

# Pursuit of Innovation in Vedic Studies

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**I**nnovation plays a pivotal role in economic development of a nation. Its relevance and examples were there during Vedic period as well. Innovation need to satisfy the criteria of verifiable truth, socially usefulness, and esthetical elegance - *satyam, shivam, sundaram*. Vedic scriptures have huge amount of knowledge that exhibit the characteristics of holistic approach, classification and measurement.

## Innovation: aim at “सत्यम्, शिवम्, सुन्दरम्”

There are related terms in vogue such as creativity, innovation, invention, discovery, entrepreneurship. At the core is a new idea or a new concept. *Creativity* involves new ideas/concepts. *Innovation* is successful implementation of creative ideas having impact on economy and society. Innovation may be linked to improvements in efficiency, productivity, quality, competitive positioning, etc. *Invention* is constructing something new out-of-box. *Discovery* is finding something unknown. *Jugaad*, an Indian term, may connote to innovate in non-formal way that may not be explained instantly in structured manner. Such innovation may be even by untrained worker. *Entrepreneur* creates value to convert ‘material’ into ‘resources’; creates new business/service. *Inclusive innovation* may include both structured innovation and jugaad – unstructured/ intuitive innovation.

Science is search for सत्यम्. Applied science leads to development of *Technology* for problem solving. Now-a-days there is concern about Integrated Design that is sustainable, beneficial to mankind, and eco-friendly. Aesthetics adds value to it. Thus the engineering solution must ensure aspects of शिवम् and सुन्दरम् as well. Innovation is driven accordingly.

Future prosperity of economies will depend both on their *ability to innovate* and on their *capacity to adjust to change*. Future innovations will spring from the base of pyramid - common men who need to be encouraged to *cooperate for innovations* and *compete for achieving excellence* to suite to local environment.

Inclusive Innovation is key driver of sustainable development. Knowledge – better ways to do things –

has always been main source of long term economic growth from agricultural revolution to the present knowledge revolution. World is transforming into networked society. Distances are shrinking. Concept of global village is being propounded. In the multi-cultural world, it is a challenge. Technological culturisation may involve the process of localization that would facilitate faster acceptance of a new technology.

Scientific basis of knowledge is contained in Vedic scriptures. Standard practices were evolved for loss-less transfer of knowledge, through Shruti- an oral tradition; for performing arts through Guru-Shishyaparampara - closer interaction between teacher and student; and refinement in knowledge through Shastrarth - discourse. Excellence and collaboration were aimed at. Holistic approach of problem-solving was emphasized at all levels of activities. “Let noble thoughts come from all directions”, “Every one can do it”, “we hardly harness very small fraction of brain power,” There is a Vedic rcha that means “Divine powers are within, become a leader not be follower. Based upon own experiences, create base for new invention.” Such was motivation to ever encourage and strive for innovation. The Vedic studies have thus great relevance even today.

## Knowledge: an engine for economic growth

नहिज्ञानेनसदृशंपवित्रमिहविद्यते। (गीता 4-38). Knowledge is critical factor in accomplishing any task with excellence. Modern science is developed based on successive observations and analysis. Hypotheses and postulates evolved based on large samples of similar observations, and the conjectures on the basis of inductive logic. Abstraction is dealt with symbolically in mathematical framework. Better understanding of the physical world through science led to innovative techniques and technologies to develop commercialisable products that resulted in wealth generation. Economic growth became primary indicator of how relevant the technology is. Innovation became buzzword on all the sectors of economy especially in the context of globalization. In-

novation is reflection of multi-disciplinary frameworks of knowledge. It may be an idea, a technique, an arrangement, or approach. Its relevance is of course tested in the prevailing or the desired environment. Innovation has become synonym of wealth creation and economic growth.

## Vedic Studies & Information Technology: a win-win case

Ray Kurzweil, technology futurist, predicted that technologies will miniaturize to disappearance by 2010 they will become part of skin and clothes; technology will become exponentially fast to bring true Artificial Intelligence and human immortality; fantastic nanotechnology capabilities will be available in a decade; picotechnology will grow; technology will build AI to engineer human brain by 2029. Most of his predictions have come true.

We may consider IT as Enabling Technology and use IT for digitization, storage, text processing and retrieval. This necessitates identifying areas for further technology development. On the other hand we may also identify niche technology development areas that may benefit of Vedic knowledge such as Speech sound classification and Vedic Mathematics and Cognitive aspects as discussed in Mimamsa, Nyay and Vaisheshik. Natural Language Processing Tools to develop may include Sanskrit Word Processor, Knowledge Representation Tools, inferencing and Interpretation mechanisms, Optical Character Recognition system for Vedic overlay, Vedic fonts, schemes for Sama Veda data entry, Spell-checkers and Grammar Checker, Web authoring tool, content digitization etc.

Following **development and deployment projects** may be considered to be initiated:

1. Digitization of Vedic Scriptures and Development of Metadata & Search Engine;
2. Standardization of text input mechanism with didactical marks, and transliteration table,
3. Sanskrit Parser, Grammar Checker, Spell Checker, Word Processor, Dictionary, Transliteration and Translation Support;
4. Concept based Networking Language (CNL) on the lines of Universal Networking Language (UNL) for multilingual machine translation;
5. Speech engine based on Sanskrit Praatisakhya – speech sound classification;
6. Inferencing and reasoning systems based on Shastric Sanskrit;
7. Techniques for automatic Knowledge compression and expansion;

8. Auto-Ontology Builder;
9. Evolving Standard of Phonicode;
10. Pattern-based Computer Architecture and Parallel Multipliers based on Vedic Mathematics;
11. Mentoring educational institutions to set up Knowledge Systems Projects Lab;
12. Revisiting curricula at school and college levels, and for technical and medical science education with a possibility of introducing Science of (Sanskrit) Language, and glimpses of ancient Science & Technology

## Innovation: a holistic approach

Multiplicity of knowledge frameworks and linguistic tools of inferencing facilitate innovation. On the basis of this hypothesis, Vedic studies in SANSKRIT language have greater potential for stimulating innovation with holistic viewpoint.

Jacques Delor report of UNESCO (1998) on higher education mentions importance of innovation, “Owing to the scope and pace of change, society has become increasingly knowledge-based so that higher learning and research now act as essential components of cultural, socio-economic and environmentally sustainable development of individuals, communities and nations”. But the report does not focus on holistic perspective of education as envisioned by Swami Vivekanand, “we want that education by which character is formed, strength of mind is increased, the intellect is expanded and by which one can stand on one’s own feet. Education is manifestation of the perfection already in man”. This ensures necessary conditions of focused approach, refraining from distractions; strength of mind, expands horizon of intertwined concepts.

Howard Gardner suggests Multiple Intelligences. Daniel Goleman proposes schooling the emotions and testing EQ (Emotional Quotient). Sanskrit scholars had emphatically mentioned need of the qualities crisply as follows: यम, नियम, आसन, प्राणायाम, प्रत्याहार, धारणा, ध्यान, समाधि. Yama refers to the ability of self-restraining; Niyama refers to judicious behavior with external world. Sound mind in sound body, so, Asanas and Pranayam are important. MNCs like Microsoft teach mediation for higher productivity & quality of employees. Microsoft certified Yoga classes are held in US companies.

Collaborative learning was promoted as expressed in the following: सहनाभवतु सहनौभुनक्तु सहवीर्यकरवाहै। Kapila, Vyasa, Patanjali and indeed all philosophers of India, applied the scientific methods of observation and analysis in coming to their respective discoveries. Kapila was the great psychologist, and the founder of

the Sankhya system. We get truths from both the microcosm (internal) and macrocosm (external). Microcosm must bear testimony to the macrocosm and vice-versa. The whole universe is built upon the same plan as one little being. In Isaavasya Upanishad, पूर्णस्य पूर्णमादाय पूर्णमेवाशिष्यते connotes this idea. In Indian mysticism, the concept of infinity and zero are very closely linked. In Sanskrit "Poornam" means both full and zero. Indian mathematician knew that division by zero gave them infinity. The symbol for infinity ( $\infty$ ), that is horizontal 8, is called lemniscates. English mathematician John Wallis introduced this symbol in 1655. The symbol is that of Anant, the great Adishesha of infinity and eternity, which is represented as coiled up serpent. The concept of infinity has always remained an enigma. The Taittiriya Upanishad says; यथोवचोनिवर्तन्ते, अप्राप्यमनससह. where mind and speech return (being) unable to comprehend. Anant is the symbol of non-thought.

Prakriti is the cause of all manifestations, which we call thought, intellect, reason, love, hatred, touch and taste.

Triplet is the minimal set for stability, completeness and expressing a natural system.

The Prakriti consists of triplet of Sattva, Rajas and Tamas. In the beginning of evolution, these are in equilibrium. The Chitta (mind-stuff) has three fold functions of buddhi (intellect), ahamkara (consciousness) and manas (mind). This gives us clue that a physical system can better be represented by a tri-state system. Modern science also supports this. Any color can be represented by three basic colors "R. G. B. Blood cells are of three types" RBC, WBC & Platelets; Atom consists of Neutron, Proton and Electron. Diagnosis of human illness is based on tridosha of Vaata, Pitta and Kapha.

Innovation and leadership go together. Quality of innovation is inspired by the holistic perspective, integrated approach, and aptitude for achieving excellence.

Gita explains various paths of Yoga: Knowledge, Action, Devotion, etc.- all aiming at the Absolute. Gita asserts the essence of Yoga lies in Action: योगःकर्मसुकौशलम् This plurality motivates for innovation in our living.

## Vedic Studies: stream of innovations

Scientific & technological innovations which are contained in Sanskrit are given below in the following chronological table:

### Period

1500 B.C.

1000 B.C.

1000 B.C.-500 B.C.

400 B.C.-400 A.D.

500 A.D.-1500 A.D.

### S & T Innovation in Ancient India

*Rigveda* : concept of natural law (rta): 1028 hymns & 10,462 rchas  
*Samveda* : book of melodies  
*Yajurveda* :the book of Sacrificial formulas, the whole series of 27 or 28 nakshatras. Number names upto  $10^{12}$ .

*Atharveda*: astronomical knowledge, more detailed medical Knowledge.

*Brahmanas, Aranyakasand Upanishads* doctrine of punchabhutas; **Codification** of medical knowledge into *Ayurveda Sub-sturas*: beginning of geometry, irrational number  
Early ideas of *Vaisheshika, Samkhya & Mimamsa*; of *Bauddha, Jain*

and *Charakadarshanas*

Physical concepts: atomism, space, time, motion and sound

Astronomical ideas:

mathematical series (AP & GP),

Agricultural practices to increase soil fertility.

*Ayurvedic treatises*- Charaka and Susruta Samhitas; Tridosha theory; extension of the doctrine of 5 elements, space, time and sound

*Arthashastra* of Kautilya,

Pingala's Chandah-sutra:

Permutation, combinations and Binomial ideas.

*Nyaya Bhashya* of Vatsyayana:

extension of atomic ideas, vision, sound, inpetus theory;

classification of animals and plants

*Padarthadharmasamgraha* of

Prasastapada: atomism, space, time, motion, sound

*Aryabhatta*:theory of rotation of earth, epicycle theory of planetary motions, values of pie & sine, square & cube, roots, indeterminate equation of the first order.

*Panchasidhantika* of

Varahamihira

### *Ganitasarasamgraha*

*Amarakosa*: classification and synonyms of plants and animals, minerals and metals.

Authoritative compilation of Ayurvedic knowledge, urine and pulse examination, Siddha system of medicine.

polytechnics; alchemical ideas, iron-casting, paper-making

1600 A.D.-1900 A.D. (Foreign influence)

Use of mercurial and non-mercurial compositions as internal

medicinessynchronization of astronomical and mathematical knowledge with India's Jantar Mantar at Delhi

Translation of Arabic literature/ knowledge; country's map

DC Ray's work on murderous compounds and rare Indian minerals JC Bose's work on polarization of electric waves by double refraction; on generality of molecular phenomena produced by electricity by living and non-living substances.

[*Influence of Indian philosophy on science*]

Setting up Engineering Colleges, and institutions of basic learning

## To sum up

Innovation is key driver for socio-economic development. Holistic approach is emphasized in developing engineering solutions. Scientific basis is necessary to ease modularity, interoperability, reusability and scalability. Aesthetics is value addition. Sustainability and ethics are also important. Innovation must therefore aim at "सत्यम्, शिवम्, सुन्दरम्". Vedic knowledge encompasses large number of disciplines such as linguistics, health, astronomy, physics, chemistry, biology, mathematics, metallurgy, fine and performing arts, etc.. Most of the documentation is in Sanskrit that specifies language architecture and application. Knowledge content therein is of high quality testified over a long period. Many scientists have expressed suitability of Sanskrit as a computer language especially for AI applications. Concept-based Networking Language (CNL) may be developed for knowledge exchange across world languages. IT and Vedic studies both may benefit from each other. Few projects for Technology Development are suggested.

Pursuit of innovation had been in our culture. Few examples are cited. There is need to introduce Sanskrit as science of language and Vedic studies as alternate knowledge framework in curricula of technical education. In the emerging knowledge based society, acquisition of multiple skills is essential pursuit. Sanskrit will help in building up innovation-conducive aptitude.

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