Theme Work Analytics

This Century belongs to the Engineer -Entrepreneur

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by

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A historical perspective is necessary

Till Four centuries ago India was one of the richest countries in the world. Every European voyager set sail to discover a short route to India. Purpose was to acquire the Wealth of the Nation, vie Silk and Spices.

It is estimated that 25 % of world exports emanated from India

A historical perspective is necessary

India was the land of artists,artisans, poets and scholars .

It was the home of mathematicians, astronomers and biologists.

It was where knowledge to process sugarcane and cotton resided 3000 years ago.

It knew how to process metals.

It was one of the richest nations in the world. With spices and silk.

1. Physics – Concepts of atom and theory of relativity were explicitly stated by an Indian philosopher around 600 BC.
2. Chemistry – Principles of chemistry did not remain abstract but also found expression in distillation of perfumes, aromatic liquids, manufacturing of dyes and pigments, and extraction of sugar.
3. Medical science & surgery – Around 800 BC, the first compendium on medicine and surgery was complied in ancient India.
4. Fine Arts – study of sound and phonetics arose from the need of correct recitation of the Vedas. The natural corollary was the emergence of music and other performing arts.
5. Mechanical & production technology – Greek historians have testified to smelting of certain metals in India in the 4th century BC.
6. Civil engineering & architecture – The discovery of urban settlements of Mohenjodaro and Harappa indicates the existence of civil engineering and architecture, which blossomed to a highly precise science and found expression in innumerable monuments.
7. Shipbuilding & navigation – Sanskrit and Pali texts have several references to maritime activity by ancient Indians.
8. Sports & games – Ancient India is the birth place of chess, ludo, snakes and ladders and playing cards.

A historical perspective is necessary

Upto 1500 B.C.	Vedic Civilization	Production of Cotton and Sugar 3000 years ago.Use of Water Wheel.
Upto 600 A.D.	Mathematics	Concept of zero and introduction of numerals 0 to 9
6th Century A.D.	Aryabhata,	Proposed Heliocentric planet system; estimated an year to be 365 days and 6 hours ; Explained solar and lunar eclipses properly and estimated earth's circumference accurately.
6th Century A.D	Varahamihira	Trigonometry ; Mathematical Astronomy
12th century A.D.	Bhaskara	Algebra; number systems ; simultaneous equations; differential calculus

A historical perspective is necessary

13th to 16th Century A.D.	References to the work of Kerala School of mathematician astronomers
Madhava of sangamana gara	Discovered infinite series ;methods to calculate the circumference of a circle
Damodara, Jyestadeva, Neelakanta Somayaji	Foundations of calculus: Theory of infinite series, tests of convergence,differentiation, term by term integration,area under a curve, solution of nonlinear equations

A historical perspective is necessary

19th century A.D.	J.C.Bose : application of electromagnetic waves to wireless telegraphy
1924	S.N.Bose : Bose- Einstein Statistics used in Quantum Physics
1928 ,1934	Sir C.V.Raman : Nobel prize for Raman Effect : Raman-Nagendranath theory of diffraction of light
1930-40s	Homi J Bhabha : Meghnad Saga : Vikram Sarabhai

Europe from 16th to 20th Century

European voyagers had “discovered” the New World. Were aggressive in colonizing many countries around the world. Their trade ambitions created a unique internal environment fostering the scientific spirit.

Thus it was the home of numerous inventions and discoveries and also led to the dawn of the Industrial Age.

Europe from 16th to 20th Century

1642	Blaise Pascal	Invents the first mechanical calculator (gets a patent from King Louis the XIV in 1649);proves the existence of vacuum
1687	Isaac Newton	Publishes Principia Mathematica
1733	John Kay	Invents the flying shuttle
1738	Daniel Bernoulli	Discovers the principles of hydrodynamics
1760 onwards	The birth of the Industrial age	A fascinating story…

Europe from 16th to 20th Century; Birth of the Industrial age : 1750 onwards

1. Problem of flooding coal mines
2. Invention of the Newcomen Engine to pump out water
3. James Watt invents the Steam Engine
4. British parliament issues a patent
5. John Roebuck, a businessman , extends financial support.
6. Then Watt gets further financial and political support from Mathew Bolten, another businessman.
7. John Wilkinson with his precision cannon boring tool improves the cylindrical shape of Watt's device and generates immense power of 25 to 40 horsepower. Strikes a deal with Watt and Boulton to supply cylinders.

Europe from 16th to 20th Century; Birth of the Industrial age : 1750 onwards

With flooded mines [market demand for efficient device to pump out water], Watt's condenser and Wilkinson's precision cylinders [technology], Boulton's money [capital] and parliament's patent [IPR]

The Industrial Revolution was on !

Europe from 16th to 20th Century; Birth of the Industrial age : 1750 onwards

James Watt could sell the steam engine only by

(a) Demonstrating the annual cost savings

(b) Packaging an innovative scheme to cover the initial cost of the steam engine and

(c) Identifying growth opportunities outside the collieries.

In 1784 , Henry Corts invented a new forging Process in place of the traditional hammering method . Together they gave rise to the modern iron and steel industry and brought the cost of power generation down by a factor of 10

Europe from 16th to 20th Century; Birth of the Industrial age :

1733 : With John Kay's invention of the flying shuttle , loom productivity soared.

In 1764 James Hargreeves invented the Spinning Jenny that improved yarn quality and productivity manyfold.

Textile industry could grow further when the steam engines were brought to power the looms. By the end of 18th century it employed 5000 workers in one location alone in England.

The New World became the ideal ground to grow cotton. Export of cotton to England grew from 150,000 lbs in 1792 to 17 million in 1800 to 700 million in 1850 !

Europe from 16th to 20th Century;

1800	Alessandra Volta	Invents Electric battery
1805	Joseph Jacquard	Develops automatic looms and a system of punched cards
1814	George Stephenson	Introduces the steam locomotive.
1815	John McAdam	Constructs the first truly paved road
1821	Michael Faraday	Demonstrates the first electric motor
1827	George Simon Ohm	Discovers Ohm's law
1844	Samuel Morse	Patents the design of the telegraph
1847	Herman Von Holmholtz	Proposes first law of thermodynamics
1850	James Joule	Proposes his final constant for mechanical equivalent of hear

Europe (and NW) from 16th to 20th Century;

1850	Lord Kelvin	Gives the concept of Absolute Zero
1856	Henry Bessemer	Develops a new process for making steel; the Blast Furnace
1858	Darwin	Announces his Theory of Evolution
1865	George Mendel	Publishes Theory of Genes
1869	Mandeleyev	Constructs periodic table of elements
1873	Henry Maxwell	Theory of electro magnetism
1876	Graham Bell	Patents the telephone
1879	Thomas Alva Edison	Invents incandescent electric light
1880	Herman Hollerith	Develops the electro mechanical calculator ;the U.S. census problem

Europe (and NW) from 16th to 20th Century;

1882	Edison	NY city is electrified
1885	Carl Benz	Develops the first working automobile
1890s	Edison	Invents the Motion picture
1897	J.J. Thomson	Discovers the Electron
1903	Wright Brothers	Fly the first powered aircraft
1905	Albert Einstein	Special theory of relativity
1913	Niel Bohr	Publishes the model of an atom
1928	Alexander Fleming	Discovers penicillin
1932		Neutron discovered

India : from 17th century to 1947

Dec 31,1600	Queen Elizabeth grants a royal charter to a body of merchants to form " The Company of Merchants of London. Trading into East India"
1601-1613	EIC makes 12 voyages to India
1619	Sir Thomas Roe gets Jehangir's permission to build a factory at Surat
1639	Fort St.George established at Chennai
1757	Robert Clive connives to get forces of Nawab Siraj Ud Daula of Bengal to defect. Defeats him in war. Traders become Rulers.
By 1765	EIC gets the right to collect revenue on behalf of the Moghul emperor in Bengal, Bihar and Orissa
Late 1700s	War with Kattabomman; Hyder Ali, Tippu Sultan
1840- 1860	Annexure of more territories under British rule . Satara, Sambalpur,Baghat, Udaypur, Jhansi, Nagpur and Awadh
	2/3 of India geographically and 75 %population under direct British rule

India : from 17th century to 1947

1857	“The Sipoy Mutiny” at Meerut, Delhi and other places. The first war of national independence
1857-58	India becomes a Crown Colony.No longer ruled by EIC. Large number of Indians join government services.
1885	First national congress assembly
1905	Bengal partition leads to the Swadeshi movement “ boycott Manchester cloth and Liverpool salt”
1911	Partition revoked. Capital shifted to Delhi(from Calcutta)
1919	Jallianwalah Bagh massacre. Gandhi’s ascendance to leadership
1919-1921	Non cooperation movement .Loss of revenue to the government from import of cloth and liquor.
1930-31	Civil Disobedience movement
1942	Quit India call
1947 Aug 15	Freedom for India

India during the industrial age

Spent two centuries fighting colonialism.

Subjugation of India's economic interest to that of Great Britain.

India was a source of raw materials and a market for British goods.

Trade through appointed agents.

Even building of the vast rail network in India benefited only the steel and machinery industry of the British.

India during the industrial age

No science education in Universities till mid 1800s.

No budget, focus or initiative on research at universities.

No network of scientists, scholars and no dissemination of knowledge.

Intellectual Property Rights , an unknown concept.

A historical perspective is necessary

Two centuries of colonialism meant that

- We missed the Industrial revolution
- We yielded the ground on scientific temper and spirit
- We lost the entrepreneurial spirit

The Changing paradigm

The world however has moved from the Industrial age to Information age in the last 50 years.

The computer and internet revolution has swept across the globe. Business Advantages built skillfully over two centuries have been wiped out to create a level playing field.

“Death of Distance, time zones and Information gaps “

The business advantage accrues to the innovator, owner of knowledge assets

The Changing paradigm : Our heroes and lead organizations

Bill Gates,Andy Grove, Larry Ellison, Larry Page, Sergey Brin, David Filo, Jerry Yang, Thomas Plattner, Gururaj Deshpande, Steve Job,Michael Dell	Micro Soft, Intel, Oracle,Google, SAP, Sycamore Networks , Cisco, Adobe, IBM,GE,DELL,Apple

Fallen Heroes…

GM,Ford,Chrysler,Boeing, Mitsubishi, Proctor & Gamble, Unilever, Bata, Dunlop, Dupont, Sears , Ceat , GKW…

Is this an I.T. Revolution only ?

Not at all. It is an I.T. lead revolution.

CAD *to* CAM *to* CAE

Accounting *to* Manufacturing *to* Design

Quality, safety and Security as external control measures *to* inherent and embedded features

Data Processing *to* Analytics and Optimization

Market for innovative engineering applications is around the corner.

The new cadre of Leaders in 21st century

As Agricultural age gave way to Industrial age during the 18th century and changed the parameters for success

The Information age is usurping the lead from the Industrial age now and changing the paradigm.

Family connections, possession of tangible assets like land and capital etc are not the key determinants of market success.

Product and process Innovations closely tied to market realities and requirements are the secret keys to open the doors of success.

This is the dawn of the Engineer-Entrepreneur era !

The new cadre of Leaders in 21st century

1. Are imbibed with the scientific spirit, viz the spirit of objective enquiry : will follow the process of Observation, Data collection, Analysis and Deduction in unbiased mode: will innovate.
2. Understand that market success can be built only with a burning desire to innovate new products and processes that drive down costs continuously.
3. Are comfortable that variance (and not standardization) is an inherent property of nature and know how to take advantage of it. Willing to take calculated risks.

The resurgence of India

Today,

We are there, as a free nation, to capitalize on the Information Revolution .

We have the necessary industrial infrastructure to manufacture most of the goods needed.

We have rebuilt a scientific community and nurtured the spirit of enquiry in the younger generation.

Since 1991 , through liberalization, we have fostered the entrepreneurial spirit

The resurgence of India

In other words, we are very well poised to be the leading nation of the 21st century.

In the context of globalization we have the opportunity to regain our position as a major exporter.

convert the numerical strength to be the world's largest facilitator of Intellectual Property creation

Riding the internet vehicle we can transform the interaction processes at both the corporate and public lives of our citizens

The new cadre of Leaders in 21st century

Today the environment is just right in India.

- Necessary scientific and applied research infrastructure exists.
- Enabling Legislation to protect IPR exists.
- Capital availability is not a constraint.
- India has carved out a unique and ring side position as a lead nation in Information Technology.
- Success found in I.T. is being leveraged in the manufacturing sector.
- There are many emerging role models of engineer entrepreneurs.

The Indian innovators

Sabhir Bhatia, Gururaj Deshpande, Raj Reddy, Shiv Nadar, Narayana Murthy, Kiran Mazumdar, Ashok Jhunjhunwallah	None has inherited wealth. Each has attained eminence by building a knowledge base or organization.Mostly Engineers and Scientists willing to assume risk.

The new genre of organization

1. Ability to differentiate the interest of the Owner / Promoter from that of the Professional Manager
2. Ability and willingness to benchmark against the best globally
3. Compete for the human talent globally and succeed
4. Leverage the talent to create Intellectual property

The new genre of organization

5 Exploit the IP for commercial use and reuse

6 Be adept in spotting the opportunity and be nimble in organizational transformation to convert the opportunity into a value proposition

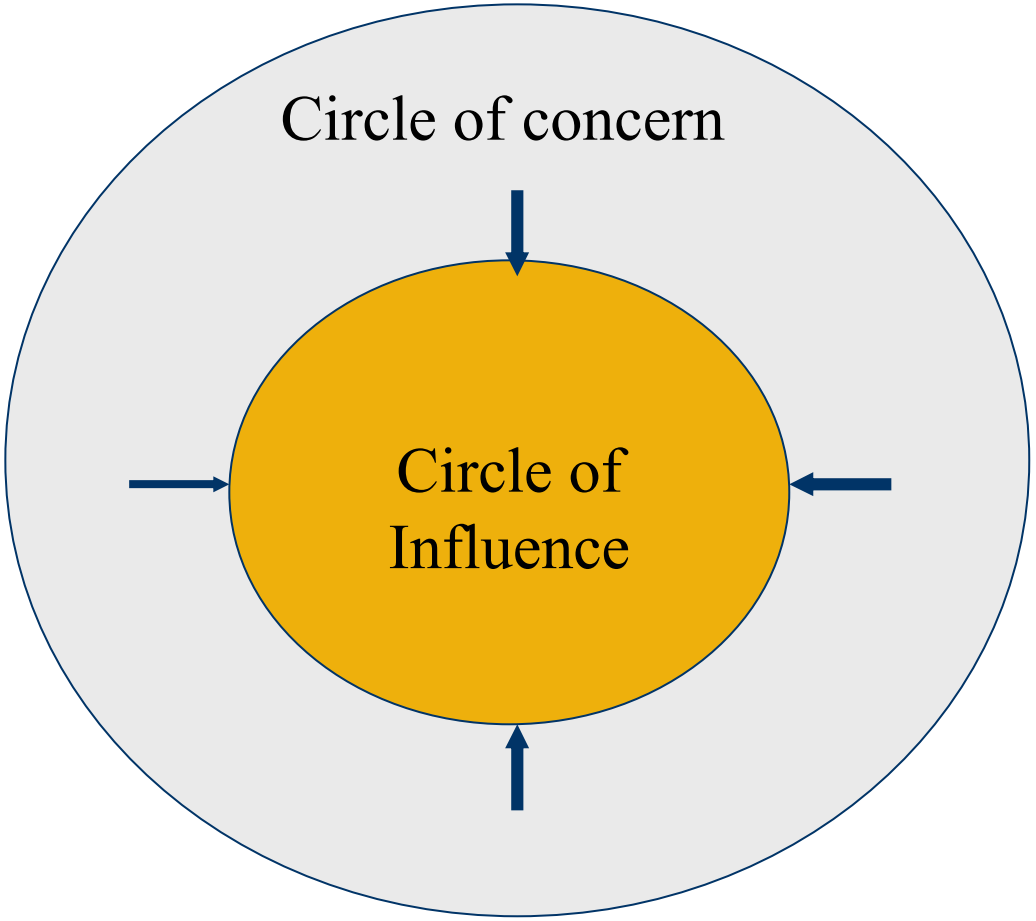
7 Evolve a Value based , multi cultural enterprise

8 Keep Delivering value upon Value ,relentlessly

How do I succeed as an Engineer Entrepreneur ?

1. Evolve processes for organizational efficiency and transparency and inject passion into it for effectiveness
2. Know how to boot strap success
3. Construct win win solutions for all stake holders
4. Capable of impacting on team's beliefs and altering its behaviour. (going far beyond knowledge sharing or skill building)
5. Understand that Trust is a two way street; leverage this very well to build an enduring enterprise

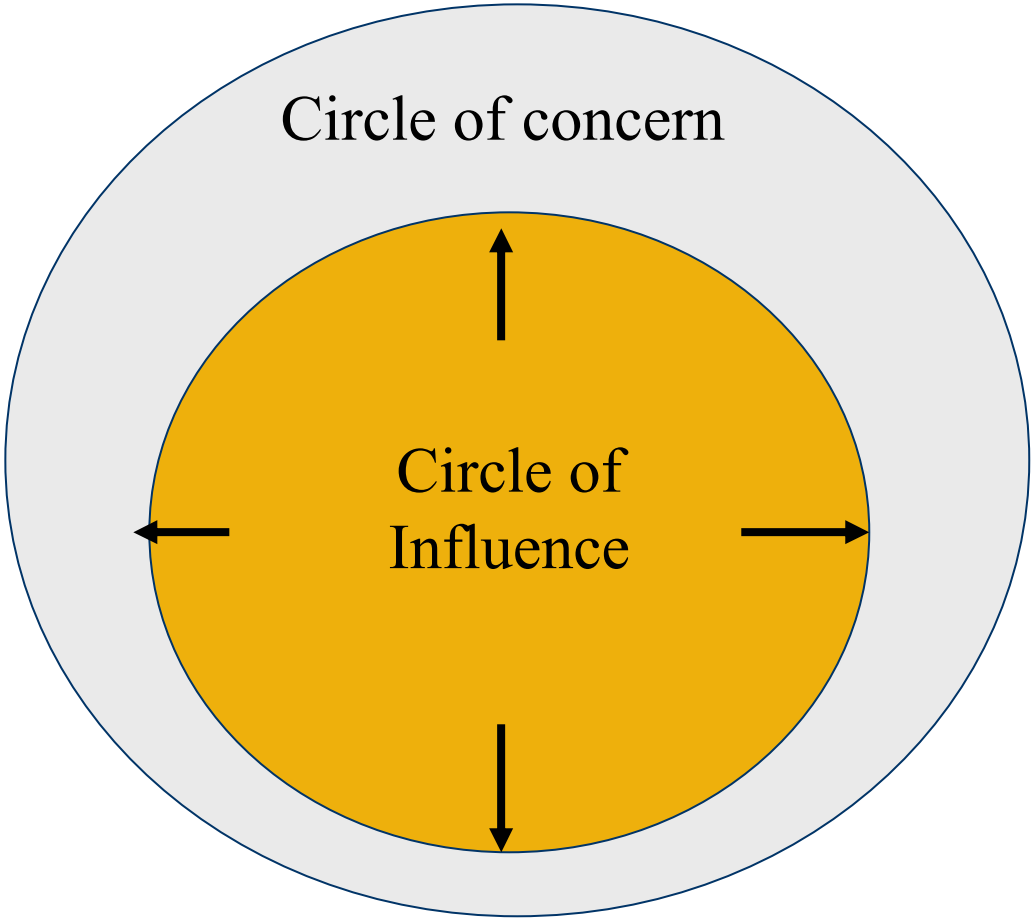
How do I succeed as an Engineer Entrepreneur ?



How to operate from the right frame of mind

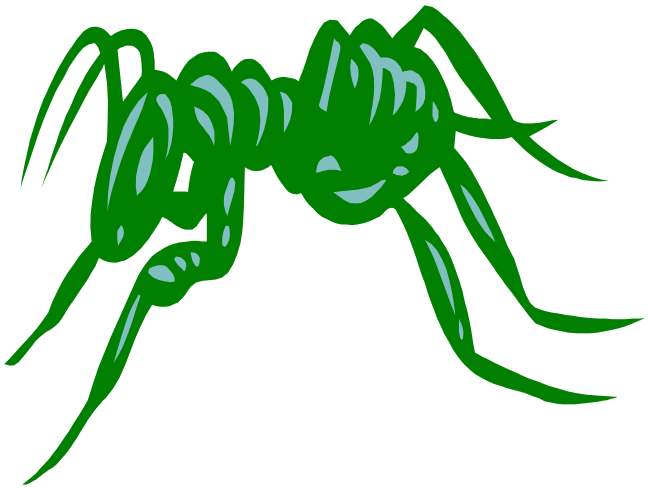
How do I succeed as an Engineer Entrepreneur ?

How to operate from the right frame of mind



Performance Differentiators

“ to sting like a bee and to float like a butterfly “



Performance Differentiators

" to be like the Santa Monica Track team in Baton Passing "

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Best Wishes for your success

by

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Intellectual Property Rights : an overview

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What are IPR ?

It is a term that conveys the rights of the owner of any Intellectual Asset/Property such as a

- Trademark
- Logo or Symbol
- Patent
- Copyright
- Industrial Design etc

IPR and Global Trade

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1883 : Paris Convention : Dealt with Protection of Industrial Property.

(Patents,Trade-marks, Industrial Designs etc)

1886 : Berne Convention : Protection of Literary and Artistic Works

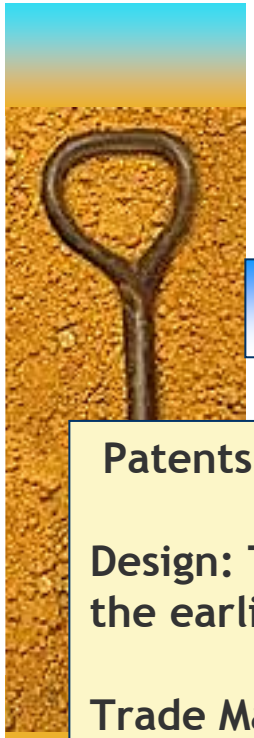
(copy rights)

Each nation had to form its legal structure relating to IPR adhering to these agreements

Nations convened joint sessions to discuss Trade related issues often. Their common understandings have been captured in and as General Agreements in Trade and Tariff (GATT)

Around 1994 GATT gave rise to the World Trade Organization (WTO) , the forum for multilateral trade issues. WIPO (World Intellectual Property organization) is an arm of WTO that deals with the IPR issues in specific. The most recent and significant agreement on IPR is captured in TRIPS (Trade related IPRs) .It specifies the nature of revisions to be made to the IPR laws in different countries and specifies the time period by which such compliance needs to be achieved.

India ,being a signatory to TRIPS, has amended its laws by 2005 for full compliance with TRIPS.



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What are the legislations covering IPR in India?

Patents: The Patents Act,1970.The act was last amended in March 1999.

Design: The Designs Act, 1911. A new Design Act 2000 has been enacted superseding the earlier Designs Act 1911.

Trade Mark: The Trade and Merchandise Marks Act, 1958. A new Trademarks Act, 1999 has been enacted superseding the earlier Trade and Merchandise Marks Act, 1958. (Enforcement pending)

Copyright: The Copyright Act, 1957 as amended in 1983, 1984 and 1992, 1994,1999 and the Copyright Rules, 1958.

Layout Design of Integrated Circuits: The Semiconductor Integrated Circuit Layout Design Act 2000. (Enforcement pending) Protection of Undisclosed Information: No exclusive legislation exists but the matter would be generally covered under the Contract Act, 1872.

Geographical Indications: The geographical Indication of goods (Registration and Protection) Act 1999.(enforcement pending).

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What is an Intellectual Property ?

Traditionally we are accustomed to owning assets such as Land, Building, Machinery and Money . When combined with labour as a resource , these assets are capable of creating products and services which have a market value.

As industrial revolution progressed from the 16th century, possession of specialized knowledge has become a key resource and a differentiator in wealth creation. It is recognized as an intangible asset and carries a collective name of Intellectual Property.

The manner in which one identifies the owner of the IP and bestowing of rights to the owner within a legal framework are critical for fostering creativity and innovation in any society.

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What are the advantages of creating IPRs?

Creating an IPR regime is a fundamental step in fostering creativity and innovation in any society. Usually economic incentives provided to the owner of IPR facilitate creative individuals to have a viable means of income so that they can continue to pursue such activities.

They have the potential to accelerate the development process in a society.

The IPR regime further facilitates people (or firms) with wealth to invest in promoting and nurturing people with special talent and getting just rewards. Their role is critical when investments required to support research is many crores of rupees.

What are the key issues in India ?

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- Till 2005 only processes were patentable in India and not the products (particularly in pharma and agri chemicals sectors).This meant that Indian entrepreneurs could reverse engineer a product ,come up with a new process and manufacture existing products without the legitimate need to pay any royalty to the first owner of the product. Such a policy facilitated vital drugs to be produced and distributed at low prices within the country.
- India has been under pressure from WTO to amend this law as the IPR owners in countries where they products originate from were losing royalty income. With the amendments to the Patent Laws passed in 2005, this situation does not hold good anymore.
- Software is protected under Copyrights in India whereas U.S. laws permit it to be covered under the Patents Law. With mechanisms implemented by Indian government to enforce existing laws, with strong advocacy from NASSCOM, software piracy is being curbed .

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What are the key issues in India ?

- India has two major concerns in this regard.
- One is to protect the traditional knowledge India possesses and that has not been protected historically. Instead it has been shared widely . Examples are turmeric (as an antiseptic) and .Now attempts are made abroad to apply for IPR for products manufactured using these items. India loses the opportunity to earn royalty as well as may end up paying royalty for such items.
- Second is the attempt to come up with product variants of popular Indian items and get the IPR in other countries. Basmati Rice and Mysore Silk are two good examples. With recent amendments to Indian laws that recognize the rights of a geographical Indication wrt such products this attempt is thwarted.

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What are the key issues in India ?

- **Business Methods ,Models and computer programs can not be patented.However they are protected under copyright laws.Only the expression is protected and not the structure ,sequence etc.**

How do I learn more on IPR ?

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- **BioInformatics Institute of India (BII) at Noida, U.P.,conducts a P.G.diploma program on IPR.This is a one year correspondence course with admission open for engineers (as well as others).**

  It covers the basics of IPR and as it applies to the fields of Agriculture, Biotechnology,Pharmaceuticals,Industrial Trade mark and Design, Patent Laws, Copyright Laws,Information Technology etc.

  More info at ipr@bioinformaticscentre.org

- **Jayashree Watal an expert on IPR and negotiator on behalf of India in WTO has written two books on this topic. They are a must read for anyone wanting to learn about IPR history ,concepts and India's journey in this path.**

Thanks

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