do not. It could further be argued that those without effective access to those tools i.e. the means and the
opportunity to use those tools in productive and useful ways are relegated to being unable to participate in the fastest growing, best paid sectors of the economy.

Also, since ICTs are the learning tools of the Information Society, those without effective access to those tools i.e. the means and the opportunity to use those tools in support of learning are relegated to being unable to participate in the most intensive social learning processes and networks; and since ICTs are increasingly the decision-making tools of the Information Society those without effective access to those tools i.e. the means and the opportunity to use those tools in support of participation in decision making processes are relegated to being unable to be active citizens in contemporary democratic processes

**Innovation in Less Developed Countries**

It is notable that most of the discussions on Innovation and Economic Development have been concerned with already developed economies and industrial infrastructures. However, it is possible that the real opportunity for innovation and for having major impacts as a result of an innovation strategy is in enabling Less Developed Countries (LDCs) to leap-frog directly into a Knowledge Based Economy from a more traditional economic base.

The possibility of this type of “leap-frogging” is greatly increased because of the wide spread opportunity for acquiring a state of the art Information and Communications Infrastructure similar (equal) to the infrastructure which is enabling industrial innovation in more advanced countries and economies. In this case the introduction of a state of the art ICT infrastructure presents to national economies opportunities for the development of a national innovative capacity parallel in this respect at least with that which exists in its much more advanced competitors.

Similarly, the increasing mobility of individuals as students or faculty or researchers has meant that many LDCs may have access to highly qualified nationals or even expatriates who can provide some of the human capital necessary to support innovation at the national level. The challenge for these countries however, is that while there may be a limited capacity for innovation and the development of innovative firms at the national level and in the capital, this may be detached from the broader requirements for innovation and economic development in rural and non-capital urban areas, where the bulk of the population and particularly the poorer population are residing.

**Innovation and Public Internet Access (Local technology centres) in LDC’s**

It should be quite clear that creating a small pocket of world competitive firms in the capital city of a LDC which is completely detached from local requirements and concerns outside of this “pocket” may not be sustainable in the medium and longer term. The challenge for these LDCs is to find ways of enabling and supporting “innovation” and “innovative practices” beyond the national capital and beyond the relatively small group of those with already established links and knowledge of international conditions and opportunities and even of linking the “pocket” in the capital with innovation systems and processes at the local level which are driving local change and development and which in turn may be presenting interesting and useful challenges for the broader and elite innovation systems.

It is into this niche that the local technology centres and other institutional strategies for achieving local or community technology access can be placed and which it can be argued, give the local technology centres their overall challenge, responsibility and opportunity. One way to
approach this is by linking the national ICT and Development strategy (an implicit if not an explicit “Innovation” strategy) directly to the implementation of a network of community based ICT centres. This approach appears to be very uncommon although it would seem an appropriate means for more widely disseminating the opportunities for “innovation” to the local level and potentially to be the next step in ICT for Development strategies (and for finding ways of obtaining a return on investment in Local technology centres).

**Constraints on Local Innovation**

Local innovation doesn’t just happen! There are many constraints to innovation happening spontaneously at the local level.

There are social constraints that result from community norms based on local cultures that support existing practices and resist change. There is the fear of ridicule or “standing out” (sometimes called the “tall poppy phenomenon) where conformity itself becomes the norm and innovation of whatever kind is seen as a form of opposition to this conformity.

There are financial constraints to local innovation since innovation implies risk and that in turn replies have the spare resources to manage and survive risk. Many, if not most in poorer local communities don’t have access to “risk” resources that allow for experimentation and the possibility (even likelihood) of failure.

And there are psychological constraints against local innovation in that there is a comfort and a support in doing things as they have always been done, even if the result is poverty and a lack of opportunity for oneself and one’s children.

**Stimulating Innovation**

Innovation or the “creation of something new” is a result of certain conditions in the immediate environment:

- Business Intelligence--knowledge of developments elsewhere
- knowledge of best practices
- knowledge of opportunities
- diversity of people, ideas, information, perspectives
- openness to change and tolerance
- flexibility
- creativity

The challenge in the context of the local technology centres is how to create an environment or atmosphere in which these conditions may be found and the challenge overall for the local technology centres is how to create on a national level a system which supports and enables local innovation.

**The Institutional Context**

**National Level**

An overall approach is to look at Innovation and other aspects of the local technology centres at three levels, national (policy, budget, administration); network (horizontal peer to peer connections between the local technology centre working through regional focal points/network
hubs); and the local. The challenge is to develop an institutional framework which can support local innovation and to do that there needs to be enabling structures at all levels including the National (program) level, regional levels and local levels.

At the national level there must be (as there clearly is currently in only a few countries) recognition that local innovation is a necessary and constituent element in all aspects of national innovation. Thus for example, the national innovation strategy will be designed so that it cannot be “hi-jacked” by special interests for example to support exclusively high profile national research labs, university research or faculty/student recruitment programs, or contributions to private sector research initiatives. While each of these is important and even necessary in the context of national innovation, the direct contribution that each of these approaches makes to local innovation is slight at best. Also, the potential budget draw for these “national” projects is very large and in other cases globally they have had the political influence at the national level to crowd out investment in more locally focused innovation supports.

In some respects, the most useful role for the national level agencies in this context is to provide a voice for local innovation in the context of national budgets and national planning and priority setting and to create and support over the longer term, the other institutional and programmatic supports for local innovation which will be organizational focused at the regional and local levels.

Network (Regional) Level

Additionally, we see the individual local technology centres stimulated and linked technically, organizationally, and socially in such a way as to form a national inclusive and dispersed network of all the affiliated (affiliating) local technology centres. This network would for many purposes function so as to enable peer to peer relations, local technology centre to local technology centre and programs and resources should be made available to support this. It is out of these types of peer to peer relations that much of the requirement for localized business intelligence, diversity, access to a broad range of localized knowledge, and the need to create local partnerships, will come.

Attention will need to be paid to ensure that the network functions as an open and engaging environment and that some of the natural tendencies towards local to local competition (as for example, might through oversight be built into budgets) is avoided. The tendency towards co-operation should not be avoided, it is a great stimulant to participation and involvement but should rather be channeled towards longer term system affiliation, collaboration and “team spirit”.

Regional hubs might be established to work on a continuing basis to stimulate peer to peer interaction between individual local technology centres and most importantly to be continuously observing activities at the local centre and providing resources (human, financial, technical) as might be needed to stimulate and support innovation as might be required. Thus for example, the regional hub should be developing and implementing strategies for enabling brainstorming, directed idea development, focused play all as pre-conditions for the development locally of innovative ideas and strategies. They should be continuously scanning the national, regional and global business environment for ideas and opportunities that might be introduced locally. They should be in continuing contact with local centres and aware of ideas as they might emerge locally and ready with a variety of techniques to help support the development of the idea from its first tentative stage into a more fully developed enterprise concept.

Following on from this the regional hubs should have access to the range of skills and resources required to support the development of a business plan including financial resources as might be
available. As well the regional hub should be a place where those locally wishing to move forward in the use of the Net to support local development might go so as to extend their skills and range of influence and operation. In that sense, the hub should be relatively open to affiliation and participation by a variety of local agencies and individuals and have some modest resources available to support individuals or agencies as they might choose to develop their ideas. In most cases the amount of resources required is very modest, rather what is useful is by making resources available, the network is acknowledging to the individual and to his/her community that the idea is a “valued” one! These resources also reduce the risk to individuals in giving time and energy towards innovations that might prove unsuccessful.

In relation to that the regional hub should have access to more specialized skills technical and business development skills as well as maintaining an active network of connections to much more specialized expertise in areas of potential interest both nationally and internationally. In fact, one of the "core competencies" of the regional hubs should be precisely this type of national, regional and global networking and this would be one of the major contributions that they would make overall to the network and to individual centres as they develop.

Local Level

A prime responsibility of the regional hubs will be to provide on-going stimulation and support to innovation and the development of an innovative capacity at the local level. In doing this it will be required to find the means to enable within the local technology centres, the variety of elements that go into innovation and innovative capability.

Business Intelligence
Developing the capacity at the system level for routinely gathering information about developments and innovations that are happening globally that might be applied or have application through the local technology centre network. This process of environmental scanning could be set up as a routine function of the R&D facility. Associated with this would be a means for routinely disseminating this information through the entire network of centres and where suitable the undertaking of R&D on some of the ideas or innovations identified in this scanning process to "localize" these for application within country or the region.

Best Practices
Existing activities as linked to the local technology centre would be identified and then subject to a review of how these were conducted elsewhere with an identification of regional and international best practices. This could begin with the training programs which could be benchmarked against similar training programs in other jurisdictions internationally. Specifically in the case of the training program, rather than benchmarking the specific training, it might be preferable to benchmark the desired outcome of the training which is providing skills for technical jobs.

Opportunities Identification
In many cases people don’t know what they don’t know, so it is thus necessary to bring into awareness the nature of the opportunities that might be available. The presentation locally of "clinics" where technology opportunities, business opportunities using technology, techniques for using the technology are presented with examples and case studies should be developed. This goes beyond training to link training into the identification of new opportunities and ways of applying the training for local enterprise development.

Diversity
Having access to a wide range of knowledge and experience including cultural variety, a range of social contexts and networks, individuals and groups with substantial skills and experience in a number of commercial or other contexts, a wide access to a range of information sources and so on is a significant pre-condition for local innovation in that it provides those at the local level with a range of possible courses of action and responses to new opportunities and challenges. To a degree an ICT platform can provide access to some of this diversity by linking local communities into a diversity of information sources, knowledge bases and cultural and intellectual/scientific products and processes. In addition and perhaps of equal or greater importance the ICT platform can link local communities into broader social networks along lines of common interest or shared activities through which knowledge may be exchanged and created and by means of which a diverse range of formal and tacit knowledge can be directly accessed for application to local circumstances.

**Openness to Change and Tolerance**

Associated with access to diversity is the capacity to accept and respond to diversity including diversity of cultural forms, social and religious practices, social values and the simple diversity of the range of human expression which has emerged in all parts of the world. This openness to change and acceptance i.e. tolerance of diversity is in many aspects a pre-condition for innovation in that it is through this tolerance and acceptance comes the openness for experimentation and adaptation of new knowledge to existing circumstances which is the essence of innovation at the community level.

**Creativity**

“Creativity” in many respects may be understood as the capacity to innovate as found within individuals rather than groups. In that sense, creativity is a characteristic of individuals which incorporates many of those characteristics which we have above identified as being elements of “innovation”. Creativity in individuals involves the capacity to revise, reformulate, and re-pattern (and so on) existing contexts, materials, ideas and strategies. While some argue that creativity is an inborn mechanism which cannot be “taught”, others suggest that there are strategies, if not for building creativity within individuals, at least in provoking individuals and groups to develop new strategies and responses in relation to existing circumstances—an outcome of creativity, whatever the input sources. In any case, strategies for provoking creativity and “creative responses” to local circumstances should be undertaken.

**Conclusion: Innovation from the Bottom Up**

As previously defined, the basis of “innovation” includes among others characteristics:

- novelty
- experimentation
- ideas and imagination
- shifts in attitudes
- the development of new products
- the development of new processes

While in most instances, these characteristics/attributes have been examined and promoted in the context of national systems and enterprises, there is in principal no reason why they could not (with much more modest expectations) be equally understood as being possible and desirable in local systems and local enterprises. While the “novelty” or “experimentation” being worked upon at the local level, may simply be “novel” or “experimental” for this community or for this local region, nevertheless it does represent “innovation” and equally it is a way of identifying and developing enterprise and service opportunities for that locale and that region.
Similarly, creating an atmosphere which enables the development locally of ideas and imaginative exploration stimulated by technological opportunities or by an observation of technologically (ICT) mediated experiences, best practices and innovations from elsewhere presents a powerful platform for local “innovation” and development. Among other areas, it stimulates and supports the development of attitudes toward technology, and economic and social opportunity which is the pre-condition for local innovation but even more importantly is a necessary constituent element and support for a shift in national attitudes and cultural expectations concerning economic and social innovation.

The experience in the developed countries has been that it is precisely these attitudes and cultural predispositions toward innovation which are the necessary background for the development of a culture out of which new products and services may emerge and find acceptance in local markets preliminary to becoming competitive in the global or regional marketplace. Thus finding a method for stimulating similar kinds of changes at the local level in LDC's and elsewhere and particularly in finding a means for having these changes widely dispersed throughout the local areas is potentially of very great significance in achieving a sustainable system of “innovation” at the national level and this is precisely the niche that the local technology centre can be seen as potentially occupying in the national and local Knowledge Ecology.

The efforts at enabling innovation at the local level through local technology centres then can be seen as equal partners in the creation of the national innovation system (IS) and strategies to support the national system should thus be directed equally to support the IS at the local levels. In this context the support for national R&D would find its counterpart in support for local R&D or at least R&D which is regionally focused and concerned with creating and supporting the bringing into operation of locally and regionally innovative models, products and services.

In this context as well, the recruitment, placement and creation of appropriate structures of incentives for Highly Qualified Personnel at the national level should be seen as having a necessary counterpart at the local level through for example, the local technology Managers and Trainers.

Also, the creation and on-going public support for institutions such as Universities, Colleges, Research Labs and so on which provide an on-going Knowledge and Research platform for national level innovation should be replicated initially at least at the regional level as supports for local innovation through local technology centres. This could be done through the creation of regional R&D centres linking into regional networks of local technology centres and perhaps where suitable linking into regionally focused labs/centres in regional Universities or Colleges.

As well, the creation of innovation supporting networks linking highly qualified personnel (HQP), R&D and innovative enterprises at the national level should equally be seen as having a very useful counterpart at the local/regional level in linking HQP, R&D and innovative enterprises locally and regionally.

In addition, as the analysis and understanding of strategies of support for innovation emerge globally (there is an enormous amount of research activity being undertaken in this area at the moment), it should be the responsibility of the Agency guiding the development of the local centres to find appropriate means for adapting these (generally) nationally focused strategies to local and regional requirements in the LDC or elsewhere.

Endnotes
The discussion which follows has been significantly enhanced and informed by the multiple contributions and multiple contributors to on-going discussions on the topic of "ICTs and Local Innovation" on the two email lists, "communityinformatics" and "CIResearchers" both @vancouvercommunity.net. While the influences are many I haven't set out to specifically summarize this discussion but I would strongly urge the reader to examine this discussion in the archives of the two e-lists for the period Nov.'03 to Jan. 04 at
http://vancouvercommunity.net/lists/arch/communityinformatics and
http://vancouvercommunity.net/lists/arch/ciresearchers

http://www.hyperdictionary.com/dictionary/innovation
http://canadianeconomy.gc.ca/english/economy/innovation.html
http://www.thefreedictionary.com/innovation
http://vancouvercommunity.net/lists/arch/ciresearchers
http://www.hyperdictionary.com/dictionary/innovation

http://www.innovationstrategy.gc.ca/gol/innovation/interface.nsf/vSSGBasic/in02424e.htm#industry

" ix cf. for example Van Lieshout, Marc, Egyedi, Tineke M. & Bijker, Wiebe E. editors. Social learning technologies. The
"x Cf. for example the work on Communities of Practice by Etienne Wenger and others; see E. Wenger, Communities of
xi Adapted from M. Gurstein, "A Community Innovation System: Research and Development in a Remote and Rural
Community", in D. Wolfe and A. Holbrook (Eds.), Knowledge, Clusters and Regional Innovation Systems, Queen's-McGill
University Press, 2002
xii For a more complete discussion of Innovation systems in this context see M. Gurstein, (2002) op.cit.
xiii For a more extensive discussion of these points see M. Gurstein (2002) op.cit.
Community Networks and Strategies for Flexible Networking" in Community Informatics: A Social Agenda for Technology,
xv M. Gurstein, Community Informatics: Current Status and Future Prospects - Some Thoughts, Community Technology
xvi M. Gurstein, "Effective Use: A Community Informatics Strategy Beyond the Digital Divide", First Monday, December
xvii M. Gurstein, "Community Learning, Community Economic Development and the New Economy", a consulting report for
Human Resources Development Canada
xviii M. Gurstein, "Effective Use...:" op.cit.
xix op.cit