Innovation: Thinking Differently to Create Value.

S. Saleem Arshad, MSIE, Ph.D
Applied Innovations, Sydney, AUSTRALIA

25 January 2014

Abstract:

It is proposed that the start of 2014 should mark the beginning of a phase of re-thinking about innovation and its applied aspects – the search should be on for new ideas rather than new jargon. To provide a clearer perspective to an often vague concept, we begin with the publicly acknowledged intent for innovation, determine its current fitness for purpose, and propose several new directions to narrow the gap between concept and practice. The title "thinking differently to create value" is a compact definition developed by the author and is applied recursively in this paper to propose new directions. The need for the development of process oriented innovation tools is highlighted as a result.

1 What is innovation, what can it deliver and how?

It is remarkable that a vague, catch-all term should have acquired such gravitas and mass appeal as has innovation. There is little that is precise either in its many definitions, its vocabulary or lack thereof, or the myriad fields to which it can apply.

Research & Development (R&D) is responsible for most of the technological advances world-wide to date, yet has enjoyed little of the mass adulation of innovation.

There are two reasons for this: First, the Western public has become more accepting of vagueness. The hard-won standards of evidence and scrutiny that were routinely applied to all new ideas until the 1960s, and 70s are no more. Second, alarm at multiple declines in national manufacturing prowess, higher educational systems, and weakness of public scrutiny and discourse, have led to a fervour demanding a remedy based on something the West is supposed to be inherently good at: "Innovation".

Fig. 1 and 2 are representations of a growing gap between a perceived state and a desired state in US manufacturing capability, a trend shared by Australia. In this model, the need for some remedial or compensating mechanism has intensified with time, and is broadly supported by national leaders, politicians from all sides, policy planners, economists, management experts, leaders of industry, academics, futurists, etc.

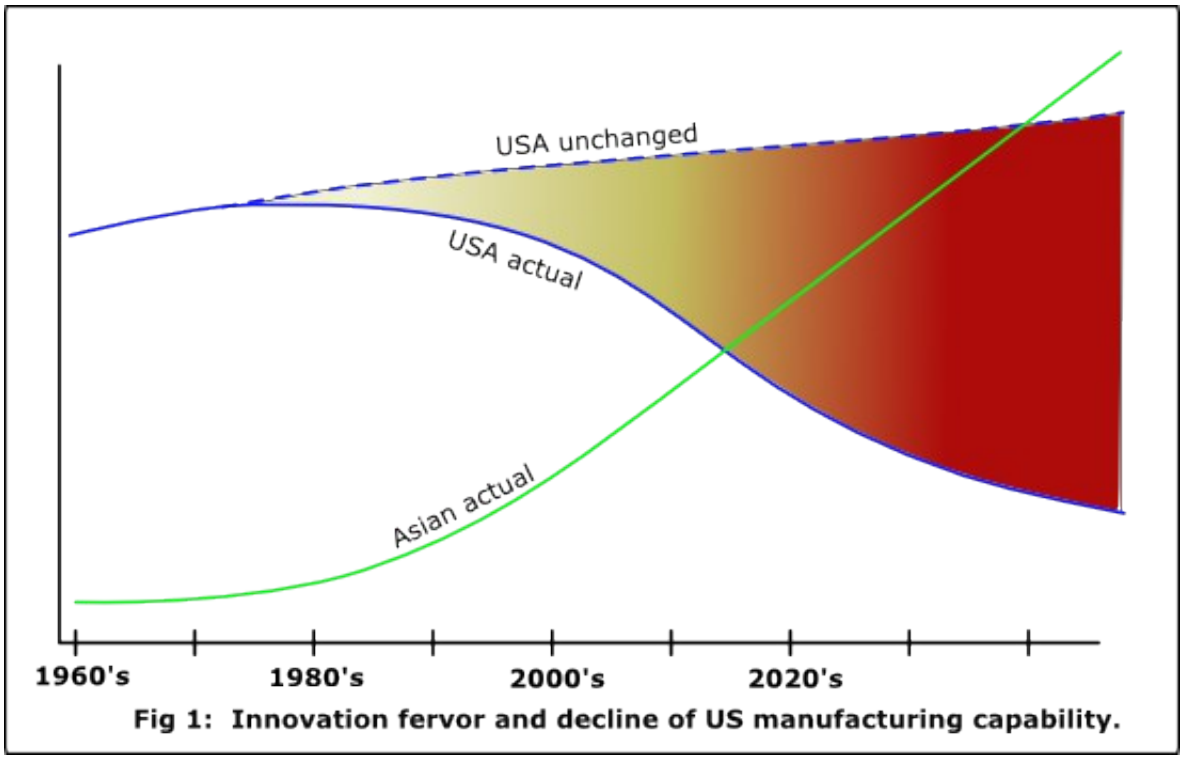

Fig 1: Innovation fervor and decline of US manufacturing capability.

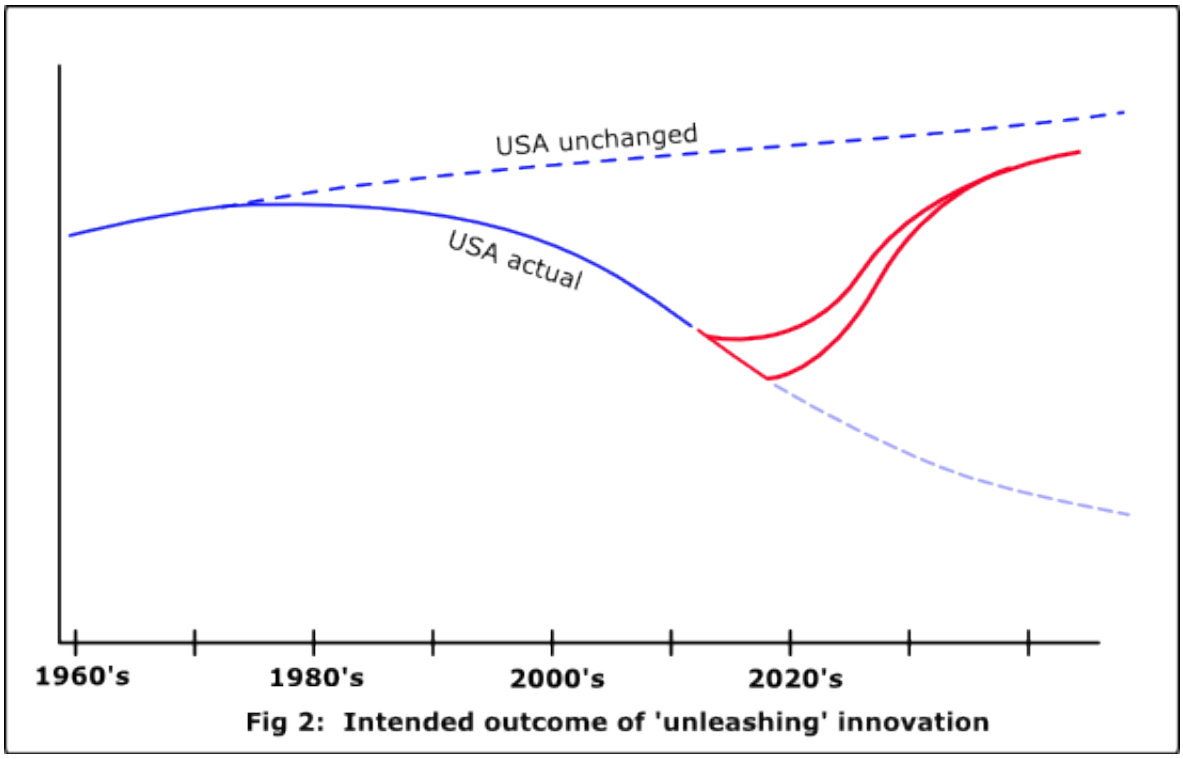

Fig 2: Intended outcome of 'unleashing' innovation

2 Economic recovery through organic change:

The primary mode of recovery and growth in any system is organic, which relies on the efficient working and revitalisation of its existing components. Economic recovery also relies on organic change taking place from within, using the three pillars of public awareness, higher education, and productive manufacturing.

In 15 years spent in the USA, and now another 15 years in Australia, the author has observed the decline of each of these three pillars of recovery:

2.1 Through public awareness, policy, debate:

Organic change on a national scale is launched by a change in public perceptions. While the public is now well aware of issues like the weakness in the economy, unemployment, increasing disparity in income, issues with the educational systems, etc., it has no capacity to influence policy. It has grown complacent on a diet of identical sound-bites delivered by the mass media, as well as both sides of the political divide, of which "innovation" is a good example.

A belief system appears to have become the prevailing mode of thinking at all levels, valuing conformity of views over an inquisitive or questioning mindset.

2.2 Through universities and higher education:

Universities and institutions of higher learning serve the function of designing our future, the blueprint for change, and preparing us for it. The US university system is still rated the best in the world, yet serious structural issues and a growing disconnect with contemporary needs are starting to emerge. Many studies, including a recent book by Hacker and Dreifus [1] discusses these in considerable detail.

The subject of innovation has not been adequately addressed in the academia. The innovation process cannot be neatly encapsulated in algorithmic form except at higher levels of abstraction. This fact and the inherent unpredictability of outcomes is off-putting to the technical and engineering disciplines.

As the process itself is difficult to replicate and study at the technological levels, the next best thing is to study a few successful outcomes with a view of inferring some structural patterns. This is the domain of management, economics, and statistical disciplines. This aspect forms the vast bulk of published academic research.

It may be mentioned that innovation best-sellers by gurus like Drucker, Christensen, Hamel, Chesbrough, Kim and Mauborgne, von Hipple, etc. at top business schools have served to popularise, even add glamour to this subject in public discourse. The study and classification of selected innovation **outcomes** does not naturally constitute a forensic study of the **process** itself. And so while exciting new terminology has been added to business vocabulary, an essential grasp of the underlying process remains elusive.

2.3 Through manufacturing and productivity:

Manufacturing is the pre-eminent engine of economic prosperity, the basis of a country's future outlook, and a huge employer of its workforce. Global economic cycles do influence national manufacturing levels, to varying degrees mostly in the near term.

The type of sudden, swift and sustained declines in their manufacturing base and employment [2] which both the USA and Australia have experienced, cannot be ascribed to external factors alone. The causes are mostly internal, caused by misplaced policy and priorities, and by now the decline is largely irreversible [3].

A telling example is that of General Electric, the US technology and manufacturing powerhouse, whose long-standing culture of organic growth based on R&D was transformed by CEO Jack Welch into one of rapid inorganic growth. The new culture led to massive lay-offs and selling off of sub-optimal business units, a priority on being no.1 or getting fired, disbanding of many engineering / R&D facilities for showing poor returns in the short term, etc. Under this change GE became a major presence in the financial and entertainment industries which greatly boosted its share price. It has been claimed that the entire budget for R&D at General Electric became less than what NBC TV, its own subsidiary, was spending on its NBA basketball telecasts [4].

The majority of low cost manufacturing was now sourced from overseas. What is less well known is that over 900 promising high-technology US firms were taken over [5] and mostly decimated merely to create space for GE to move into areas where it now lacked its own R&D capability. Sadly, many other US firms followed this aggressive business style of downsizing, mass lay-offs and off-shoring as the first resort of management policy, and not its last. The long term effects of such policies remain.

Another observed trend for US businesses was to source components from say China, assemble them locally with a much reduced workforce, and then report remarkable, even world-leading gains in productivity (revenue per existing worker).

What should also be kept in mind is that supplier nations in this global chain have, as a result and over time, built up considerable manufacturing capability, skilled manpower, and technological talent. This will now be impossible to replicate locally in the US [3]. In addition these external capabilities can only advance upwards under their own supportive, long term policies and by a shift towards domestic consumption.

3 Economic recovery through innovation:

3.1 The manufactured concept of innovation:

The concept of innovation has been largely manufactured and popularised in mass media as a curative to prevailing economic malaise. The rationale provided is curious: Innovation is something the West, or more precisely the USA, is naturally and traditionally good at, and so there is no need to train our young in something that is part of their genetic build. There is little evidence to support this belief.

Fig. 1 and 2 indicate an alternate thesis. As the gap has grown and will continue to grow, public calls for something to be done will also intensify. Fig. 2, taken in the context of the discussion in Sec. 2 above, would indicate that for innovation to provide any such remedial or corrective mechanism, it must deliver hitherto unimagined technological impetus to our existing capability.

That it must have focus, clearly defined components and vocabulary, verifiable outcomes when scaled up or down, be taught with intensity at universities as a technical subject of choice and by faculty whose practical competence and track record are beyond questioning.

At present, this is far from being the case and therefore, the question of unleashing innovation remains hypothetical at best.

4 Evolutionary directions for practical forms of innovation:

What is feasible, however, is to devise ways in which the generic concept can evolve into its more practical forms.

A) "Innovation" is freely and interchangeably used to describe the mindset, the capability, the process, its outcome, and the reasoning. Development of precise vocabulary and nomenclature must become a matter of urgency.

B) Universities need to undertake research on the more challenging aspects of innovation dealing with the actual process itself, rather than only analyse data on successful outcomes. They have to become participants rather than remain commentators.

C) The process of innovation needs to be examined using more qualitative approaches that study the Process Trio of Innovation: i.e., the problem space, the person and the procedures.

D) Usable modules of practical know-how need to be developed which can be delivered conveniently and with an acceptably small footprint to users.

E) Improved methods of internal knowledge generation and enhancement within the firm need to be developed.

F) Professor Vaclav Smil suggests that most innovation is not done by research institutes and national laboratories but comes from manufacturing companies that want to extend their product range, improve their costs, and increase their returns [3]. There should be close interaction with the manufacturing sector.

G) New modes of training and knowledge transfer need to be developed with longer periods of interaction and collaborative engagement with a firm.

H) An individual's personality, interests, style and duration of formal education, style and duration of professional experience, is an important but neglected topic which should be factored in as well.

5 Incorporating new directions in the technology of innovation:

Fig. 3 presents a visual context to the directions presented above. Its four sides represent the four essential themes: process based research (left side) as compared with outcome based research (right side). The top side represents conceptual and abstract developments while the bottom side represent developments that are detailed, practical, and ready for implementation.

5.1 University research:

University research in innovation comprises the top-right corner of Fig. 3. As noted in Sec. 2.2, academic research in innovation has followed a low risk approach in studying successful outcomes and inferring trends. Such reports are not directly utilised in most industry. Also, few faculty have the time, the inclination, or the risk-taking mindset to venture into industrial settings and actively participate in the process.

One strength of academia is its ability to carry out multi-disciplinary research, which is needed in items C, E, G, and H listed in Sec. 4 above. The natural directions for evolution are as indicated below.

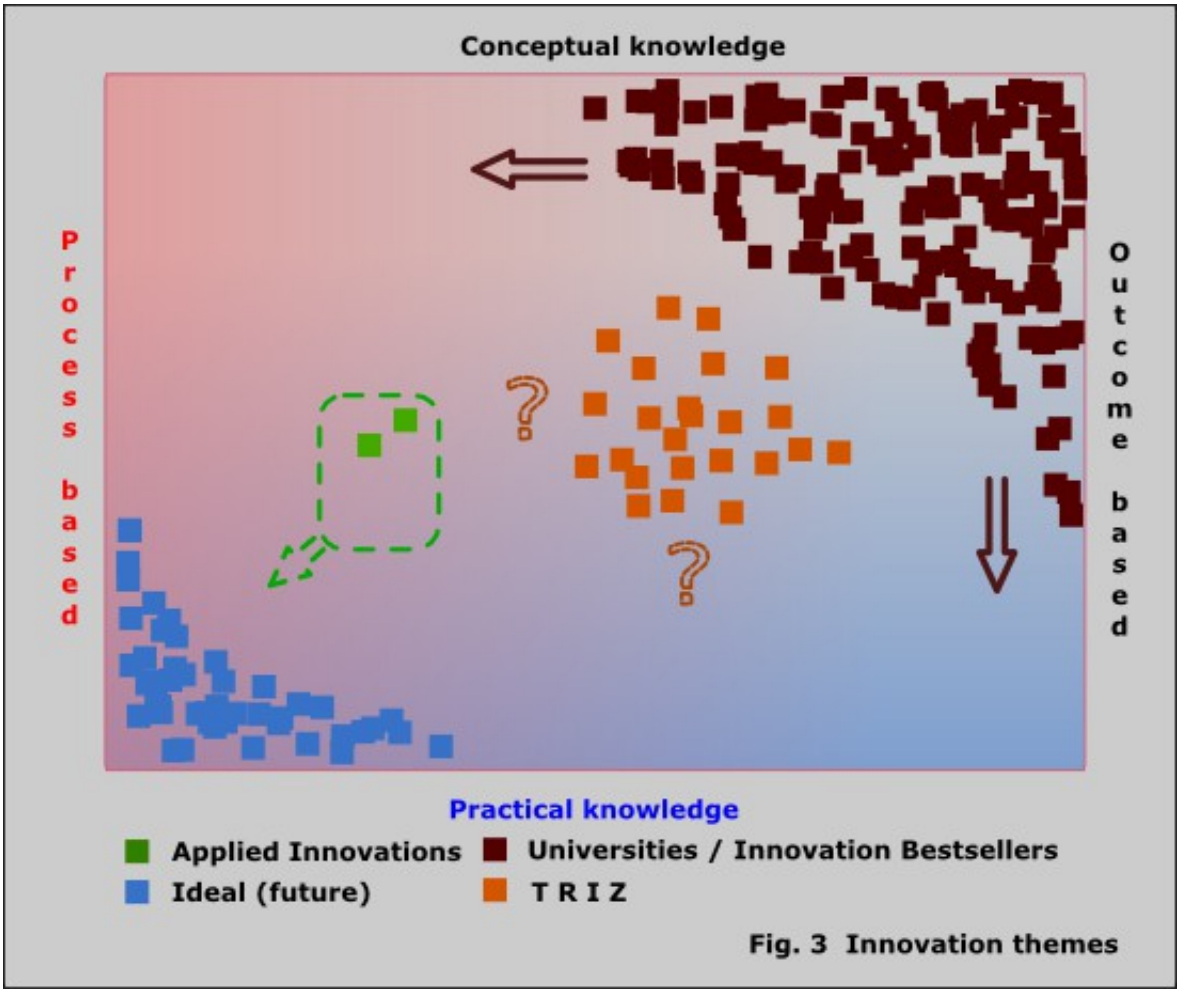

Fig. 3 Innovation themes

5.2 Existing technology – T R I Z:

T R I Z occupies the middle ground in Fig. 3. On the conceptual-practical axis, it transitions down towards the desired goal of practical knowledge. On the process-outcome axis, it transitions left towards the desired process side. Why it does not complete these transitions and deliver a perfect tool for applied innovation is a matter for its more vocal experts to comment upon.

Two possible reasons come to mind:

First, T R I Z experts often exhibit the belief mindset of a perfect system rather than critical introspection necessary for the further evolution of a work in progress.

There is no inherent shortcoming, they claim, the only cause for lack of success is the user's limited knowledge and imperfect understanding. As no examples of best practice usage are available or demonstrated, the matter ends there.

The second reason is structural and possibly more fundamental. G. Altschuller developed T R I Z as a "theory for inventive problem solving" by studying patents. Its methods, developed by studying outcomes (patents), do not apply equally well to the process side as has been noted above in this paper.

The directions of evolution are marked as '?' in Fig. 3, as details of any such work being carried out are not known.

5.3 Emerging technology – Applied Innovations:

Applied Innovations is under development by the author and focuses primarily on the process side of innovation, i.e. the left side of Fig. 3. New thinking constructs are proposed such as "ideative energy", a composite of the problem, the person, and the procedures available. Emphasis is placed on producing quicker results so as to drive the innovation process forward. Adapting and developing the mindset of the user is given priority.

The concept is a work in progress as indicated in Fig.3. There is considerable tacit knowledge present within process know how which needs to be extracted and compiled over time through repeated applications to actual problems.

Two short papers based on this approach will be presented shortly.

6 Conclusions:

To fulfil its intended role, innovation needs to transition from a conceptual construct to an applied technology capable of adding greater value to a myriad of activities. A repertoire of new process-focused methods and procedures must be developed which provide practical and usable information to the user. Eight evolutionary directions are presented to guide this transition. The concept of process-focused applied innovations is introduced, which will be expanded upon in upcoming articles.

References:

1. Hacker, Andrew and Claudia Dreifus, 2011 **"Higher Education?"**, St. Martin's Griffin, New York, NY., 304p
2. Pierce, Justin and Peter Schott Dec 2012, "**The Surprisingly Swift Decline of U.S. Manufacturing Employment**", NBER Working Paper No. 18655, The National Bureau of Economic Research, Washington, DC., 47p.
3. Smil, Vaclav, 2013, "**Made in the USA: The Rise and Retreat of American Manufacturing**", The MIT Press, Cambridge, MA., 256p
4. O'Boyle, Thomas, 1998, "**At Any Cost: Jack Welch, General Electric, and the Pursuit of Profit** ", Alfred A. Knopf, New York, NY., 449p
5. Knowledge @ Wharton, Sept 13, 2001. **"There is Just One Word….."**

Acknowledgement:

The work has benefited by an exchange of views with Professor Toru Nakagawa.