SCIENCE, TECHNOLOGY AND INNOVATION : CHALLENGES FOR CSIR

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Human Resource Development Centre
Ghaziabad

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CSIR

- Origins , History and Evolution
- Mission and Functions
- Structure and Governance
- Character and Competence
- The Changing Context : The Future CSIR

SCIENCE AND TECHNOLOGY IN INDIA

The three phases

- **The infrastructure build up phase (1947-60)**
- **The assessment and reorientation phase (1960-80)**
- **The accountability and performance phase (1980-90)**
- **The economic liberalization and market orientation phase (1990 -)**
- ***Science and Technology policy statements***
- **Science policy resolution, 1958**
- **Technology policy statement, 1983**
- **Science and technology policy, 2003**
  - **Reforms in academic scientific systems**
  - **Measures to increase public private partnership in R&D**
  - **Importance of Intellectual Property as an instrument of wealth creation**
- **Science, technology and innovation policy, 2013**

SCIENCE AND TECHNOLOGY IN INDIA : A CHRONOLOGY

•Council of Scientific and Industrial Research	1942
•National Chemical Laboratory/ National Physical Laboratory/ National Metallurgical Laboratory	1950
•The Atomic Energy Act	1948
•Bhabha Atomic Research Center	1957
•First IIT at Kharagpur	1954
•All India Institute of Medical Sciences	1957
•First Agricultural Research University at Pantnagar	1960
•Indian Space Research Organization	1969
•Launch of First Sounding Rocket	1963
•Department of Science and Technology	1971
•First Atomic Device Detonation (Pokharan)	1974
•First Indian Satellite, Aryabhata	1975
•Department of Ocean Development	1981
•National TV Network	1982

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)

Mission

"Build a new CSIR for a new India"

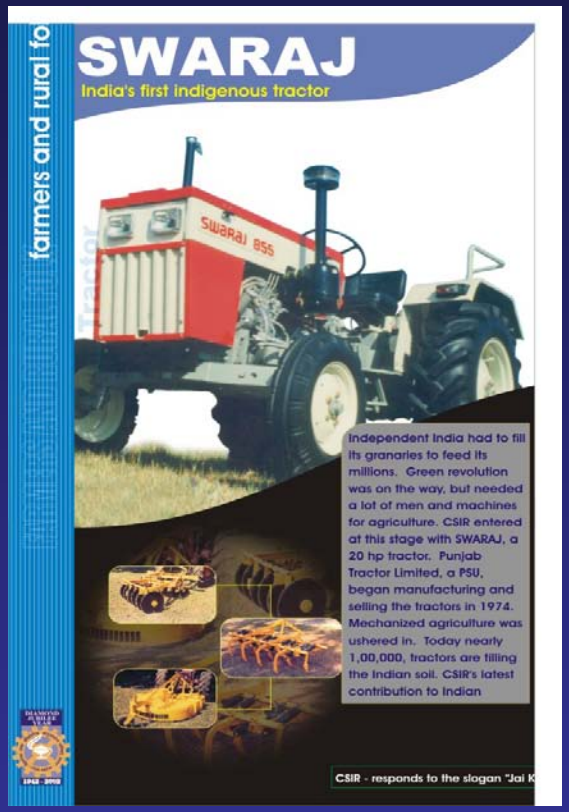
Vision

Pursue science which strives for global impact, technology that enables innovation driven industry and nurture trans-disciplinary leadership thereby catalyzing inclusive economic development for the people of India

PATH TO ACCOMPLISH CSIR's VISION

- **Leadership in science and engineering**
- **Innovative technology solutions**
- **Open innovation and crowd sourcing**
- **Nurturing talent in trans-disciplinary areas**
- **Science based entrepreneurship**
- **Socio economic transformation through S&T intervention**

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)



ESTD. 1942

Aerospace
Life and Plant Sciences
Chemical Sciences
Drugs & Pharmaceuticals
Material Science
Leather Science
Engineering Sciences
Food Science
Earth , Ocean & Physical Sciences….

Multi-disciplinary multi-location chain of 37 research laboratories
Largest chain of publicly funded laboratories
Total staff strength of 18000 ; scientific and technical staff : 13000

CSIR : IN THE MIDST OF A TRANSFORMATION

- **India and the world is experiencing and encountering immense economic, cultural, social, political and organizational transformations creating , in its wake, both challenges and opportunities**
- **Organizations have history and carry, both, baggage and future aspirations of existing and new employees. Leadership has to respond to both**
- **For any organization to create new history, it needs to renew itself, re-anchor itself, design and recalibrate, both its objectives and processes with the present realities and future expectations**
- **When this realignment occurs, new choices and new directions emerge**

CSIR IS IN THE THROES OF A MAJOR TRANSFORMATION ; THESE CHANGES WILL PROFOUNDLY AFFECT THE WAY WE WORK IN CSIR

CSIR : IN THE MIDST OF A TRANSFORMATION

- **Yesterday is history of which we can be proud of**
- **While the past can act as a beacon, it cannot be the road for the future**
- **We need to constantly envision the future and create new roads to reach the destination**
- **It is also important that all stakeholders agree on this future vision so that we can as individuals align ourselves to this new future**
- **This can be done only through intense debate and discussions**

Clear thinking about the history, nature and direction and development of an organization is imperative. The past lives on in most institutions, influencing attitudes and judgments in a manner which is deeply hidden. Successfully managing change depends on getting these issues in the open

PUBLICLY FUNDED RESEARCH INSTITUTIONS : ARE THEY STILL RELEVANT ?

- **Publicly funded R&D Organization have existed for over sixty years in India**

- **Many of them serve the strategic sectors of the economy, such as , defense, space, atomic energy, food and agriculture, public health etc where public funding of S&T is essential (Public Goods and Services)**

- **CSIR was originally created for the purpose of serving the non strategic sectors of the economy, namely, industry, consumers, global competitiveness of Indian products (Private Goods and Services)**

PUBLICLY FUNDED RESEARCH INSTITUTIONS : ARE THEY STILL RELEVANT ?

- **In the coming decades, industrial research will further mature making CSIR's helping hands more and more redundant. Drugs and Pharma as well as automotive industry are two examples where industry is well on its way to maturity in terms of New Product Development and R&D efficiency.**

- **So where does CSIR position itself in the coming years? What aspects of research and development will be still relevant for CSIR ?**

- **A deep introspection is called for if CSIR has to remain within the folds of public funding**

PUBLICLY FUNDED RESEARCH INSTITUTIONS : ARE THEY STILL RELEVANT ?

- **Several options are available to us**

- **CSIR can become a simple contract research organization for industry or a hand maiden for the strategic sector R&D. There is no rationale for public funding to the former ; if we pursue the latter option CSIR will stand the risk of losing its identity**

- **The imperative for CSIR is to therefore search for a unique space for itself, based on its core strength, namely, outstanding human capital, innovation potentials, as a center for advanced education in S&T and outstanding infrastructure for research (land, buildings and facilities)**

PUBLICLY FUNDED RESEARCH INSTITUTIONS : SOME QUESTIONS

- **What are our metrics for measurement of effectiveness ?**
- **Have we established a brand for ourselves ?**
- **Should CSIR be a sub-contractor for the strategic sector ?**
- **What component of our research should be market facing?**
- **How do we create wealth in the society through innovation ?**

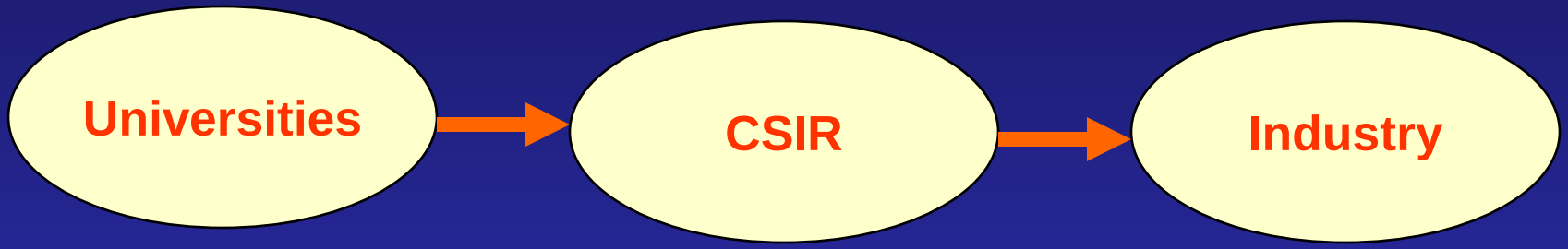
WHAT BUSINESS ARE WE IN?

- **Our business is to perform research and provide knowledge based services to fulfill stakeholder expectations**

- **These functions are , to differing degrees, performed by industry, public institutions of research and universities**

SO HOW DO WE DIFFERENTIATE OURSELVES?

WHERE DOES CSIR FIT IN?



- PI driven funda-mental research
- Problems tend to be narrowly defined
- Education is the primary goal
- Teaching and mentoring is a core activity of faculty

- Team driven multi-disciplinary research
- Problems need to be large and difficult
- Larger degree of application focus
- Long term needs of industry and society
- Education is an associate goal

- Team driven multi-disciplinary research
- Objectives business driven
- Focus – short and medium term

CSIR AS A NATIONAL ASSET

- **Largest concentration of inter-disciplinary talent in S&T**
- **Finest infrastructure for S&T in India : Land , buildings, research facilities, demonstration facilities etc**
- **Long tradition of scholarship and leadership in science and technology and has nurtured some our most distinguished scientists and engineers**
- **A great generator of human resources in S&T ; A significant percentage of India's S&T manpower must have been beneficiary of a CSIR-JRF or SRF !**
- **Generous public funding for R&D; most scientists do not need to write proposals and compete for funding**
- **Systems and procedures in CSIR are not too overpowering although scope exists for further simplifications**
- **In spite of many weaknesses, CSIR is still a good place to work, providing great freedom to scientists to express themselves in S&T**

LINKING SCIENCE TO SOCIETY

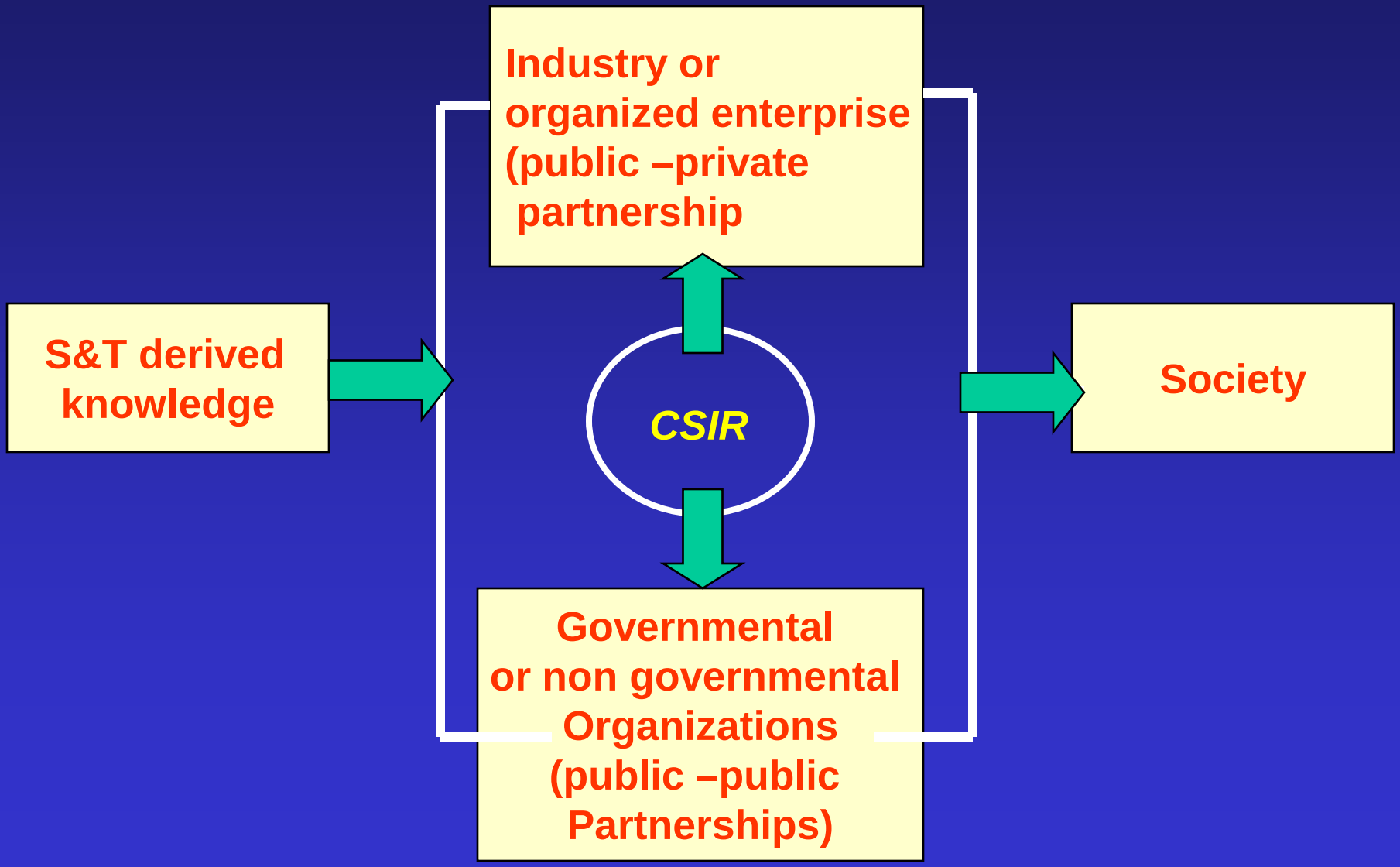
- **Learning to connect principles of science to the concerns of society ; emphasis on application and functions**
- **Balance breadth with depth, creation of knowledge with delivery of solutions to the stakeholders**
- **Integrate disciplines : Chemistry-biology, material science – physics, earth and atmospheric science and engineering**
- **Communication : ability to "sell" the solution, not merely "solve" the problem**
- **Globally competitive and yet be locally relevant**

STAKEHOLDER EXPECTATION : TRANSLATING RESEARCH INTO APPLICATIONS AND CREATING WEALTH (SOCIAL OR ECONOMIC) IN SOCIETY

RELATIONSHIP MODELS FOR REALIZING OUTCOMES

- **Conversion of knowledge into economic wealth requires partnership with industry or Government**
- **Innovative models of public / private partnerships need to be experimented with in CSIR laboratories**
- **In a similar vein CSIR needs to focus on several societal missions with renewed focus on delivery to the stakeholders where active partnership with "Social Entrepreneurs" could greatly help in diffusing and replicating technologies in different strata's of society**

PARTNERSHIP IS ESSENTIAL FOR S&T TO REACH THE STAKEHOLDERS

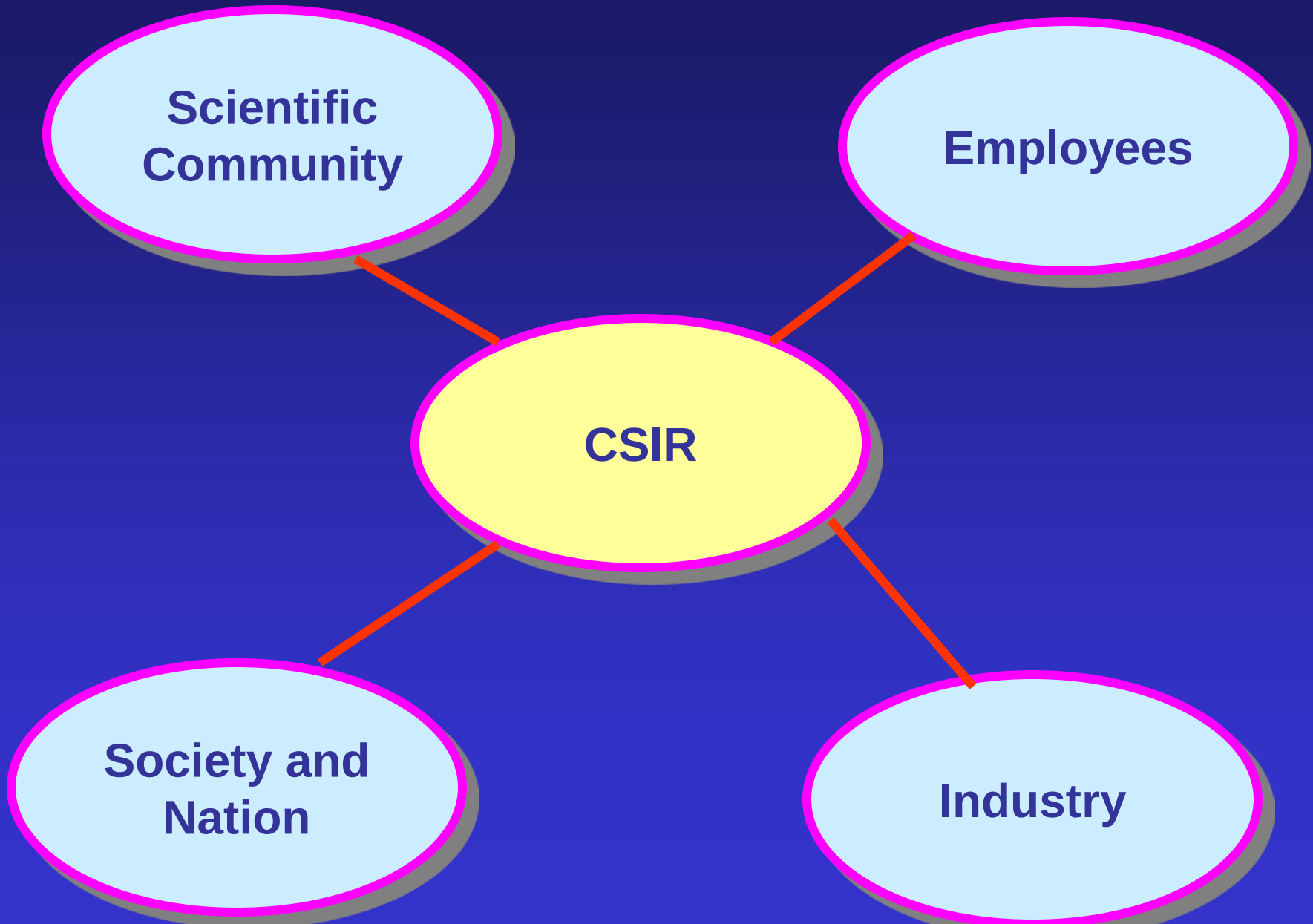


MINDSET CHALLENGE

- **Puzzles versus problems**
- **Interesting versus important**

CSIR has to solve problems which are important

CSIR's STAKEHOLDERS



PUBLIC, PRIVATE, SOCIAL AND STRATEGIC GOODS

- **Private goods and services : These are defined as goods and services where the consumption of that goods or service is rivalrous and exclusion feasible (for example, development of a process technology for a client under contract research mode)**
- **Public goods and services : These are defined as goods and services where the consumption of that goods or service is non-rivalrous and exclusion of others is infeasible (for example, generic knowledge published in books, scholarly journals etc.)**

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PUBLIC, PRIVATE, SOCIAL AND STRATEGIC GOODS

- **Social goods : These are defined as those goods and services that a society prefers to provide to the community (for example, creating science awareness among students, development of technologies for using local resource endowments to improve welfare of the disadvantaged)**
- **Strategic goods, services and technology options: These are defined as goods and services to meet national security need or other national needs / obligations for which no solution is available or accessible elsewhere. As also, goods and services developed in order to meet independence of indigenous industries from critical foreign supplies. Other examples are : Pre-competitive technology development aimed at breaking into unchartered technology domains or achieving leadership in selected technology domains or enhancing national prestige and standing**

CHARACTER AND COMPETENCE

Competence

Capability, efficiency, having sufficient skills to accomplish a defined goal

Character

The combination of attributes that define the nature of an organization

CSIR : CHARACTER AND COMPETENCE

Character

- **Collection of 37 laboratories with its own mission and stakeholder focus**
- **Loosely federal structure with high degree of functional autonomy**
- **Recent attempts to network diverse competence of the individual laboratories towards larger national goals have met with mixed success. To some degree, the very character of CSIR laboratories mitigates around top driven ordering of priorities or focus within CSIR**
- **However, this unique character of CSIR laboratories has its advantages in terms of nurturing high quality science, greater intellectual and operational freedom as well as encouraging strong leadership at the laboratory level**

CSIR : CHARACTER AND COMPETENCE

- **There is a need for greater focus on converting knowledge into wealth; new public-private partnership models, encouraging knowledge driven entrepreneurship, promoting a climate conducive to greater risk taking in R&D and greater innovation in fulfilling societal and strategic mission**
- **R&D intensity in several manufacturing sectors is outpacing CSIR. CSIR will need to move up the value chain to be relevant to industry in the years to come**
- **India will continue to be challenged by several societal problems. CSIR will be called upon to deliver solutions to these problems which, by their very nature, need to have high impact and visibility**

Substantial transformation of "competence" will be necessary, for CSIR to meet the emerging challenges in the R&D / S&T landscape,both, within India and globally

WHY DO WE NEED CSIR

- Leadership roles depend upon who we are and what we are trying to accomplish
- If there is ambiguity in role of CSIR , there is bound to be incoherence in leadership

One of the key responsibilities of leadership in CSIR and the laboratory is to articulate why we exist and who will miss us if we do not exist

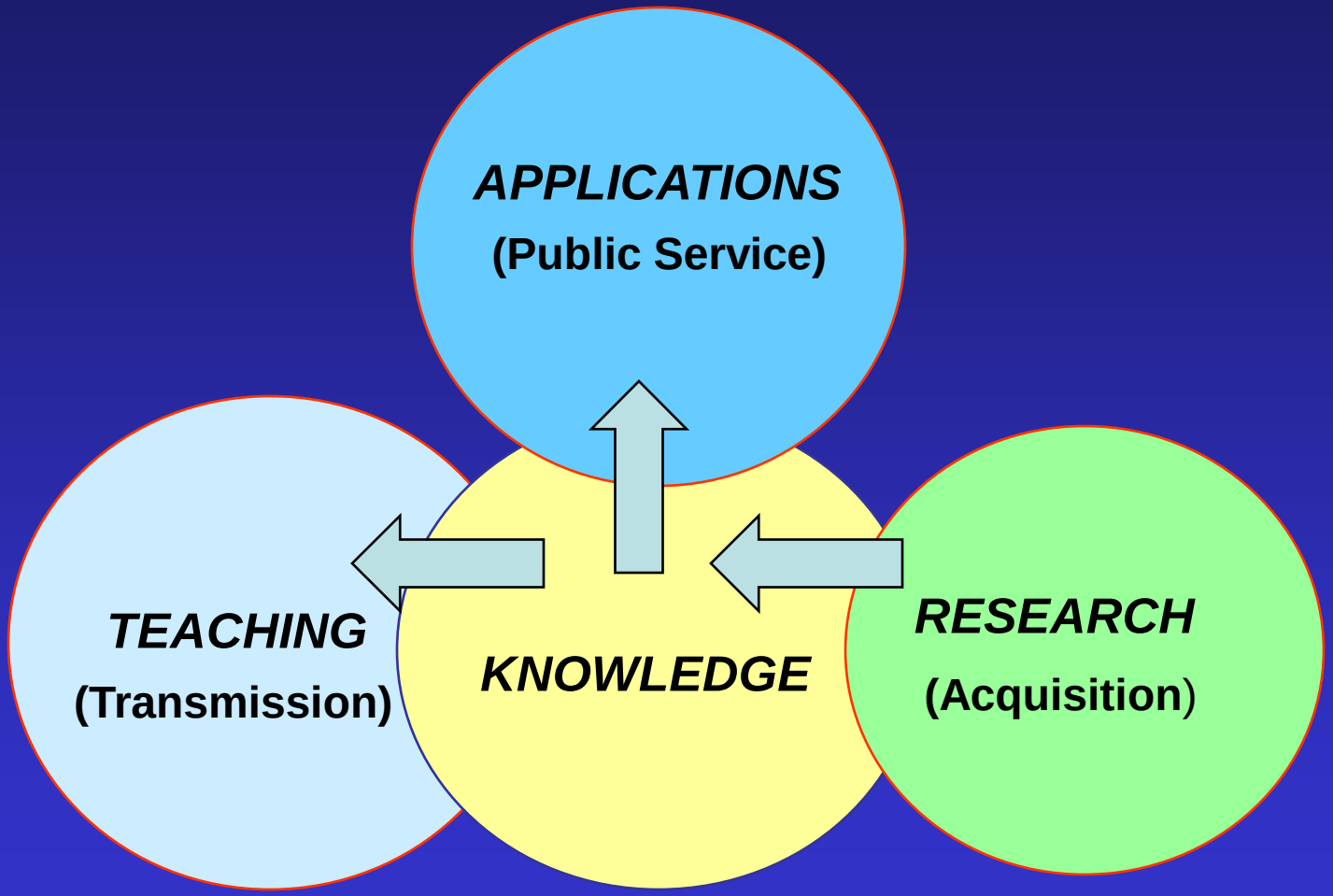
CSIR'S FUTURE VISION

- **Crossing Intellectual Barriers**
  - ***Use the best global bench marks***
- **Serving National Agenda**
  - ***Relate to the national agenda***
- **Innovating for Industrial Competitiveness**
  - ***Participate in the global knowledge economy***
- **Redressing National Shortfalls**
  - ***Remain socially relevant***

TO CREATE AN INSTITUTION WITH ENDURING VALUES OF EXCELLENCE DEVOTED TO ACQUISITION, TRANSMISSION AND APPLICATION OF KNOWLEDGE

Courtesy: Dr. T. Ramasami, Secretary, DST

COMPONENTS OF A KNOWLEDGE INSTITUTION



SCIENCE, TECHNOLOGY AND INNOVATION

- Scientists and scientific innovation
- Innovation organizations : New models
- Organizational challenges : CSIR
- Change management in public organizations

WHO IS A SCIENTIST ?

- **One who practices science as a profession**
- **Science can be practiced in universities, research laboratories, government departments, schools and colleges or industries**
- **One who invents or discovers irrespective of whether one works in an organized enterprise or not**
- **Science managers , administrators or bureaucrats**
- **Teachers, communicators, journalists, legal professionals**

Science : Is it for

- Pleasure ?
- Profit ?, or
- Pleasure and Profit ?

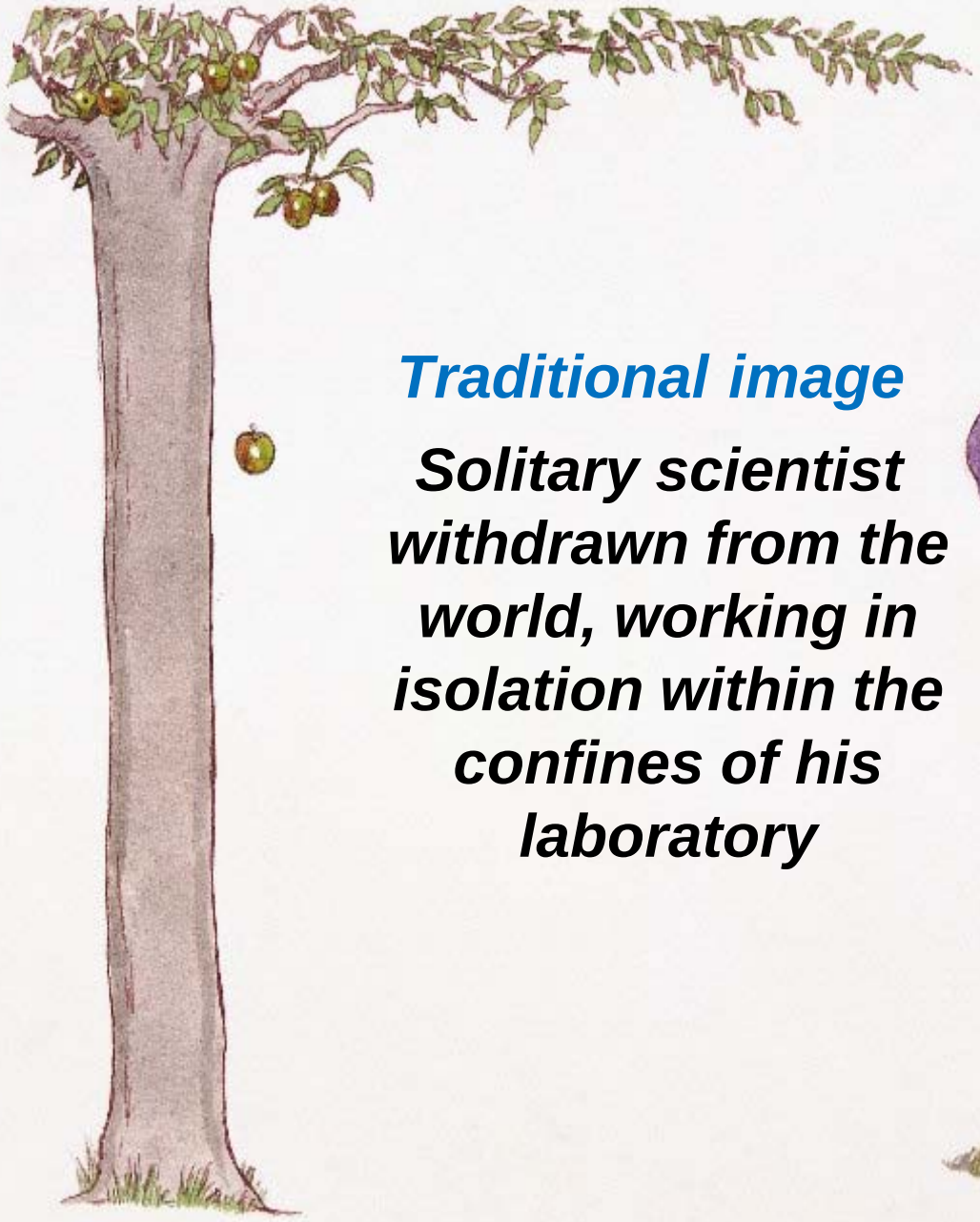
Does it benefit anybody ?
Is it worth the money spent on it ?
Is it directed at the right objectives ?
Is there too much or too little?
Is it too pure or applied ?
What are the rewards of research ?

As the world attains prosperity, science is taken for granted and is increasingly being questioned

SCIENTISTS : SOLO OR CONCERTED?

AH Cottrell The Listener 1960 Sept 13 411

- **The scientist, however, remote he may seem is bound closely to the scientific life around him. He cannot work in a vacuum. He, both, takes and gives in the scientific currency of his time.**
- **Keeping in touch is the thing and that means meeting as many people working in the field**
- **This is because science is at heart a progressive evolutionary subject and a collective endevour**



Traditional image

Solitary scientist withdrawn from the world, working in isolation within the confines of his laboratory

WHERE ARTS IS AHEAD…

Organizing scientific research on the scale of big operatic and theatrical production is still something new in science

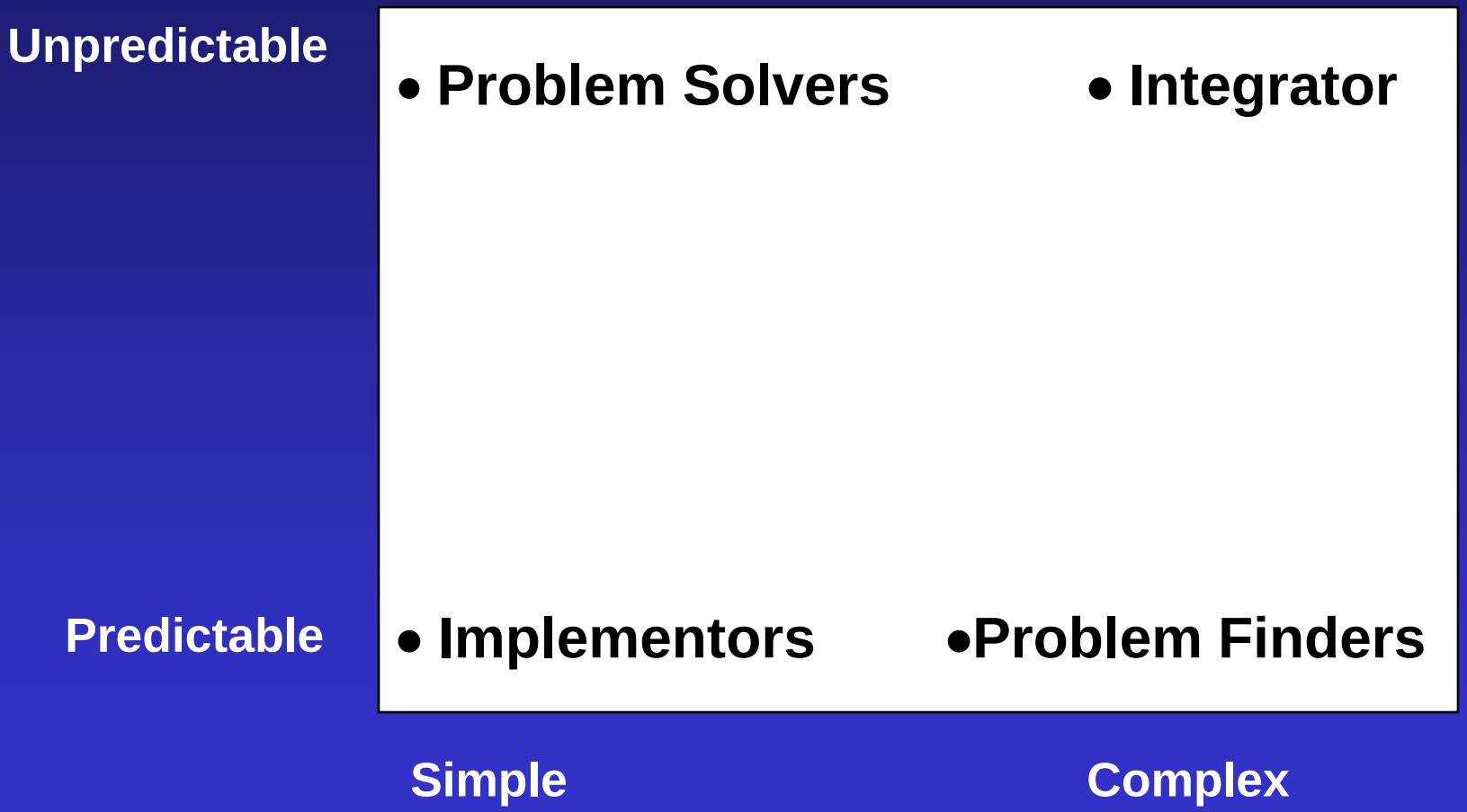
NATURE OF INNOVATION PROCESSES

- **Breakthrough or radical innovation**
  - **Knowledge intensive**
  - **Long term returns**
  - **High risk R&D**
- **Incremental innovation**
  - **Practice intensive**
  - **Short to medium term returns**
  - **Low risk R&D**

INNOVATION AND CROSSFUNCTIONAL TEAMS

- **Cross functional diversity provides multiplicity of ideas essential to creative thinking**
- **However, merely including a large number of functional areas in a team does not improve performance. While more ideas may be generated problem solving becomes difficult**
- **For a team to succeed, one must have a strong "superordinate identity" to the team. Often team members retain deep rooted functional allegiance**
- **Strength of interpersonal ties among team members influences innovativeness. High social cohesiveness a deterrent to innovation**
- **Close monitoring of activity is a powerful motivator for enhancing innovation**

ATTRIBUTES OF A INNOVATION TEAM



Roles range from creative generators of new ideas to coordinators who keep everyone working together

LEADERSHIP ROLE IN INNOVATION PROCESS

- **Leadership that is failure tolerant; views failure as complement to success, not opposite**
- **Leadership that is fully engaged in the innovation process; Focused on increasing organization intellectual capital**
- **Leadership that is collaborative, not controlling**
- **Leadership that is less evaluative, more interpretative**
- **Encourage communication; Create avenues for ideas to "bubble up"**

FAILURES OF VISION

1876 - ‘This “telephone” has too many shortcomings to be seriously considered as a means of communication.’ - ***Western Union internal memo***

1895 - ‘Heavier-than-air flying machines are impossible.’ - ***Lord Kelvin, President, Royal Society***

1899- ‘Everything that can be invented has been invented.’ - ***Charles Duell, Commissioner of the US Office of Patents***

Contd…..

FAILURES OF VISION

1920 - 'The wireless music box (radio) has no imaginable commercial value. Who would pay for a message sent to nobody in particular?' - *David Samoff's associates, in response to his urgings for investment in the radio*

1943 - 'I think there's a world market for maybe five computers.' - *Thomas Watson, chairman of IBM*

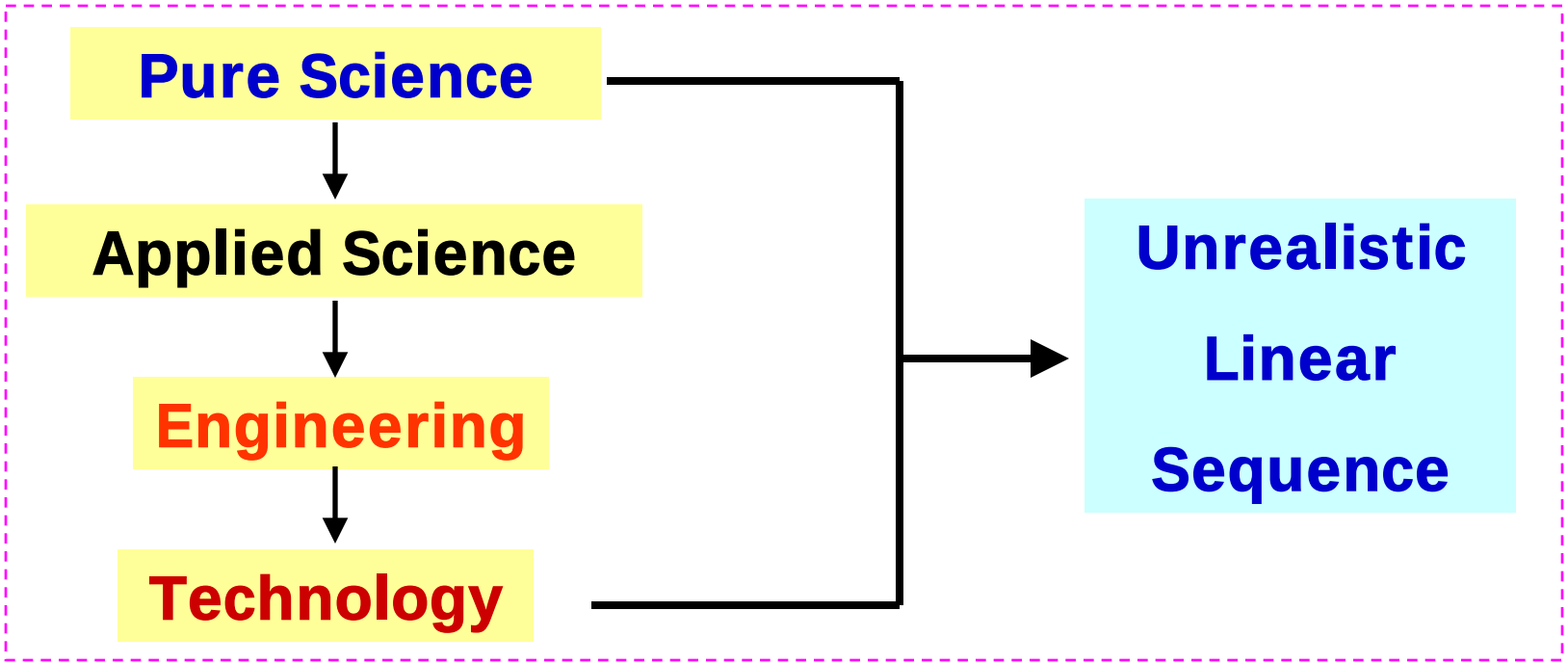
1949 - 'Computers in the future may weigh no more than 1.5 tons.' - *Popular Mechanics*

1977 - 'There is no reason anyone would want a computer in their home.' - *Ken Olson, president, chairman and founder of Digital Equipment*

1981 - '640K ought to be enough computer memory for anyone.' - *Bill Gates, chairman of Microsoft*

Innovations that last and that don't

- **A Pencil, invented in 1761 by Faber Castell is still in use; 20 million pencils are made every year.**
- **How do you bring about innovation in a pencil ? Can you make an unspectacular product spectacular ?**
- **Match sticks, candle are other examples of inventions that have lasted**
- **Inventions that have not lasted : Slide rule, calculator, typewriter, drawing instruments, recording tape, photographic film.**



Science by itself provides no panacea for individual, social and economic ills. It can be effective in national welfare only as a member of a team. But without scientific progress, no amount of achievement in other directions can insure our health, prosperity and security.

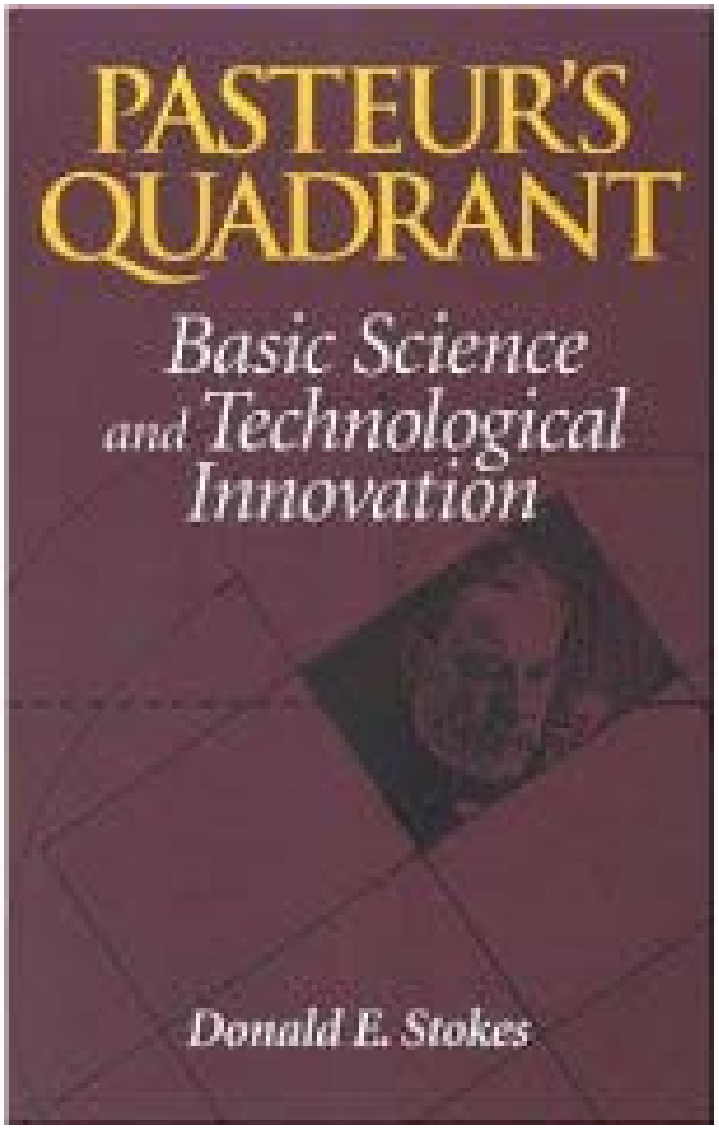
Vannevar Bush

"Endless Frontiers" -1946

THE NON LINEAR PROCESS : SEAMLESS INTEGRATION OF RESEARCH AND INNOVATION

- **Research : ideas, concepts, principles, techniques, theories (*Discover)***
- **Translation : proof of concept, connecting solutions with needs, validation (*Develop*)**
- **Defining the customer and his needs (met or unmet) and cost –performance targets, prototype or pilot plant development, customer acceptance, business plan, investment and economics *(Demonstrate)***
- **Marketable Product *(Deploy)***

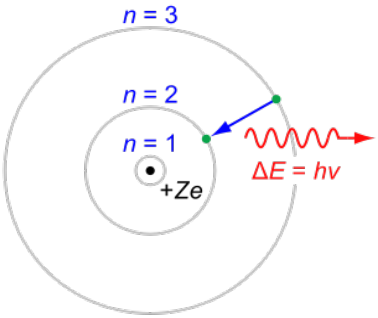
Success in the laboratory does not always translate into success in the market place


PASTEUR'S
QUADRANT
Basic Science
and Technological
Innovation
Donald E. Stokes

1997

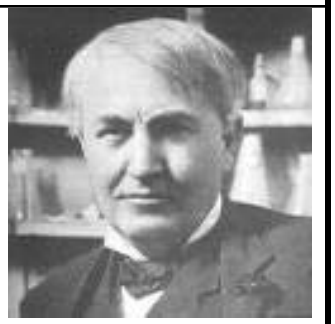
Pasteur's Quadrant

Bohr



Pasteur

Average
Academic
and
Industrial
R & D



Edison

Fundamental Research

Use Inspired Research

INNOVATION : THE INDIAN CHALLENGE

- **Mindset not oriented towards problem solving**
- **Institutions are predominantly resource driven**
- **Distance from markets and users**
- **Technology management capabilities**
- **Weak institutional mechanisms for technology transfer, IP licensing etc.**
- **Weak “investment ready” technologies**
- **Weak supporting eco systems**
- **Missing incentives and recognitions**
- **Inadequate risk takers , both, in industry and academia**

MINDSET FOR TECHNOLOGY INNOVATION

- **Willingness to invest in risky projects**
- **Persistence to build capabilities**
- **Tenacity to stay in the midst of failures and obstacles**
- **Capability to manage all the above in a systematic way**

BARRIERS TO KNOWLEDGE DRIVEN INNOVATIONS

- **Cultural barriers (knowledge is free, making personal wealth out of knowledge is not right, separating the goddess of knowledge from the goddess of wealth in the Indian pantheon of gods)**
- **Unable to look into the eye of business partner; tendency of academic community to assume a high pedestal**
- **Immaturity of markets and risk averse**
- **Inability to connect basic discoveries with potential applications**
- **Weak innovation eco systems (mentoring, venture and angel funds)**
- **Peer recognition systems heavily biased in terms of abstract academic research; not enough incentives for individuals who wish to translate science into products and services**

CHANCE OF SUCCESS

- **Long years of preparation**
- **A timely reading of a book or paper**
- **Repeated failures**
- **Conversation with a colleague**
- **Periods of indolence**
- **Ambition and courage**
- **Longevity**

Concept of "divine" revelations in science is a myth. Archimedes (Buoyancy), Newton (Gravity) and Kekule (structure of benzene) discoveries were products of deep thoughts, not casual occurrences

LUCK AND SERENDIPITY

- **In science, unlike in sports there are no absolute winners and losers**
- **Success in science means many things to different people; also success has many levels**
- **Chance and circumstances, often lead to great discoveries**
- **However, chance always favours the prepared mind. If there is no fuel, there can be no fire.**

Life is a journey, not a guided tour. In this journey there are no winners or losers, only survivors

SCIENTISTS: EXPECTATIONS, VALUES ATTITUDES AND MOTIVATION

- **Scientists, in general , are oriented towards things, not people, possess poor social skills, are comfortable with things that they can measure and control, are introverted and show diminished loyalty to employers**
- **Scientists generally shirk administrative responsibilities, are critical of administration and have a pathological aversion to bureaucracy. Bureaucracy (noun) is defined as any system of administration in which matters are hindered by excessive adherence to minor rules and procedures**
- **Their psychological needs are focused on achievement, peer recognitions, professional growth, freedom to choose a problem to work on and a hassle free environment**
- **Scientists like to innovate, are not afraid to take risks and are challenged by the new**
- **Scientists are averse to hierarchy, are good communicators and can collaborate if they find value in team work.**

LESSONS FOR SUCCESS: WHAT DISTINGUISHES A GREAT SCIENTIST FROM A GOOD SCIENTIST ?

- **Choose a problem ahead of its time, not because it is fashionable; Big challenges are truly ahead of their time**
- **You have to say either the first word or the last word in science to be noticed**
- **Never be the brightest person in a room; In science, it is better to be criticized than adored ! Getting out of intellectual rut requires jolts. If there are more smart people around you, smarter you will become**
- **Stay in close contact with your intellectual competitors competition is inevitable, if you are pursuing important objectives. To know who else is tackling similar problems as you are is an indication of how important the problem is**

LESSONS FOR SUCCESS: WHAT DISTINGUISHES A GREAT SCIENTIST FROM A GOOD SCIENTIST ?

Contd….

- **Work with teams where intellectual partnership is equal**
- **Always have some one to save you. Build a network of well wishers, mentors, men of consequence and angels. In spite of all your accomplishments, you will always need a helping hand as you climb the ladder.**

JD Watson, 1970

WHY SHOULD SCIENTISTS IN PUBLICLY FUNDED INSTITUTIONS BE INTERESTED IN TRANSLATING SCIENCE INTO PRODUCTS AND SERVICES

- **Institutional compulsions**
- **Challenge of bringing good science to the market**
- **Becoming rich**
- **Altruism or doing good for the society which nurtured them; desire to act as agents of change in society**
- **Creating wealth at the bottom of the pyramid**
- **Self actualization and growth motivation (highest in the hierarchy of human needs according to Abraham Maslow)**

At the end of the day, every scientist has this yearning for having been useful

TEN REASONS WHY A CAREER IN SCIENCE IS REWARDING

- **Freedom to choose your directions**
- **Reinventing oneself throughout one's career**
- **Participating in discovery and inventions**
- **Being a part of a global community**
- **Opportunity to travel and enjoy periods of indolence**
- **Staying young forever**
- **Many measures of success**
- **Be your own boss**
- **Doing some good to your fellow humans**
- **Scholarship**

R. D. Vale, 2010

Do you wish to work for a living of live for working?

SCIENCE IN THE 21st CENTURY

- **Blue skies vs Directed Science**
- **Small vs Big Science**
- **Individual vs Team Science**
- **Curiosity driven vs Grand Challenges or Utilitarian Science**
- **Open access vs Intellectual Property**

RESEARCH ENTERPRISE : COMPLEXITIES

- **Individual or solo research**
- **Collaborative research**
- **Mission driven research**
- **Research leading to IP**
- **Research leading to products and prototypes**
- **Research aimed at societal needs**
- **Teaching , mentoring and communication**

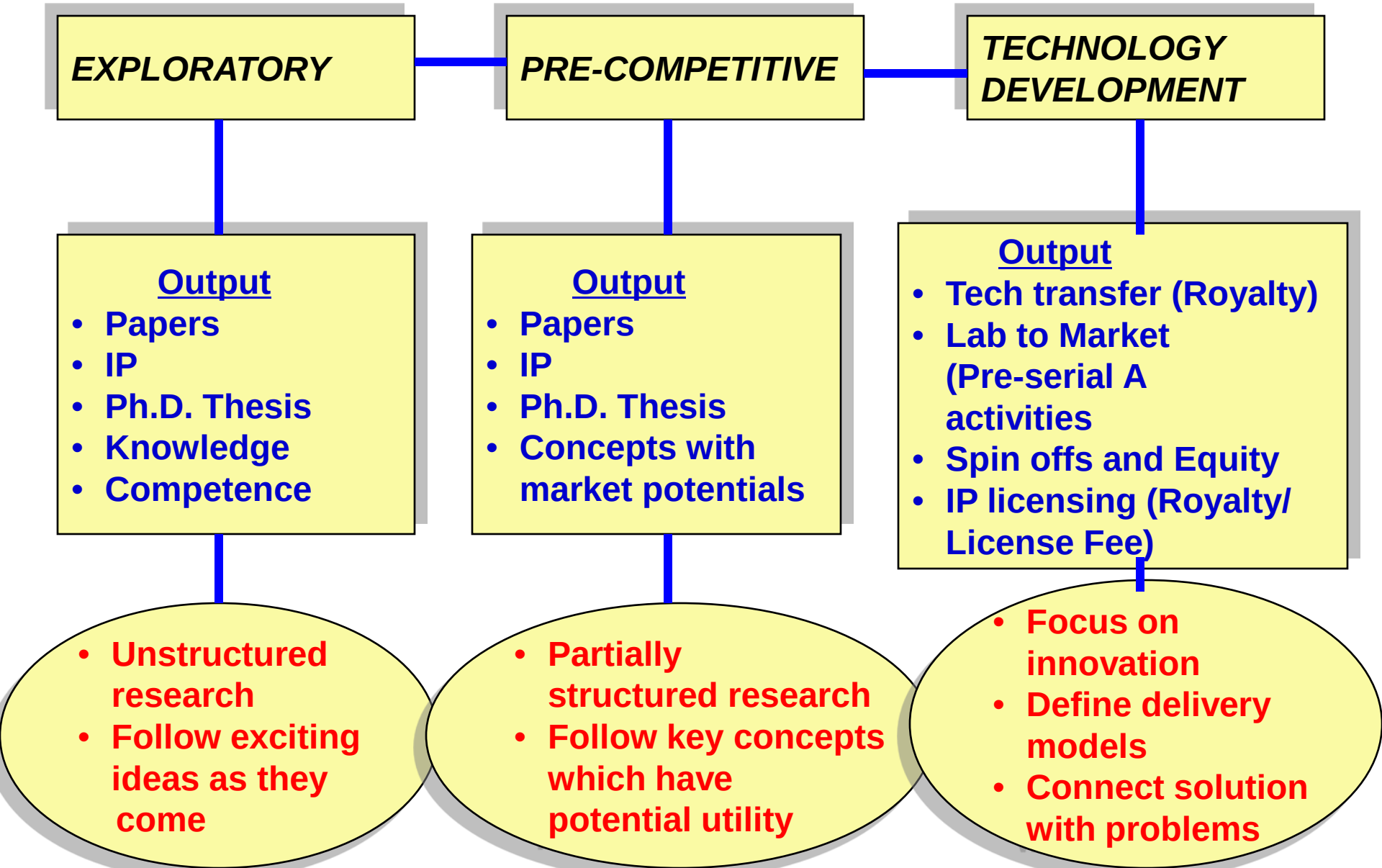
SCIENCE → SOLUTIONS → MARKETS

- **Desirable**
- **Feasible**
- **Viable**

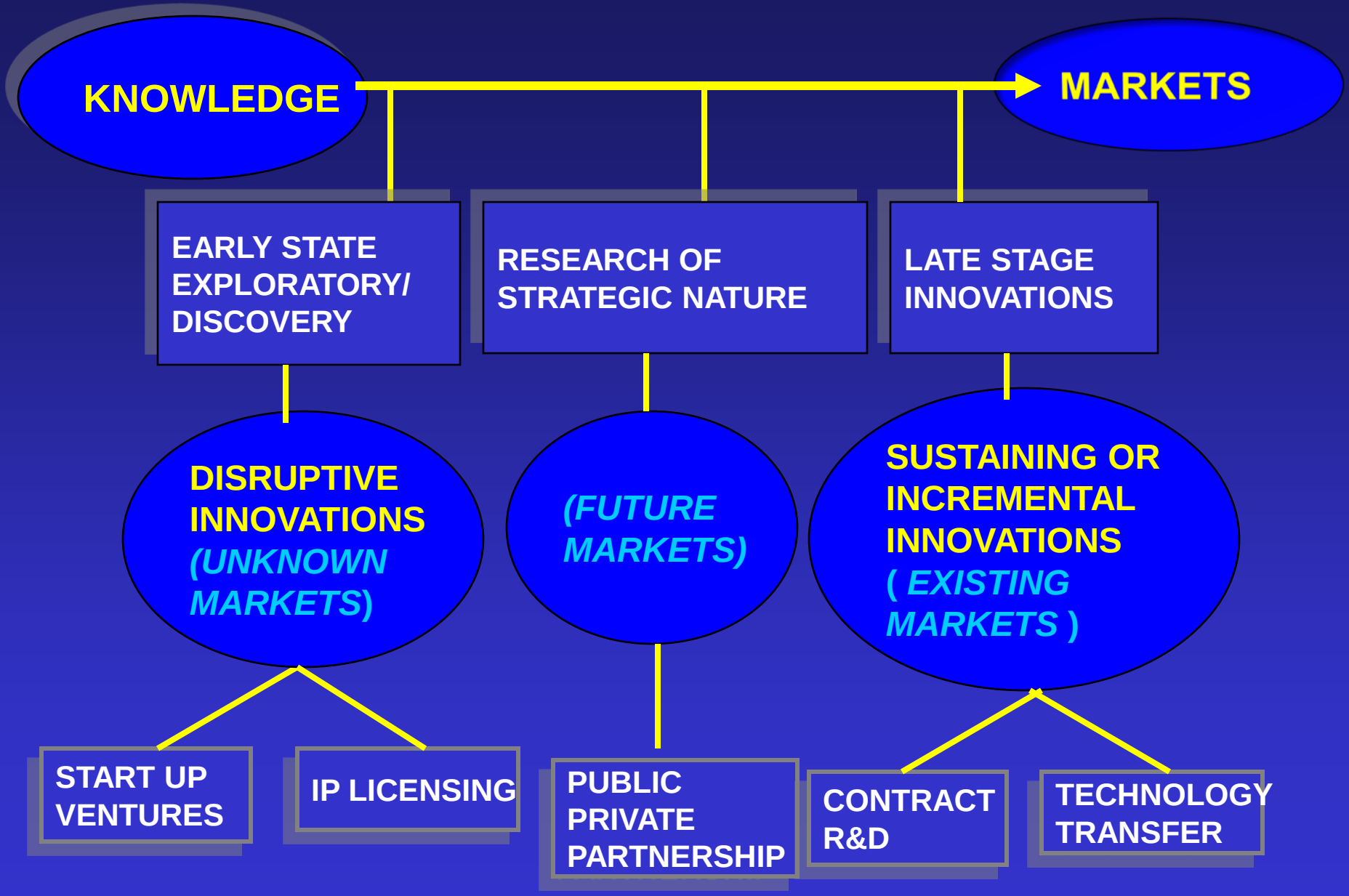
The most important thing in science is not so much to obtain new facts as to discover new ways of thinking about them

William Bragg

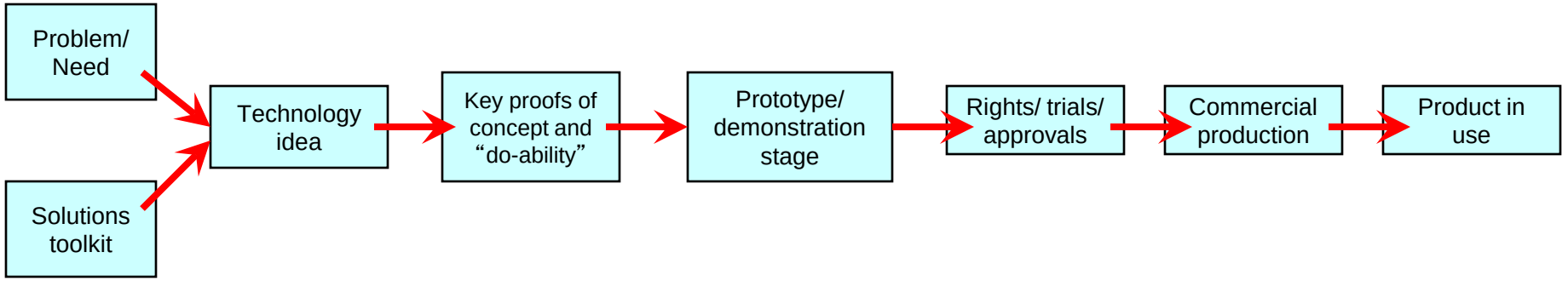
NATURE OF RESEARCH



LINKING KNOWLEDGE TO MARKETS



Technology Innovation: A simplistic model



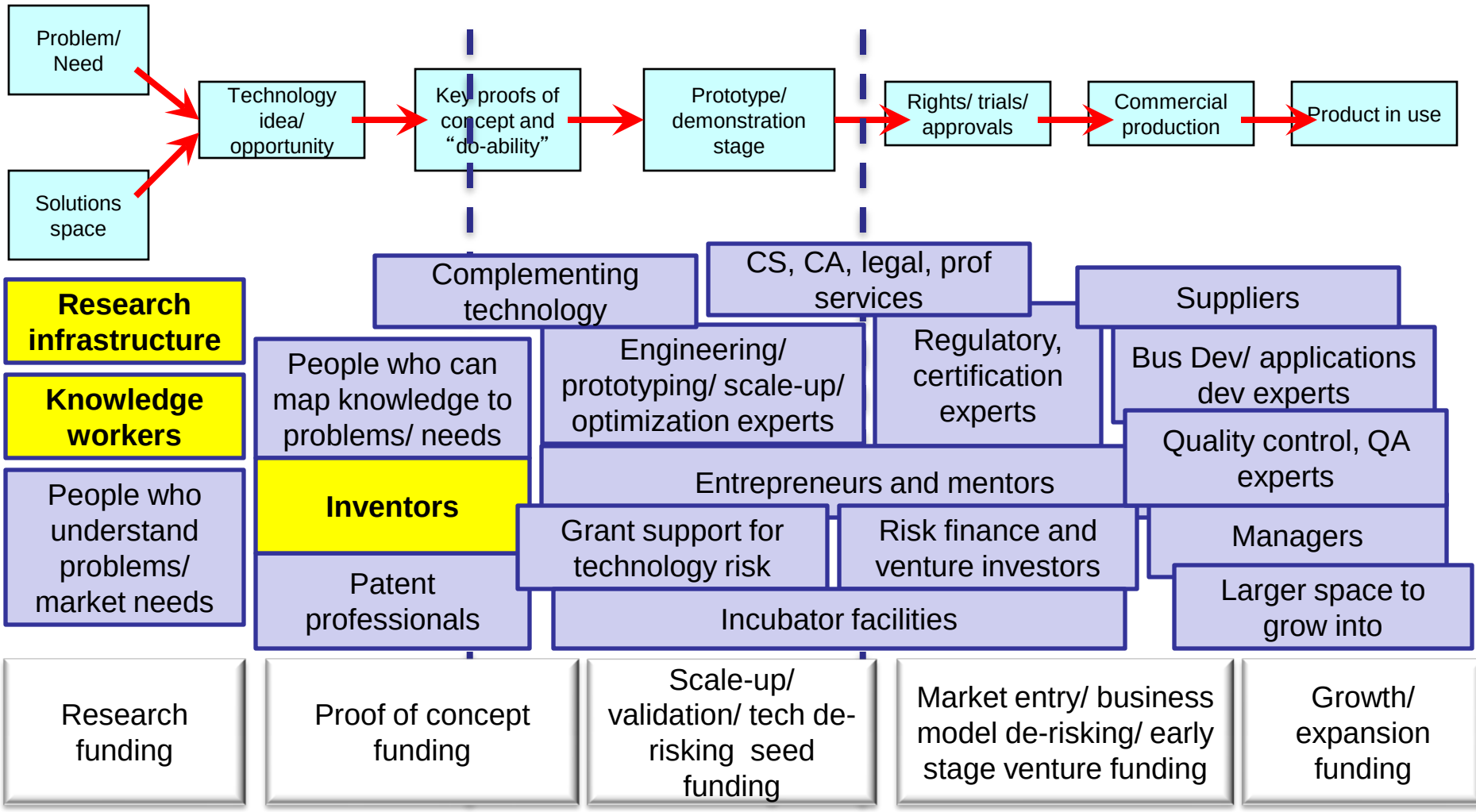
Invention

80% of work, time, investment

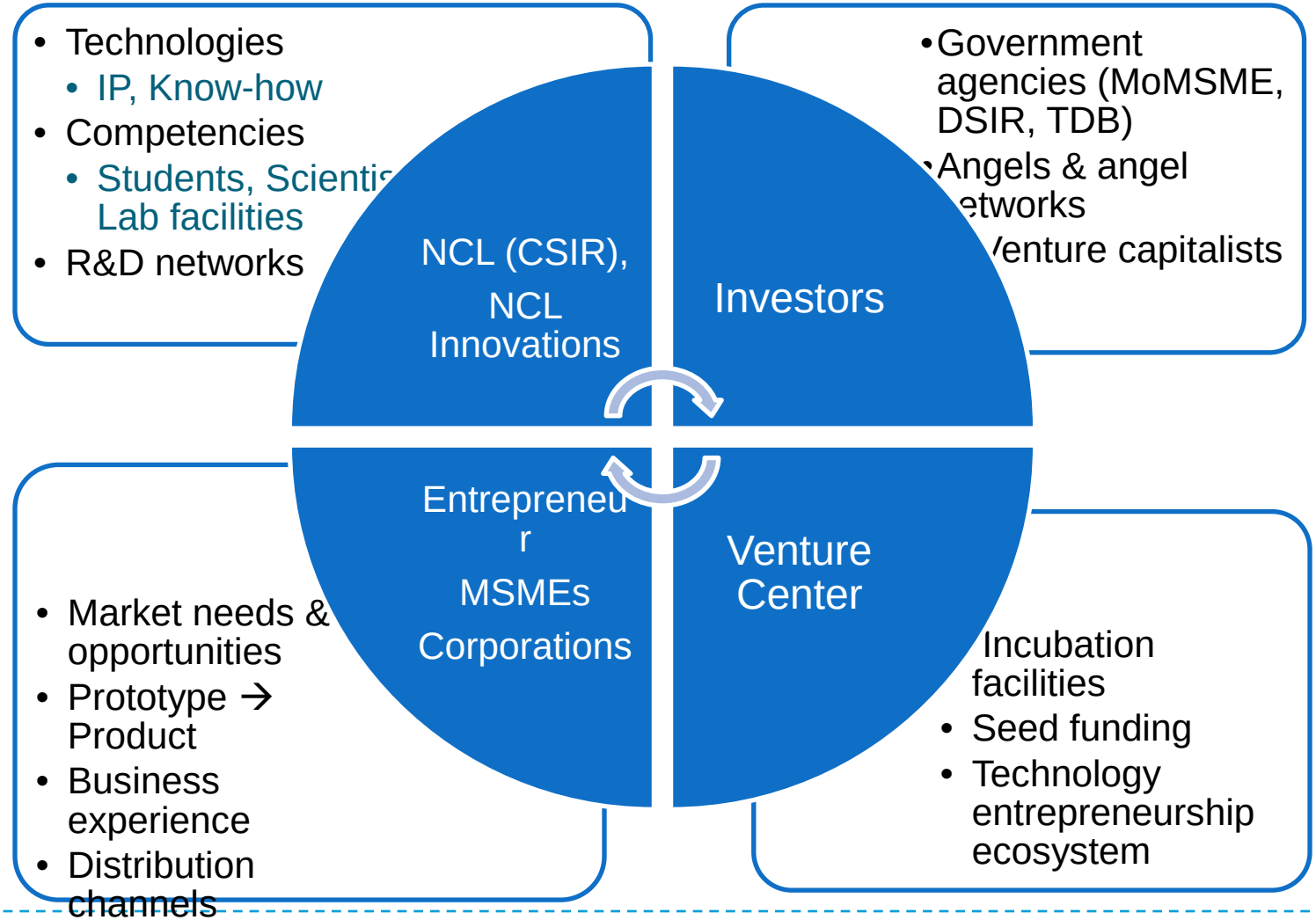
All the inventions that are remembered have successfully navigated this process!

Innovation is 80 % perspiration, 20 % inspiration !

Technology commercialization – The ecosystem



Technology Commercialization v2.0

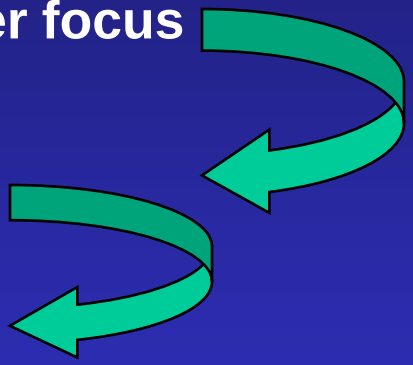


EMERGING TECHNOLOGIES : THE ERA OF START UPS

- **Bio-fuels**
- **Biomass derived chemicals and materials**
- **Biotechnology, diagnostics and biomedical products**
- **Electric vehicles and batteries**
- **Solar energy**
- **Fuel cells**
- **Flexible and molecular electronics**

CSIR-STAKEHOLDER INTERACTIONS : TOWARDS EVOLUTION OF NEW MODELS

- **The transactional model : Little or no stakeholder focus**
- **The relationship model : stakeholder satisfaction**
- **The partnership model : stakeholder success**



SOME USEFUL LESSONS

- **Learn to walk the last mile**
- **Putting the team together and energizing the team**
- **Patience , perseverance and failure tolerant**
- **Who gets the glory and who gets the blame**
- **The role of a champion; the leader as a champion**
- **Going beyond the written contract**
- **Passion to succeed; Are you ready to stake your reputation?**

Science is an individual effort; technology is a collective endeavor

Knowing is not enough; we must apply. Willing is not enough; we must do : ***Goethe***

MAJOR FORCES INFLUENCING GLOBAL ECONOMY

- **Shift from information to knowledge**
- **Shift from hierarchies to networks**
- **Local/national to transnational**
- **Competitive to collaborative strategy**

EMERGING MODELS OF INNOVATIVE ORGANIZATIONS

- **From hierarchal or linear to distributed networks**
- **Fluid network of many interacting parts, with many nodes, but no singular leader**

Leadership will need skills to create partnership, govern loose networks and lead by influence rather than control and command

THE STARFISH ORGANIZATION (The Starfish and the Spider : The Unstoppable Power of Leaderless Organizations by O. Brafman and R.A.Bckstrom

- **Being small gives competitive advantage**
- **Communities of networks creates better value of human resources**
- **Creativity thrives in chaos; order and structure squelch creativity**
- **Knowledge is spread throughout the organization; the best knowledge is at the fringe of the organization**
- **The spirit of sharing thrives; everyone wants to be a contributor**
- **In a starfish organization, people will do what they will do; the role of management is to connect people and ideas**

If you cut off a spider's head, it dies; but if you cut off a starfish's leg, it grows a new one .Traditional top down organizations are like spiders

RESEARCH AND DEVELOPMENT

- R&D, by its very nature, is an activity that is aimed at generating new knowledge, testing hypothesis about how matter in the physical or chemical world act and react, and in general, providing answers to observations in nature and in systems in that part of our life to which they pertain.

- The uncertainties of outcome of research, the difficulties in measuring the impact of research and the differences in the expectations , values , attitudes and motivation of scientists from those of other employees are some of the distinguishing features of this profession

- R&D institutes are rather peculiar places – professionally questioning and argumentative communities where every one has an opinion; and issues tend to generate heat in inverse proportion to their importance

CSIR AS AN ORGANIZATION : THE FUTURE VISION

- Whom do I work for ?
- Doing things right vs doing the right things
- Process vs results
- Silo vs matrix
- Team vs individual
- Action vs consequence
- Wheels vs motion
- Taking a stand vs reaching a consensus

CHANGE MANAGEMENT IN GOVERNMENT

- **The operative rules and procedures in government are less flexible**
- **In government penalties of failure are always greater than rewards for exceptional performance**
- **All actions in government are conducted in a 'fishbowl' and almost every initiative is bound to meet with someone's disapproval**
- **Span of leadership is generally short leading to discontinuity**
- **In government positions of leadership are not necessarily chosen based on qualities of leadership. More often these appointments are based on individuals command of policies, contribution to science or political connections**

CHANGE MANAGEMENT IN GOVERNMENT

- **Most employees generally feel estranged from a government organization's strategy and mission. Employees have poor understanding of how their individual or collective efforts affect the organization's performance. As they lose sight of the overall mission they come to care only about those things that they can directly control, like protecting their own turf**
- **Employees often stay in the organization for a long time, typically much longer than the leaders. This is both a liability and an asset**
- **Key tasks of a leader : Formulate a vision; be aware of present realities; develop a broad base of support internally; set a clear path; respect the complexity of what you are attempting; hold people accountable for both results and commitment to the change effort**
- **Bureaucrats respect barriers; leaders have to find ways to go around barriers**

Be a leader , not a bureaucrat

A man who dies without enemies is a man who has changed nothing and most probably contributed to little in his life time

Walter Murdoch

(1874-1970)

CSIR : ORGANIZATIONAL CHALLENGES

- **Shift the focus from inputs and outputs to outcomes**
- **Promote cross functional interactions; Foster virtual teams with common goals cutting across divisional boundaries; Spread the word that teams win, not individuals**
- **Learn from failures and successes; understand the past, redesign the future**
- **Attract and encourage great people to achieve**
- **Generate greater value out of existing assets**
- **Create greater focus on the stake holder**
- **Build infrastructure for high quality research**
- **Create a performance driven and result oriented organization**
- **Maximize the use of IT in everyday functions of the Laboratory to improve the comfort levels of the scientists**
- **Promote organizational learning through community building and communication**

ORGANIZATIONAL TRANSFORMATION: THE CHALLENGES

- The Purpose : Organizational goals; why do we exist ? Who will miss us if we do not exist ?
- The Incentives : Bureaucracy gives powerful incentives to follow rules; status quo brings steady rewards; innovation can only bring trouble; employees are paid the same irrespective of what they produce

ORGANIZATIONAL TRANSFORMATION: THE CHALLENGES

- Accountability : Whom are you accountable? Are you accountable for following rules are accomplishing results ?
- Control : Bureaucratic systems tend to be hierarchical; power is concentrates at the top; Government employees respond to orders rather than to the needs of the stakeholders

ORGANIZATIONAL TRANSFORMATION: THE CHALLENGES

- Culture : Values, norms, attitudes , expectations of employees; Bureaucratic systems use detailed specifications – functional units, procedural rules, job descriptions to mold what employees do; employees trend to become reactive, fearful of taking initiatives and create a culture of fear, blame and defensiveness

It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change.

- *Charles Darwin*


The Journey Continues .....
Still many more miles to go .....