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Improving innovation in economic clusters. Spurring innovation in economic clusters by making improved investment decisions

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This White Paper explores some of the basic concepts of innovation[1] management when applied to investment decisions for economic clusters.

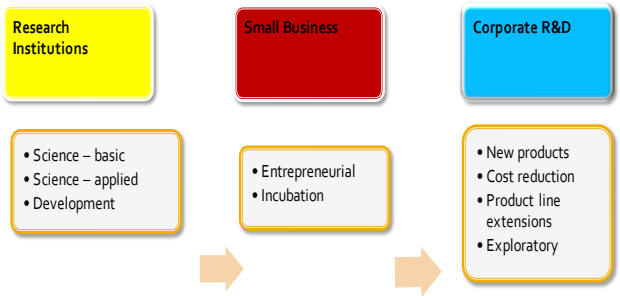
The purpose of this White Paper is to explore the desirability of adopting a uniform set of definitions and a protocol with the intent of improving the ability of investment decision makers to both assess strategically and communicate information on innovative initiatives within an economic cluster.

Executive overview

Does your region (economic cluster) have the appropriate range of innovative technologies and depth to grow and sustain long-term economic growth? How would you know if this was the case or not?

Increasingly, with the advent of;

- international economic growth,
- the global dispersion of research and development efforts,
- increasing technology complexity and at the same time, and
- the relatedness of technologies,



Professional support.

there is a need to provide both public and private stakeholders with succinct and meaningful information on investments in innovation. Researchers and innovators in general need to know

[1] Innovation comprises the creative process including the development of new sciences, ideas for products, product extensions, services, and business models.

more about initiatives which are taking place globally in order to link into relevant creative centres of excellence. Public and government stakeholders, as major supporters of research institutions, need to be better informed so that priorities impacting investment decisions can be based on reliable and clear information.

As private sector risk taking and corporate interest in 'university-like' laboratories declines[2], public sources of funding, an essential part of any economic development strategy, will become an even more important part of the innovation process. Those who manage investment flows at the 'cluster' or regional level require better information. An improved protocol for assessing and communicating the work of economic clusters is needed.

Terms such as; 'world class', 'unique research capability', 'leading edge technologies', are often used to describe innovative initiatives. These terms often tend to fall short of their promotion due to the absence of a full understanding of the global effort in a specific technology initiative. There is also a need to close the traditional communications gap between public and private sector R&D initiatives. Information transparency and effective communications are a major part of the solution.

Corporations, totally dependent upon engaging in leading edge technologies for survival and growth, have often led the way on how best to communicate their investments in technology to their stakeholders; i.e. shareholders, customers, employees, partners and collaborators. Innovative companies such as 3M and DSM are but two examples.

This White Paper explores some of the ideas regarding the use of a common nomenclature which could improve the understanding of work within economic clusters and, at the same time, strengthen the ability to assess the robustness of the cluster's innovation initiatives.

The White Paper concludes with a list of questions relating to investment decisions in economic clusters.

Economic clusters: definition

The term "economic cluster" at its most basic level[3] refers to a group of firms that profit from their association with one another. These firms share certain types of inputs or outputs (e.g., raw materials, labor force, or customers), and within a cluster, some firms will typically have close purchasing and sales links while others may be direct competitors. Economic clusters have risen to prominence as a focus of economic development efforts because of the perception that they

[2] Business Week; January 13th, 2010.
[3] University of Washington, Evans School of Public Affairs, Community Vitality Project.

can produce greater returns on investment in terms of jobs created and economic growth than less-targeted efforts.

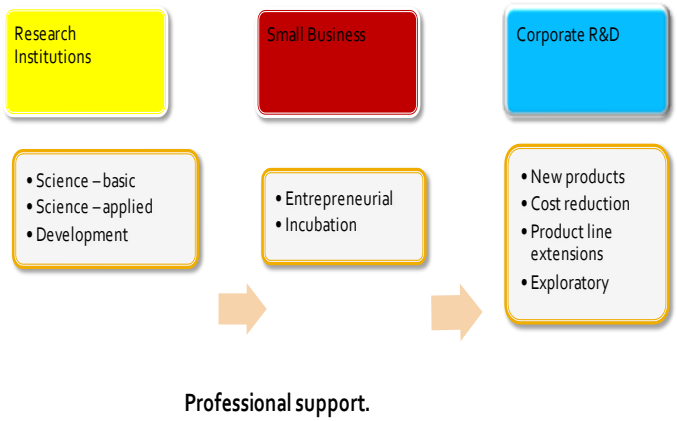
Quantifying the relationships that define a cluster has made it difficult to pinpoint their existence, let alone assess their benefits. While there is significant anecdotal support for the efficacy of clusters as economic development engines, their generalized benefits are still hotly contested. None-the-less their economic importance is an important issue in economic development.

A somewhat different approach to the work within an economic cluster has been referred to by Richard Florida. He defines 'learning regions'[4]; "as collectors and repositories of knowledge and ideas, and [that] provide an underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning".

Whichever the definition, the work within an economic cluster or learning region has become an important part of economic development thinking. What is also clear is that there is nothing static about this work and change, even over the short term, is the rule. The inevitable trend to globalization and the rapidity of change makes a strong case for improving protocols for communication within and amongst regionally dispersed clusters.

Innovative initiatives within economic clusters

A comprehensive depiction of the activities within an economic cluster provides an insight into whether the cluster – and the economic region which is dependent upon the cluster – will be successful over the longer term. Typically, and based on the economic maturity of the cluster, activities may range from basic science through to the production of products or services along with professional support.



With the current emphasis by the private sector on the need for a short-term profit perspective, corporate research becomes more closely related to new products and product extensions. Science-based creativity, taking place in

[4] Knowledge Clusters and Regional Innovation, edited by Holbrook and Wolfe, p. 16.

research institutions mandated by the use of publically funding, and with a longer-term planning horizon, can be viewed as a major source of 'breakthroughs' and new sciences which, over time, will lead to new products/services. There is, as a consequence, a need to effectively communicate science/technology-based information among research institutions and corporations within an economic cluster and to facilitate their global interaction with organizations with similar interests and investment initiatives.

Relationships between the public and private sector vary by nation, region and industry

The World Economic Forum Competitiveness Report 2009 – 2010 provides insight into aspects of innovation. A comparison amongst three leading nations provides a picture of the varying states of innovation, by country, and some of the practices which impact innovation.

12th pillar: Innovation	U.S.A.	Japan	Canada
12.01 Capacity for innovation	6	1	20
12.02 Quality of scientific research institutions	2	15	11
12.03 Company spending on R&D	5	2	22
12.04 University-industry collaboration in R&D	1	20	9
12.05 Government. procurement of advanced tech products	4	49	25
12.06 Availability of scientists and engineers	5	2	6
12.07 Utility patents*	3	2	10

Item 12.04, the collaboration between universities and the private sector, shows that Canada is rated below the U.S. but ahead of Japan. Based on research from the mid 1980's[5] on the subject of university-industry collaboration, the U.S., at that time, was disadvantaged when compared with Japan but now exceeds both Japan and Canada. This is especially relevant as R&D spending in the private sector seems in decline. Company spending on R&D is highest in Japan and lowest [of the three countries] in Canada, and yet the quality of scientific research institutions in Japan is lowest. The availability of scientists and engineers seems little different amongst the countries. The U.S. government sector, primarily at the federal level, through various defence, space, and infrastructure initiatives, invests highly in advanced technical programs.

[5] Arthur D Little study on Global Innovative Companies. See web site; www.corporateinnovationonline.com for more information.

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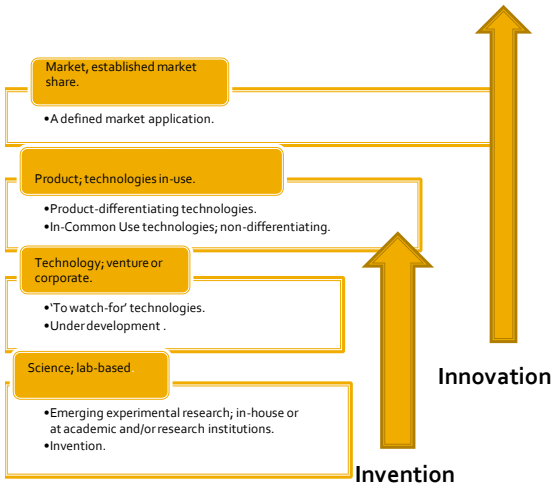
The success of a region, a cluster, is heavily dependent upon the effectiveness of each of these contributions to innovation. Invention, in the sense of 'breakthroughs', will likely come mainly from research institutions whereas the adoption and development of technology will be more closely related to corporate action. Job creation, along with the desired creation of high-valued jobs, is ultimately due to corporate decisions within the region while serving a global, or out-of-region, market.



We can define four stages of technology development; migrating from the lab into commercial product applications.

- **In 'Common Use Technologies':** These technologies are essential in order to be in and to remain in the business; but are non-differentiating as a competitive factor.
- **Current 'Differentiating Technologies':** Important for the product at this moment in time and can be used to differentiate one's own product from the competition.
- **To 'Watch For Technologies':** those under development by some, but not all of the competition, but their introduction could have significant impact on the industry. Keeping a 'watching brief' is important.
- **'Experimental or Emerging Technologies':** The early stage of broadly-based research but whose out-of-laboratory success and competitive impact is mostly unknown.

A protocol which enhances the ability of stakeholders to assess and make the appropriate investment decisions regarding the structure of the economic cluster will better provide the 'value-for-money' results desired. Such a protocol also provides the basis for communicating the work of the cluster and increasing its global reach.

Both private and public sector involvement is required, with research institutions being well supported by public funds, and the private sector, whether involved in the research or not, poised to capitalize on new discoveries. While incremental innovation is not to be downgraded, it is clear that real opportunity derives from the economic cluster having, within itself, a full range of innovative activities and the ability to realize the benefits of both 'breakthroughs' and incremental innovation.

Substance and variety in the economic cluster

Technology is many-faceted and permeates almost all businesses activities; research, development, engineering, automation, information systems, materials, products, processes, applications, systems, and operations. The terms 'technology', 'innovation', basic and applied science, are all subject of wide interpretation. What is critical to investment decision making is to understand the strength, substance, and strategic position of the work within an economic cluster. For example, breakthroughs are unlikely to happen if activity excludes the advancement of technology in new areas.

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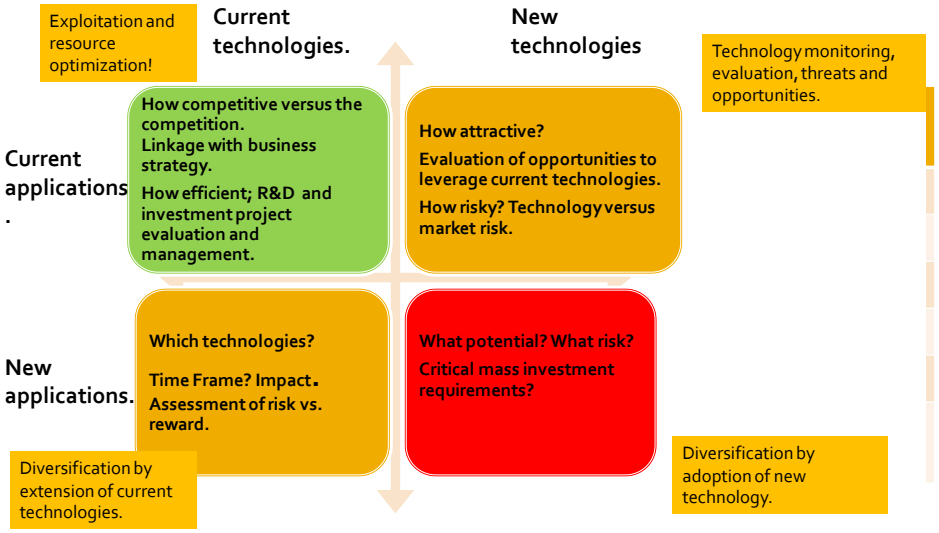
The content of any cluster should therefore contain not only contain a host of current technologies – as evidence of past success – but also have a presence in new technologies for new potential applications.



Ideally, the mix of technological programs would be undertaken by both private and public investment initiatives. Full and transparent information from all sources is the key to ensuring that the most optimized decisions are taken.

Common nomenclature

Every product comprises a number of distinct and identifiable technologies. Technologies progress from the lab through several stages, as illustrated above, and eventually find their final place in a successful product. Over time, however, what was once a unique technology becomes a commodity since the technology loses its ability to provide differentiation from competitor's products or services. Each technology occupies a position within a life cycle and a stage of industry maturity. Competitors (other clusters, corporations) also have different relative strengths in different technologies.

Economic clusters should ensure that their technology investments are within the embryonic or growth phases of the life cycle. At the same time there is a need to understand whether their investments are likely to result in at least a 'favourable' if not in the 'strong' or 'dominant' position, relative to other initiatives globally.

For economic clusters, it is extremely important that economic clusters contain both research-based and product application initiatives so that, over time, the cluster will continue to develop.

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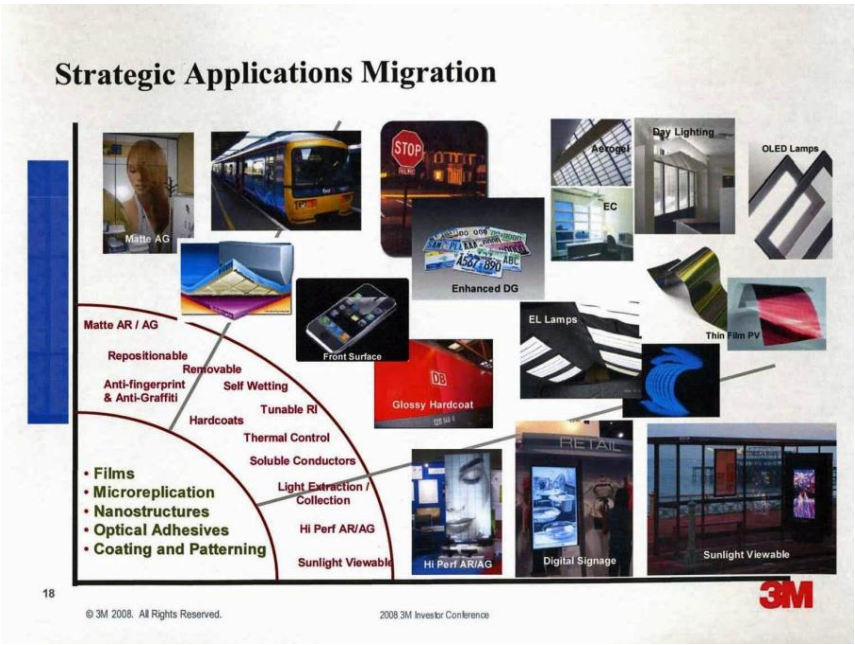
Technology investment strategies should be driven by technological and business conditions rather than purely by management ambitions or a ‘spin’ which, in time, may prove to have no substance.

A 3-pronged definition of a technology seems required for making informed investment decisions. With only a one or two-dimensional definition, there is too much ‘wiggle’ room and vagueness attached to the opportunity and little basis for ultimately assessing the value received from investment. The three components of the definition can be, as an example, i.e. a ‘science’ for a ‘product’ aimed at a ‘market’. This definition provides for an assessment of the state – i.e. the life cycle of the technology; embryonic, growth, mature, or aging? The other axis provides an assessment of the relative current strength of the technology when compared to competitive initiatives; i.e. is the technology dominant, strong, favourable, tenable, or weak? Along with knowledge of the growth trends in the market, the information provides a means of assessing the investment decision in strategic terms. A characterization of the relative strength of the technology, when compared to similar technology initiatives in other regions, provides the basis for a strategic assessment as well as the ability to measure progress.

Corporate examples of effective communication of technology initiatives

Economic clusters are often the outgrowth of decades of development. Starting with an entrepreneurial initiative, most often linked to a natural advantage in the region and subsequent spin offs from one early successful initiative, create a mix of competition and cooperation which builds on its own development.



3M is a company which clearly communicates its technological priorities and provides the observer with a reasonably clear indication of the direction its technology initiatives are taking without, obviously, giving away ‘state secrets’.

3M makes use of a range of visual presentations to illustrate the focus of its technology investments;

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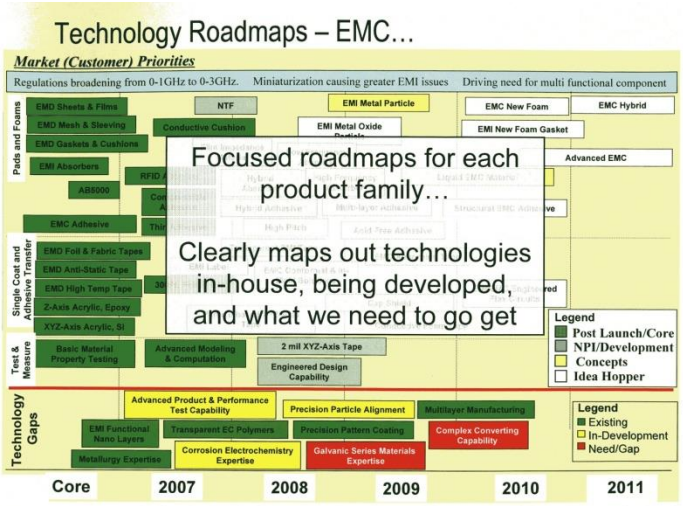
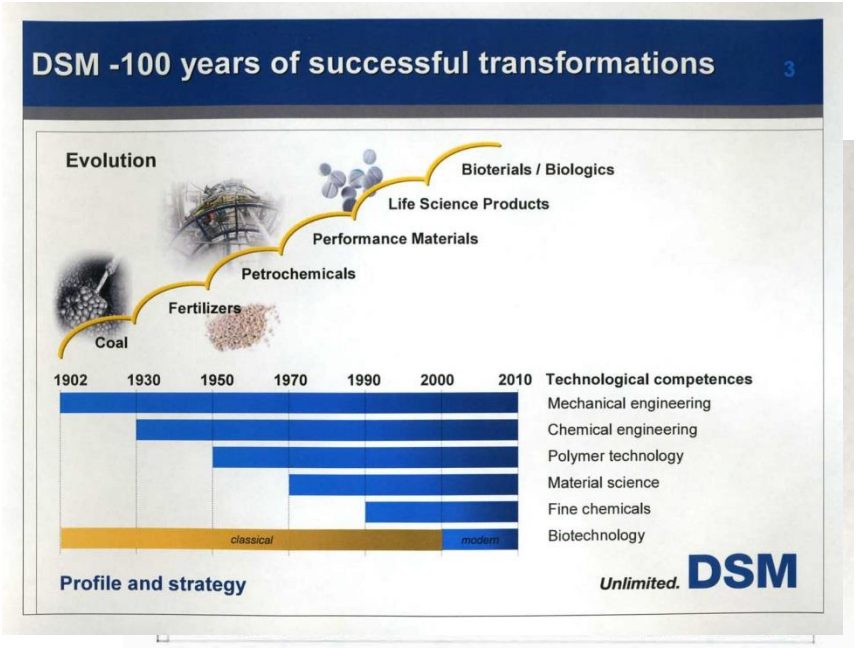
- the main areas of science-based interest,
- the applications which are in sight, as well as
- a targeted market area.

Three prongs to the definition provide stakeholders, in this case shareholders, with a clear picture of where investment initiatives are placed. 3M also makes use of multi-year technological roadmaps.



DSM (founded in 1902), is a Netherlands-based company, founded in 1902, which has over a century transformed itself from a state-owned mining operation into a specialty company. DSM, which emphasizes the uniqueness of its portfolio of market and technological interests, places emphasis on the interaction amongst its various innovative investments.



Coincidentally, both 3M and DSM started as mining companies. Both companies are examples of organizations which emphasize the importance of innovation[6] in their stakeholder material.

[6] For more information on 3M, DSM, and other highly innovative companies, visit www.corporateinnovationonline.com.

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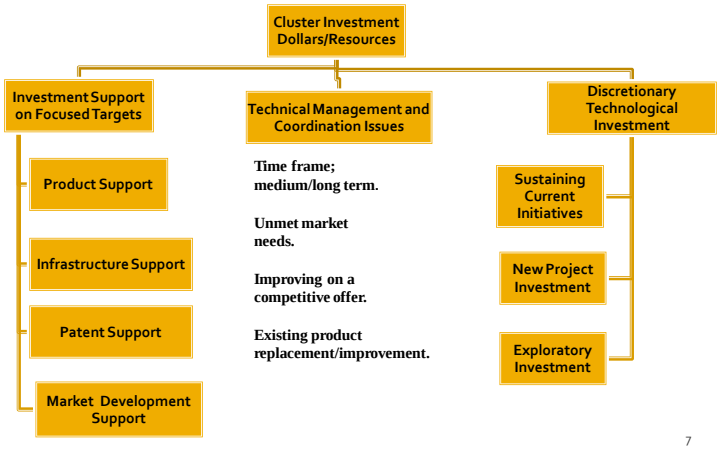
Investment questions which need to be addressed

Within a given cluster, there is only so much funding available. How does one optimize the investment to achieve maximum value over the medium to long term? Is the cluster strategically well positioned for future growth?



Statistics on R&D spending and on innovative initiatives often make little or no mention of the capital and operating spending on an infrastructure so necessary for facilitating an environment for new ideas.

The starting point for addressing investment questions is to agree on a reasonably **uniform set of definitions.**

- Are the terms in use well understood?
- Can one differentiate, for example, among spending on; basic research, applied research, development and application?
- What are the terms to use?

Further to the issue of definitions, and with the intent of identifying and dealing with **barriers to innovation**, questions arise regarding issue of collaboration both within and without the economic cluster.

- Are their barriers to collaboration?
- Are there barriers between; the science and the technology, the technology and the product?
- Are there overlapping investments in technology which are counter- productive – and may not contribute to a sense of cooperation and beneficial competition for grants and related sources of funding?
- What is the mechanism for sharing information amongst cluster participants?
- How does ‘collaboration’ work in a nascent cluster?

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Are **investment goals** well defined?

- If the technology initiatives are, over time, successful, what are the prospects for regional business investment and job growth?
- Will the product of the initiative simply result in off-shore investment and job growth outside the economic cluster, the region, or the nation which provided the risk funding in the first place?
- Is the technological content sufficiently robust to deliver needed investment, job growth, and sustainable development?

Are the appropriate **organizational and management** issues addressed?

- Are decisions regarding investment in technology high up in the community hierarchy?
- Are these national as well as regional and local issues?
- How are programs at the national, provincial and regional level coordinated? Are they?
- Is technology planning built into, or integrated with, the community/cluster/regional/national plan?
- Are the appropriate resources in place?
- Where does the accountability for expenditures and success reside?

Is the economic cluster **strategically** well positioned?

- How do you identify businesses vulnerable to new technologies or technologies which may have a favourable or negative impact?
- Is there sufficient risk built into the mix of initiatives or is a less risky, more conservative, less likely to achieve breakthroughs, the option of choice?
- Is there a regular overview or strategic assessment of neo-cluster efforts?

What are the **measures of success** of an economic cluster?

- R&D expense as a percent of sales for companies in the economic cluster?
- Patents applied for?
- Jobs [high value] created?
- Businesses started or sustained?

Conclusions

The work within any economic cluster is increasingly complex. Researchers and investment decision makers would benefit from a greater transparency in the communication of this important work so fundamental to growth in the cluster.

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