

SYSTEMIC DEVELOPMENT AND IMPLEMENTATION OF INNOVATION: TOWARDS 'VISION 2020'

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## INTRODUCTION

Visions, innovations and inventions are cornerstones to the development of human society. To take root and flourish they need to be accepted and adopted by a critical mass of stakeholders among individuals, communities, businesses, institutions and government.

To result in equitable, sustainable development they need to be supported and supplemented by ample, relevant, unfettered and timely knowledge, in a form easily applied by the end-users.

The social and bureaucratic context of innovation is often not ready for change. The resistance met in a village, a corporation, or public institution may have cultural, social, economic, political or multiple causes.

To secure friendly acceptance is a major challenge unless innovation becomes part of the predominant culture. In many cases success can be achieved by ethically rewarding constructive support of new initiatives for the common good.

The Malaysian 'Vision 2020' to be a fully developed country by the year 2020, economically, politically, socially, spiritually, psychologically and culturally, is truly among the grandest and most encompassing of visions for any country, including all of those who call themselves developed today.

The remarkable USA vision and objective formulated in 1961, to put a man on the moon and bring him safely back again to earth before the end of the decade, mainly involved the purposeful and innovative mustering of a few sectors of American society. The project primarily involved academia, high-tech industries and the military. An overall national approach was not necessary.

For any nation to be well on its way towards the goal stated by Vision 2020, in my opinion it would need to adopt a systemic approach to development and

implementation of innovation. This should include all of its major components: population, systems, resources, the environment and a host of other major factors of influence. For such an ambitious nation it is not enough to involve only the most obvious sectors. It needs to embrace a culture of innovation for the common good.

In the following I shall refer to personal experiences from decades of living with inventions, innovations, and development around the world. I think that direct accounts from real life often make it easier to emphasize points than theoretical statements. In order to make this paper as distinct as possible I will refer to three earlier papers of mine that should be considered as integral parts of this presentation.

## **INNOVATION - INVENTIONS - TECHNOLOGY**

Innovation is at the core of all socio-economic development. For many it is most frequently associated with technological inventions. Yet social, economic, educational, cultural, organizational and legislative innovation is certainly of no less importance to the development of society.

Many believe that important inventions can only be conceived in corporations with very substantial R&D budgets. On the contrary, many if not a majority of major inventions have actually come into existence in very modest environments such as kitchens, basements, or shacks, on shoestring budgets (1). I think this fact contains a very important message for developing countries.

At the same time it should be realized that many inventions require very high development costs, which is a major reason why, especially in high-tech sectors many innovative upstart companies are taken over by large corporations with the capital necessary for development, production and marketing.

Another key reason is the typical lack of ability of most major corporations to foster breakthrough inventions. It is said that major R&D organizations are likely to be minor sources of major inventions and major sources of 'improvement' inventions. I think that this statement illustrates well the situation in many industries.

Many people - in developing as well as developed countries - are convinced that natural ability to innovate and invent is intrinsic to a very small percentage of the population at large. In my experience that is not so. Many more people than generally assumed have the potential for making innovations and inventions (1, 2). They just did not get the chance to develop their hidden skills. It is like playing an instrument or climbing a mountain. Those who never touched an instrument or encountered a mountain would not ever come to know. And even the best would have to work hard to develop their innate talents.

Important inventions can offer exceptional new possibilities but can also cause disruption far beyond their original field. And in many fields even very recent

inventions risk being quickly overtaken by still newer and better ones, or even sometimes old ones, which may come to be used in new ways.

The following for me classical example from the dairy industry illustrates such a situation. For decades manufacturers had competed intensely about who could invent the most ingenious device for getting butter out of churns and move it further on in the process. A great many contraptions - including several versions of screw conveyors - were invented, duly patented, and in use, but none of them properly solved the problem of how to easily and regularly clean the rather complicated equipment from the sticky butter.

Then suddenly occurred an elegant solution, which all manufacturers adopted without hesitation: to attach external vibrators to churns and other equipment. A few seconds of vibration and all of the butter was out of a churn and further on in the process without any visible trace.

The amusing part of the story is that the new solution could not be patented - because it was based on common knowledge. Had a construction worker, used to vibrating concrete, passed by years earlier and learned of the problem, he would very likely just have turned around and said casually: why don't you just fix vibrators to the outside of the equipment?!

One of the lessons from this story is that incessant curiosity, association of ideas, and ample occasion to learn about methods and technologies used in fields far from one's own are most important ingredients during the processes of invention and innovation.

Today information technology and other industries are filled with similarly scary examples of almost instantaneous obsolescence. The need for reliable and up-to-date knowledge, curiosity, foresight and even wisdom is boundless. Adaptability becomes imperative.

Incidentally, have you ever noticed that several outstanding inventors did not do well within the frameworks of traditional school systems. Others with the highest formal education sometimes jokingly claim that that they have been able to make their exceptional inventions and innovations in spite of their high formal education.

There is something to it. To know only the chartered ways of learning and doing things - even inventions and innovations, does tend to leave vast areas of possibilities untouched. From my own personal experience I can tell you that a number of successful international corporations with large R&D departments repeatedly sent members of their senior R&D staff (all highly educated) to courses for individual independent inventors and entrepreneur-inventors in order to, in their words, 'open up the tunnel vision of their R&D people'.

Another illustration from real life is as follows: a countryman of mine with only rudimentary schooling made an invention which until then had been declared scientifically and technically impossible by some of the best existing technical universities. It was a process for deep-drawing stainless steel sheets to produce among others kitchen sinks.

Since that technological breakthrough there has probably been produced tens of millions of kitchen sinks based on his invention. When asked how he did it, invariably he answered with a wry smile: 'Well, I just did it. Nobody had told me that it was impossible'...

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I want now to call attention to a special problem, which few people think of, to its full extent: What may be state-of-the-art innovation and technology in one country and environment does not need to be state-of-the-art- in another, even if the general level of technological development may be the same in the two countries.

Products, processes and systems are obviously not just the results of innovative minds free of constraints. Usually one way or another they also have built into them the current laws, technical norms and standards, available services, price and tax structure, incentives/levies, agreements on the labor market, typical ergonomic measures, social and cultural factors, climatic conditions and other specific traits of that particular country and place of origin.

So, in many cases when used outside of the place of origin it is quite possible that the function will be less satisfactory than in the place of origin because of such mostly invisible features.

## **KNOWLEDGE AND LEARNING**

Proven, timely, appropriate and adequate information and knowledge is of paramount importance to every individual, community, enterprise or nation wishing to progress. New knowledge is created continuously everywhere. Some of it may only have ad hoc or very localized relevance but most knowledge has importance far beyond time and place of origin. At the same time our environment of information and knowledge is immensely polluted, much more, in its own way of course, than our natural environment.

This phenomenon is so much the more critical for developing countries, communities and people vitally dependent upon the quality and adequacy of the knowledge available to them.

Many very valuable innovations in the form of ideas, designs, models, programs and processes, etc., and that include millions of patents which are not any more actively maintained, are available for free use. Enormous amounts of information is today available via the Internet. However, much of it if not the vast majority need reliable verification, and much if not most information of that kind is not yet available in a form and language compatible with the needs of most potential end-users in developing countries.

One way sector information could be organized is illustrated in my paper 'Development of the Indigenous Construction Sector with Special Reference to Plant, Equipment and Tools' (3).

I find it very regrettable when educational institutions are not used to their maximum potential. Some time ago I visited a school in a small town far from the capital of a country south of Sahara. The town had no electricity, but the school was new, and already an out of town contractor and his crew were expanding the school buildings.

I visited some of the classes during hours, and the very clean and keen children demonstrated their skills to me. The faces of the teachers were beaming. The children read for me, they recited, and they made calculus. I asked the teachers whether they profited from the occasion that construction was going on around them to teach the children about tools, materials, planning and design. 'Of course not', was the reply. That was certainly not their line and assignment.

I became very depressed. During my lengthy drive back to the capital I thought of the future of these children and that of their community. Next day I bought a small box full of tools, some of each, and send it to the children. In the covering letter I thanked them for the wonderful occasion I had had the day before witnessing how well they were doing in school. In return I was sending those tools asking the

children to request the teachers to somehow help them to learn to use them, so that in the future the children could participate in building other buildings and houses in their town.

Around the same period when occasionally I taught invention and innovation to professionals, I had the opportunity through two semesters (as a volunteer) to teach fourth graders in a Danish municipal school 'how to make inventions'. It was a most interesting experience. Within that school year the 'constructive-creative' abilities of the children as well as their self-confidence developed greatly, and I too developed in the process (2).

Subsequently organizations of school principals and of schoolteachers, as well as the Danish Ministry of Education became interested and the Ministry financed me in developing and running courses in innovation for school principals and teachers. The principals wanted tools to apply in their administration and further development of the schools. The teachers wanted to learn how to teach the subject.

To my knowledge no major school system anywhere in the world has yet been designed specifically to develop pupils' innate capacity for invention and constructive innovation. This may cause amazement since the mental and practical processes are by now quite well understood. The world is full of problems and challenges that require innovative thinking and action. This should be a great challenge to visionary governments in developing countries.

In fact, I believe that many developing countries may have a substantially better background for adopting this new line within their educational system than more 'settled' countries, once they see how such innovative educational initiatives can help underpin and accelerate the processes of development.

Finally a note on the curricula at large. As indicated above, I believe that there may be a need to take an 'innovative look' at many of the subjects already taught. Additionally I see a need to upgrade the teaching and training of the pupils in how to function better in their local environment. As an example I could mention that easily learned knowledge about locally occurring soils and water, conditions of the ground, and the weather could probably help reduce the occurrences and magnitude of localized weather and ground related disasters, including flooding and earthquakes.

Simultaneously, most of that same knowledge could be useful in connection with construction, public works, sanitation and agriculture. Such knowledge ought to be part of the local 'public goods'. Not just reserved for being delivered piecemeal from the outside.

## **GOVERNANCE**

An integrated national program of innovation would necessitate that government and many public and private sector institutions and organizations earnestly commit to and identify with the program. I am fully aware that this will not be so easy to accomplish. But it is possible to build innovation-promoting mechanisms into almost any organization.

A famous example of how such a mechanism was not in place at the right time in several large organizations is the story of Xerography, the dry-copying process that fundamentally changed office procedures the world over. It gave The Xerox Company a virtual monopoly on office copying for many years until the key patent expired and the world was inundated by the products of competing corporations using that same technology.

Who invented it? Employees of Xerox? No! Employees of a major player in the photocopying business taken over by Xerox? No again. The inventor was a certain Mr. Chester Carlson, who developed his invention largely in his kitchen... For years he tried in vain to sell the invention to more than twenty of the largest corporations in the office machinery business including IBM, Kodak, General Electric and RCA. None were interested. They did not have the right procedure (and possibly spirit) to grasp the unique occasion right in front of them.

Another case started in the late 1980s in Denmark when I initiated the involvement and support of several government ministries as well as the European Union in a pilot eco-community. Most of the ministries showed exceptional flexibility, and the community was started up around ten years ago in harmony with the native community in the area.

Unfortunately one of the ministries, though seemingly not negative towards the project as such, was not ready to practice a lawful but liberal interpretation of one of

its regulations in order to secure full synchronization of the various constituents of the scheme. That delayed important parts of the project for several years. Later on the eco-village went on to obtain the highest recognition including a European 1<sup>st</sup> prize for planning.

Yet another example from firsthand experience is a most innovative Demonstration Operation Project for the Development and Dissemination of Information and Consultancy Tools in the Andean Pact Countries in the Field of Food Industry. Two UN Organizations and the Andean Pact Secretariat were sponsoring the project, and the budget was approved. The project did never come off the ground because of some totally unrelated internal happenings within one of the organizations.

Legislation, and technical standards and norms, is of course an area of great importance. It is not particularly difficult to develop legislation, which support technical innovation in the private sector, at universities and other institutions. Also, it is quite straightforward to establish by law institutions specially dedicated to the promotion of innovation. It is much more challenging to adjust existing laws and regulations to make room for yet unknown innovations.

Possibly the biggest challenge though is to subject legislation as such to innovation, both with regard to form: to make laws easy to understand for those it concerns, including lay-people of course, and with regard to the way people are informed of their rights and duties. And also to insure that legislators and officials truly understand the full implications of the laws and regulations they create, and that there are never internal or external inconsistencies. To secure through each and every law that if literal application of a law or regulation in certain specific circumstances would lead to absurd and clearly unintended consequences, then it is the intent behind the law, not the letter, which overrides the other.

Permit me to mention an example of an approach within this particular field that I developed years ago. Among others I made graphic symbols to illustrate different procedures (about thirty relating to water alone) to be used in the public administration of the first comprehensive Danish law on the protection of the environment. Practically all professionally affected parties including all municipalities of the country used the symbols for years. I made 'crash courses' in using these and a number of other new tools, and all of the municipalities in the country and hundreds of consultants and others learned within a few weeks how to use these new tools.

## COMMUNITIES

Low-income rural and urban communities could benefit substantially from a number of innovative initiatives. If reliable, reasonably priced fixed-wire Internet connections cannot be established, a combination of satellite and terrestrial-wireless based Internet connections could greatly facilitate easy access to locally relevant knowledge and related information.

As an example dynamic, intelligent non-specialist entrepreneurs could have access to sufficient guidance and know-how in an appropriate form and language, that they would be able to carry through basic feasibility study, planning, establishing and running small-scale enterprises, with an absolute minimum of outside expert assistance.

To illustrate more precisely what I mean I like to tell you an eye-opening experience I had many years back in a developing country. I was negotiating the purchase of a second hand power station for use in connection with a hospital. In came a man from a small very remote community. He wanted to buy a cable. 'What kind of cable?', asked the salesperson. 'An electric cable', was the reply. 'What for?' 'We want electricity', was the reply. 'And how do you get electricity when you have such a cable?', asked the salesperson. Well, it transpired that some kilometers from the community passed a high-tension transmission line. So, with a cable they could get electricity into the community...

'How big should be the cable?', asked the salesperson. After some palaver, the visitor indicated the cross section of the cable with his fingers, stretching his hand towards the salesman. And thus the conversation went on for a while.

'How many households are there in your community, I asked? What about school and marketplace, and workshops? And after some further questions, using rules of thumb and basic formulas I was able to make a very rough estimate of the needed generating capacity of an initial power supply for the community. Probably within the range of +/- 35%.

The man from the community was an intelligent and trusted representative of his community. He, and his fellow villagers just had not been given the tools which could have guided them to do their own preliminary feasibility study, including approximate costs of alternative solutions, and how to proceed with the process.

The know-how could also include how to set up and run a small electric supply company in the community, how to fix pricing, etc. What I happened to be able to do in that instant, he himself could have done and much more, had the right predigested information and knowledge been available to him in or near to his community from the very beginning. At the same time, the nearest municipal authority, credit union representation or other trusted point of contact with the outer world, should likewise be in touch with the knowledge base and beyond, in order to be able to be a constructive part in the process.

Additionally, knowledge in the field of small public works, production and processing plants, housing, community organization, trade, remittance and microfinance, etc. could and should be easily and freely available in all local communities. It could become a true catalyst for innovation and development.

I am currently involved in the development of an action support system and services for developing countries to deliver such technology and information infrastructure, and to offer such know-how, pre-digested as to content, form and language to be locally relevant to the potential end-users.

## **HOW TO START ...**

By now, twenty years before the target year of 'Agenda 2020' I assume that starting a national program of Systemic Development and Implementation of Innovation cannot wait long deliberations before taking concrete action.

Therefore permit me to suggest a basic strategy for initiating concrete action without delay. It would contain the following key elements:

1. Motivating opinion leaders in the public and private sectors, as well as 'civil society' through presentation of concepts and demonstration of potential.
2. Mobilizing the media to start a continuous campaign to
  - feature innovative solutions to problems and challenges on all levels of national life
  - track problem areas where innovative approaches may solve the problem, encouraging the readers/audiences to participate in the process of suggesting and finding constructive solutions
  - feature success stories - including from other countries;
3. Introduce innovation as a subject of study in the education system, starting with those institutions from which the students will leave soonest to move on into productive life. Later to expand down through the system until also grade schools and pre-school institutions will be embraced.
4. Encourage and assist professional, industry, and other organizations in planning and running seminars and courses for their members and their employees.
5. Introduce process incentives and assistance to minimize barriers to innovative progress.
6. Introduce a program to teach teachers and instructors to teach: teachers and instructors ...
7. Establish a center to launch, support and coordinate the above initiatives.

All of the above can be started up with only a short period for preparation. The costs would be very manageable. In the meantime more elaborate programs, plans and projects can be prepared and initiated.

## **CONCLUSION**

I would not blame you if by now you would lean back and say: 'What a tall order'. Let us at first take the time necessary to study very carefully the whole field of innovation before beginning to formulate a strategy and a program, not to mention plans and projects.

However time is in short supply in the perspective of Vision 2020. I believe that the risks involved in pursuing an initial strategy as suggested are smaller than if preparing for a massive rollout to begin in year 2001 or 2002.

In any case, if a broad national strategy of innovation is embarked upon, I would expect that in the future people from the world over would flock to Malaysia to study how you did it. The opportunity is there. Why not...?

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## **REFERENCES**

The following three papers have all been written and presented by John Zachariassen:

- 1) Encouragement of Inventiveness and Innovation in Developing Countries (Paper presented at World Symposium on the Importance of the Patent System to Developing Countries) organized by The World Intellectual Property Organization (WIPO), Colombo, Sri Lanka, February 21-24, 1977)
- 2) A Systematic Approach to the Development of Creative Capacity (Paper presented to Fourth World Conference on Gifted and Talented Children, Montreal, Quebec, Canada, August 21-25, 1981)
- 3) Development of the Indigenous Construction Sector with Special Reference to Plant, Equipment and Tools (Working paper presented at Expert Group Meeting on Development of the Indigenous Construction Sector, United Nations Center for Human Settlements (HABITAT, Nairobi, Kenya, 23-30 November 1981)