



A Tutorial on Building the Competence to Innovate for “Make in Global India” Initiative



Future of Life... on earth...

A crisis as life-altering as the coronavirus pandemic naturally inspires speculation about how it will change everything.

These are days definitely to be silent, keep quiet and introspect.

Let us understand ourselves.

We also got to learn that human desire to overpower, avariciousness to dominate people and land, desire to rule the universe comes to nothing in front of a nano-virus which stealthily takes just seconds to vanquish the whole humanity!



Future of Life... on earth...

Starting from a wet market in China's Wuhan (or maybe a nearby Lab), the novel coronavirus has reached the remotest corners of the world.

The impact it has had and continues to have on each and every aspect of our life is in fact beyond words.

We may not yet know how this story ends, but we already know for sure that this pandemic has brought the greatest reversal of our times, turning the world along with its wisdom on its head...

This is our freak chance to unlearn and learn. Let's not blow it.



Future of Life... on earth...

It has been observed that the **technologies** developed by human beings in the last 2-3 centuries have had a major impact on the **earth's climate** and our **nature's equilibrium**.

Some believe that we have reached a point of no return. This can have a huge impact on **life on earth**, especially on the **human species**.

However, while **technology** has been responsible for most of it, **technology** also seems to have a **solution** for it.



Disruption – the New Normal...

"PeaceMaker", the ironically named advanced nuclear missile that emerged from the US' arsenal during the cold war, with the ability to carry 10 independent payloads, each of which was 20 times more powerful than the first nuke dropped on Hiroshima, changed the future of warfare forever.

This incident indeed created the worst carnage known to mankind and made every weapon used until then obsolete.

It changed the fundamental principles of warfare and is to date deterring humanity from plunging headfirst into another World War.

Likewise, this pandemic is going to have profound and everlasting impact on how the human race evolves in the post covid-19 era.



Disruption – the New Normal...

Today, management of large organizations, startups and Governments alike, face the same challenge that Roosevelt did during the Cold War.

Will your organization today approve a radical idea, allocate funds and be the early adopter amidst a crisis?

Or, will it stay stuck in the labyrinth of your legacy and perish?

The global business dynamics is going to witness a sea of change in the coming times.



narnix

designing with secure n sustainable dna

©narnix 2020

Disruption – the New Normal...

As Prof. Clayton M. Christensen, the scholar who introduced the Disruptive Innovation theory says:

Disruption is a process, NOT an event... and Innovation can only be disruptive relative to something else...

Are you going to be an Innovator, Early Adopter or a Laggard?



Crisis often begets opportunity...

The global business dynamics is going to witness a sea change in the coming times.

All nations are now delving on their exit strategies from China and becoming self-reliant...

Today, the world is in pursuit of new business models. India, a youthful nation known for its innovative zeal can take the lead in providing a new work culture.

India, with the right blend of the physical and the virtual infrastructure can emerge as the global nerve centre of complex modern multinational supply chains in the post COVID-19 world.

Can our Engineers rise to the occasion and seize this opportunity?



“Innovation led Design; Design led Manufacturing”

seems to be the only way forward to break this impasse

If India wants to be a serious player in this competition – while also fulfilling perennially urgent goals of boosting manufacturing and creating jobs – a number of fundamental changes in policy and mindset are necessary.



Towards ATMANIRBHAR Bharat...

This building of self-reliant India will stand on 5 pillars-

- ❖ **ECONOMY** – that brings quantum jump rather than incremental change.
- ❖ **INFRASTRUCTURE** – that becomes the identity of modern India
- ❖ **Our SYSTEM** – that's technology driven
- ❖ **DEMOGRAPHY** – our source of Energy, and
- ❖ **DEMAND** – harnessed to its full potential.



Make in India to Make in Global India

“Conceived, Designed & Manufactured in INDIA for the World”



narnix

designing with secure n sustainable dna

©narnix 2020

National Technology Day – 11 May...

On this Day, our nation salutes all those who are leveraging science & technology to bring a positive difference in the lives of others.

We remember the exceptional achievement of our scientists on this day in 1998 when they successfully carried out nuclear tests at Pokhran.

Last month, India celebrated its 29th National Technology Day. The day acts as a reminder of the country's technological advancements..

National Technology Day holds a great importance because on this particular day, India achieved a huge technological progression. It was a landmark moment in India's history.



narnix

designing with secure n sustainable dna

©narnix 2020

RESTART...

The theme of The National Technology Day this year was

“Rebooting the Economy through Science, Technology and Research Translation”

Operation “RESTART”

Mission “Make in Global India”



narnix

designing with secure n sustainable dna

©narnix 2020

an engineer defined

An engineer is a person who passes as an exacting expert on the basis of being able to turn out with prolific fortitude infinite strings of incomprehensible formulae calculated with micrometric precision from the vague assumptions which are based on debatable figures taken from inconclusive experiments carried out with instruments of problematic accuracy by persons of doubtful reliability and questionable mentality for the avowed purpose of annoying and confounding a hopeless chimerical group of fanatics referred to all too frequently, as engineers.....



The Engineer – an enabler of Change...

An engineer is an enabler of change.

He is equipped with the ability to take society's grand vision or magnificent concept and literally make it work.

In a world of increasing unpredictability, the role of the engineer assumes a critical level of significance.

The days of the ivory-tower, academia-bound engineer, are over.

The engineers of today and the future must acquire more than a nodding acquaintance with the concept of sustainability in all its aspects – social, environmental and economic.



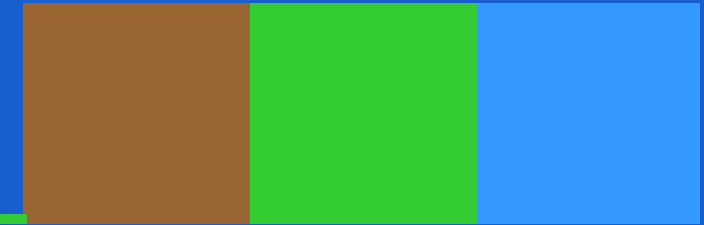


“Technology is anything
that wasn't around when
you were born”

Alan Kay



The Most Profound Technologies...



*The most profound technologies
are those that disappear...*

*They weave themselves into the
fabric of everyday life until they are
indistinguishable from it...*



Disruptive Technologies

- ❖ Disruptive technology is the bearer of tremendous opportunity and equally, a harbinger of obsolescence.
- ❖ Technology's impact on society and business is substantial, if not underestimated.
- ❖ Though product cycle times are accelerating, the underlying technologies unfold over many years.
- ❖ Within each trend there are multiple enabling technologies, all at various stages of maturity and adoption.



Innovation – Improving Lives

Indians have played a major role in bringing Innovations to the world to improve lives of its inhabitants from times immemorial...

be it from the times of **Aryabhatt** who introduced the world to the power of ZERO or in recent centuries scientists like C. V. Raman, Satyendra Nath Bose and many many more...



Amar Bose - the global Minister of SOUND

- ❖ The wizard of SOUND, who revolutionized SOUND.
- ❖ The engineer, who changed the way the world listens to music.
- ❖ He showed the world, how forefront academic research can spawn a global corporation, and how science can directly change our lives.
- ❖ Bose Inc. has been very aptly called the “**Apple**” of the Audio world.
- ❖ He went into business so that he could do interesting things that hadn't been done before.
- ❖ Can we have a few more engineers like Amar Bose.
- ❖ Do we Indians have it in us?
- ❖ Is our Education System conducive to Innovation?



INNOVATION...

Everybody is harping about
INNOVATION!!!

Some say, Innovation is the KEY to
India's rise in Electronics on the Global
Arena.

*But, HOW DO WE INNOVATE WITHOUT
the "COMPETENCE TO INNOVATE"???*



PASSION...

Passion is everything. You give that one emotion to anything and you are bound to excel.

Passion helps you enjoy the journey as much as achieving the goal!

Passion is the lever that helps lift the mundane to extraordinary, the mediocre to excellent.



PASSION...

How do you know what you are passionate about?

Ask yourself and you will know!

Anything that you love doing or which makes you happy!

The most successful people are those who are able to select careers matching their passion!

However, in an age of intense competition, everything gets reduced to numbers.

Maybe things are easier to understand when they are presented as data that can be compared favorably or unfavorably to something else.

So facts and records become far more important than the effort and passion that went into achieving them.



The Root Cause...

Unfortunately, education too has been reduced to a game of numbers.

At the end of school years, all you are worth is the score you achieved at the Board Exams! It doesn't matter how passionate you were about your studies or how you gained mastery over an aspect that particularly intrigued you!

Education system in India over the time has become "Qualification Oriented" rather than "Knowledge Oriented".



The Root Cause...

Unfortunately, the key focus of education has shifted to providing & acquiring qualifications, which are expected to get you, placed in reputed and/or global organizations.

It might be the fact that higher education is about critical combination of Fundamental Research & Applied Research that leads to design of new technology solutions and to some extent identifying new skills or barring the skills.

The Indian heritage script on historical places is one of the examples.

It would be better to restore or develop the earlier values in such a way so as to meet the requirements of the society at global level.



Building Knowledge Economy & Society

Our Education system needs to move to a paradigm of comprehensive & inclusive Learning based education, particularly in the Higher Education Institutions.

Once the youth is equipped with comprehensive knowledge of their respective domains, they would easily glide into research at the global level in fundamental research as well as applied research in their respective fields.

Need of the hour is to focus on multi-disciplinary approach in education with super specialization in niche area.



Engineers' Ethos & Values...

Another challenge, that we are facing is that today's Indian so-called design engineers are not actually doing any design at all, rather they are interested in only getting paid for "soft skills" and quickly moving on to managerial cadre.

They are not ready to work in the proverbial trench for 15, 20 or 30 years and become "specialists" or "designers" in any particular domain in electronics.

We need, as a society to make change in the values of our young generation's mindset, so that our engineers like to stay in design and not move to managerial line in a hurry.



Engineers' Ethos & Values...

Remember? In seventies, eighties & even nineties, our engineers went abroad for further studies to build up the "competence."

Since during those days we did not have ecosystem in place to utilise their competence, they stayed there and contributed to the Global "Electronics System Design & Manufacturing" ecosystem.

Today, Indian design engineers are very well recognised and respected the world over for their "competence to innovate" and now for their ethics & global leadership qualities.



Engineers' Ethos & Values...

But, the present generation! Alas, they want to innovate and become entrepreneurs in a hurry.

The industry leaders, VCs and even the government, all are harping about innovation & entrepreneurship.

Nobody ever focuses on building the competence.

India is nowhere on the "Patent Filing" scale.

It is because; our design engineers or the so-called innovators do not have the competence to do the kind of research that leads to meaningful patents.

They are a very complacent breed that stays very happy being part of the "Design or Innovation Ecosystem".

To them it really does not matter whether they themselves innovate or not; they are satisfied doing the "soft skills" jobs, as long as they are well paid.

The values of today's generation have reached an unprecedented low.

Their gratification comes from professional and financial success and not from having led a meaningful life and contribution to their chosen field, leaving aside the society or nation.

designing with secure n sustainable dna

©narnix 2020



Engineers' Ethos & Values...

Another aspect to consider is the mindset they need to develop.

“It is important for them to be visionaries to a certain extent since, that is what will help them create good technology keeping in mind the fast pace at which we are approaching an accelerated futuristic era.”

“It is important for the engineer to not only know how to write a code or program, but also think and plan strategically, know of ways to manage once they have executed the idea and be capable of applying a pluralistic thinking method to encourage sales by understanding the consumer's exact needs.”



The missing Link:

The culture here is one of success based upon academic excellence, studying, learning, practicing and having a good job and a great life. For upper India, not the lower.

I see two INDIAs -

That's a lot like Singapore – study, study, work hard and you get an MBA, you will have a Mercedes but where is the creativity?

The creativity gets left out when your behavior is too predictable and structured, everyone is similar.

Look at a small country like New Zealand, the writers, singers, athletes, it's a whole different world.



Design Houses in India...

To meet the global expectations from India, another crucial link in the electronics manufacturing eco-system is our design houses.

Most of our design houses are merely design implementers. NOT creators...

As in civil engineering, we have architects and contractors; our design houses are performing the roles of contractors and are happy to merely meet the customers' specifications of the products.

May be, it is because a contractor makes more money than an architect?

It is high time our design houses took upon themselves the responsibility of being the design architects rather than mere design implementers.

The design houses must start building domain expertise in their respective fields and try to become the "Friend, Philosopher and Guide" to their customers.



The Return of Science?



narnix

designing with secure n sustainable dna

©narnix 2020

The Return of Science?

Science is enjoying its moment in the sun...

Rarely in recent memory, have the names of scientists been as much at the forefront of our consciousness as they are today nor have their opinions been followed with such breathless anxiety.

The world looks anxiously for science to deliver its magic, and every little progress reported is cheered enthusiastically, and every setback is rued.

Research papers full of obscure scientific language are devoured, and graphs, data, the changing shape of the 'curve' are at our fingertips.

We have been schooled in epidemiological models, notions of 'herd immunity', antibody-based serological surveys, the transmission and doubling rates, can hold conversations fluent with acronyms, and casually talk about the relative merits of HCQS and Remdesivir.



Trends Reversal...

In a reversal of a current trend, there is a renewed respect for experts.

While social media warriors are not willing to cede their own self-appointed positions as people-who-understand-everything-better-than-everyone-else, given that these are potentially matters of life and death, grudging space has been accorded to people who have literally spent a lifetime studying this subject.

Of course, listening does not preclude fierce disagreement, and those are frequent. Conspiracy theories too abound with their own alternative constellation of experts.



Absence of Science...

The absence of science and the questions that it pursues from mainstream consciousness is a relatively recent affair.

Through the centuries, the work of scientists and inventors has been followed with keen interest with so many of its leading lights being household names.

Scientific findings created widespread excitement, fuelled fierce controversies; questions of science were an integral part of the intellectual life of the times.

That involvement with science seems to have waned.

Perhaps the last time that the world was truly enthused by a scientific quest was 50 years ago, when human beings landed on the moon.



Technology and/or Science???

Perhaps it is our interest in technology rather than science that has led to this growing indifference.

While technology and science would appear to be inextricably linked, they are coded quite differently.

Unlike science, technology delivers outcomes without troubling us with deeper understanding.

Today, for reasons of necessity, we are rediscovering our interest in science.

Even if we follow its progress not so much with shiny eyes as with white knuckles.



Magic in Technology?

*There is also the strange inability of technology to do its **MAGIC**.*

The digital giants who now own substantial chunks of our lives, continue to be a critical part of our lives, but only in the sense that they always were.

We are dependent on them for our video chats and the streaming platforms, which have made sustained lockdowns tolerable.

But beyond their existing capabilities, they have had nothing terribly significant to offer at a time when the world is desperate for answers.

Even as far as information goes, there have been no radical predictive breakthroughs.

No magic AI answers, no dazzling algorithms.

designing with secure n sustainable dna

©narnix 2020



Science v/s Technology...

The problem lies with our expectations.

We have created the technology myth- one of relentless limitless magic.

Of progress as an inevitable response to our growing needs.

Science is hard, it takes us inside to understand why things happen the way they do.

There is no escape from deep and causal understanding.

Technology on the other hand is made to look easy.

We can't take it apart today to figure out how it works. We only enjoy its fruits.

Things improve all the time. Upgrades happen routinely.

We have no curiosity about what goes behind these advances.



Science – the paradigm...

Thanks to our current circumstances, we are enjoying a close-up view of the scientific process- following its progress through a series of small incremental steps, not all in the same direction, prospects of breakthroughs, setbacks, misjudgements, retractions, a torrent of new research all adding up a little bit constantly.

It is an untidy, often fractious process, with different schools of thought competing in real time and in public.

Varied models of possible ways of controlling the pandemic play out in different geographies, drugs offering possible treatment options are hotly debated, vaccines being developed across the world are using a range of different approaches, different testing methods are throwing up their own streams of data; so much is happening crammed in such little time.

And in the meantime, the clock is ticking.



Science & Politics...

But science is not really in control; politics is.

Information is guarded zealously, released selectively, modified to suit narrow political ends.

One would have thought that widespread testing would be a no-brainer, but that is far from being the case.

Part of the reason why testing has been so tightly controlled in so many parts of the world has to do with concerns about inadequate capacities, but a lot of it has to do with putting up better appearances.

The management of the pandemic is of course is a deeply political question.

Scientists may have played a larger role in the initial parts of the crisis, but today, it is the politicians that are taking the calls.

This is necessary to a certain extent, for the administrative consequences of trying to contain this exponential growing beast can be overwhelming.

But to leave out experts from the decision-making altogether, which is beginning to happen, is fraught with tremendous risks.



Return of Science...

Instead we watch the spectacle of science as it grinds into action.

We are told that what we are seeing unfold is actually happening at warp speed.

No vaccine has ever been attempted to be developed in such short time frames.

The avalanche of research on the subject is without precedent.

This is a live human experiment in problem solving at a scale that has never been seen before and it has needed science in its most traditional avatar to do what it has always done.

Dig deep and find fundamental answers.

If at the end of this nightmare, we will have regained a measure of respect for science and the methods that it employs, the kind of rigorous thinking that it demands and the absence of promises that it makes, the pandemic would not gone in waste.



The imperative...

We need to –

FIRST BUILD UP THE
COMPETENCE
BEFORE WE FOCUS ON
INNOVATION



narnix

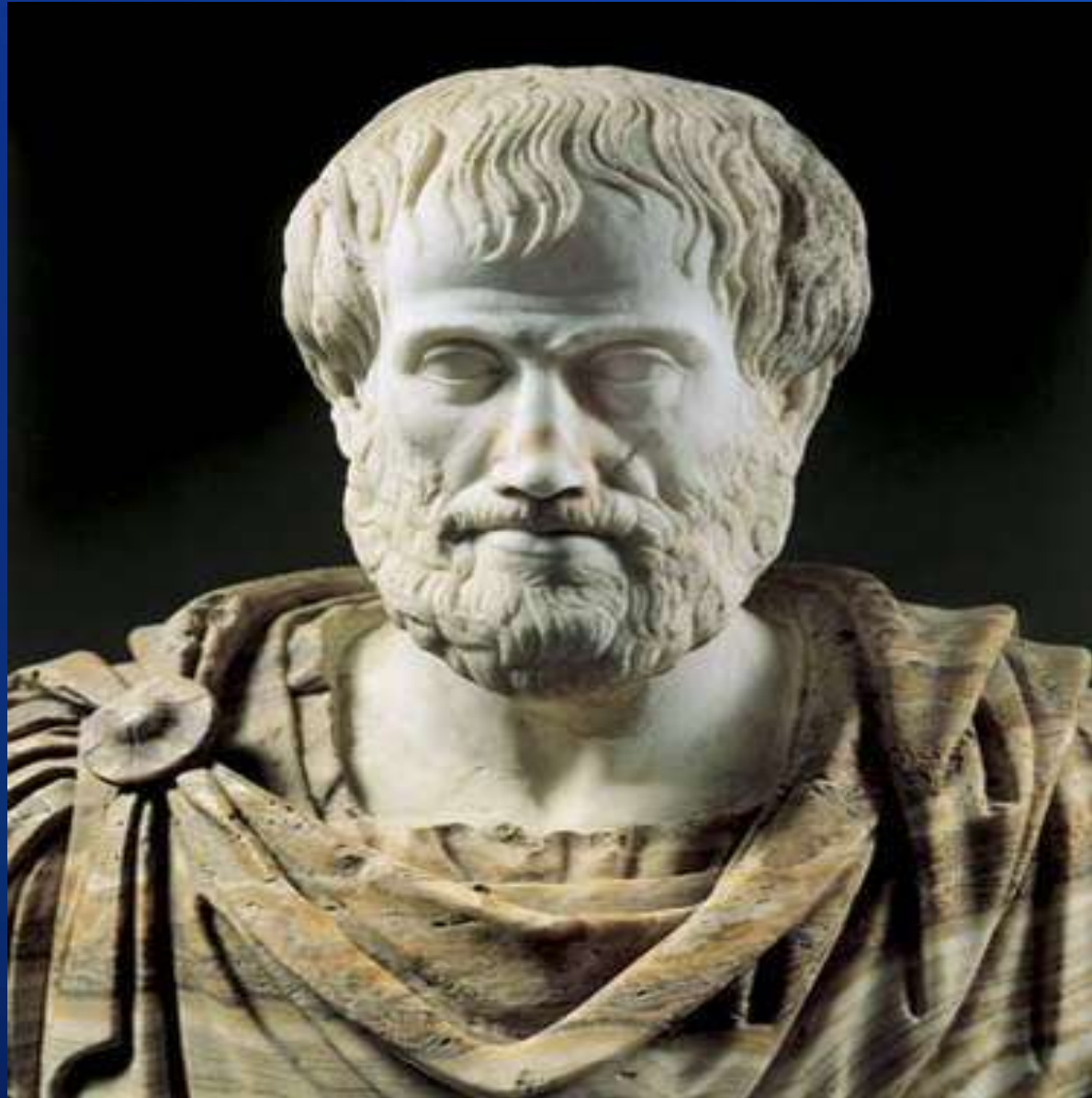
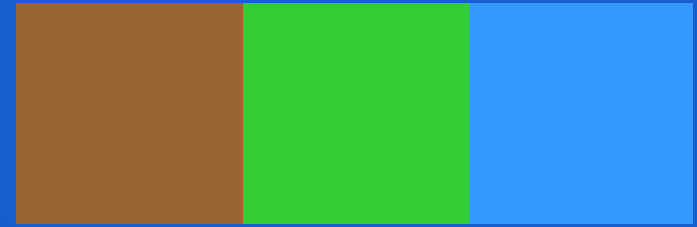
designing with secure n sustainable dna

©narnix 2020

HOW TO ACCELERATE AND DE-RISK **THE Career JOURNEY**



Systems Approach: Holism



300 B.C. , Aristotle:

**“The Whole is
Greater than the
Sum of its Parts”**



narnix

designing with secure n sustainable dna

©narnix 2020

A (man-made) Systems is...



...is more than a collective entity.

The **System** is the **product of the interactions** of its parts, rather than **the sum of its parts**

Systems have properties that none of its parts have (**emergent properties**)

The **performance** of a system depends on **how the parts fit** not how they act taken separately

designing with secure n sustainable dna

©narnix 2020



narnix

Systems and Systems Approach

System: *A group of interacting, interrelated, or interdependent elements forming a purposeful 'WHOLE' of a complexity that requires specific structures and work methods in order to support applications and services relevant to the stakeholders.*

Systems Approach: *A holistic, iterative, discovery process that helps first defining the right problem in complex situations and then in finding elegant, well-designed and working solutions. It incorporates not only engineering, but also logical human and social aspects.*



Systems Approach demystified...

- **Identify** and understand the **relationships** between the potential problems and **opportunities** in a real world situation.
- Gain a thorough **understanding of the problem** and describe a selected problem or opportunity in the context of its wider system and its environment.
- **Synthesize** viable system **solutions** to a selected problem or opportunity situation.
- **Analyze** and **trade off** between **alternative solutions** for a given time/cost/quality version of the problem.
- **Measure** and provide evidence of correct **implementation** and **integration**.
- Deploy, sustain, and apply a solution to help solve the problem (or **exploit the opportunity**).
- All of the above are considered within a **life cycle** framework which may need **concurrent**, **recursive** and **iterative** applications of some or all of the systems approach.

48



narnix

designing with secure n sustainable dna

©narnix 2020

Understanding the Design Paradigm



An insight into the electronic system design imperatives



Design Paradigm...

One of the critical components of the product realization process is the engineering design, which deserves a special attention in the engineering education to better prepare engineers to meet the demands of the industry.



narnix

designing with secure n sustainable dna

©narnix 2020

Evolution of Design Paradigm..

The evolution of a design paradigm in Engineering curriculum is based on integration of several design experiences into theoretical courses and the design-specific courses.

This approach is imperative to enhance the employability of Engineering Students in the industry by virtue of filling the wide gap between the Theoretical Aspects of Learning in the Indian Education System and the Practical Applications of the concepts learnt in college, which are essential for employment in the industry.



The Imperative:

- ❖ It is imperative to address the vital gap in the fundamentals taught and their applications in Product/System Realization thru the understanding of the Design Paradigms.
- ❖ It leverages all the theoretical learnings and introduces the students to the vast applications of the concepts learnt thru the exposure to an approach to the Integration of comprehensive design experience with the “Engineering Curriculum”.



What is Design ? ? ?

- ❖ Design is the practice of intentional creation to enhance the world.
- ❖ It is a field of doing and making, creating great products and services that fit human needs, that delight and inform.
- ❖ Design is exciting because it calls upon the arts and humanities, the social, physical, and biological sciences, engineering and business.



Design Thinking ! ! !

❖ Design thinking comprises strategies for finding and solving problems by bringing an understanding of people and society to technology design, focusing upon finding the correct problem before rushing to a solution.

❖ I believe that design thinking skills will be a key success factor for a new generation of creative leaders in technology, business, and education.



narnix

Future of Design...

- ❖ But design faces an uncertain future. The traditional design fields create artifacts.
- ❖ But new societal challenges, cultural values, and technological opportunities require new skills.
- ❖ Design today is more human-centered and more social, more rooted in technology and science than ever before.
- ❖ Moreover, there is need for services and processes that do not require the great craft skills that are the primary outcome of a design education.



Future of Design...

- ❖ Although design can sometimes bring creative insight to new problems, this ability is more of an art than a science, limited to a few especially talented individuals and design firms.
- ❖ In order to expand beyond chance successes, design needs better tools and methods, more theory, more analytical techniques, and more understanding of how art and science, technology and people, theory and practice can commingle effectively and productively.



Core Characteristics of Design...

Design has the capability to lead because it cuts across all disciplines. Design is transformative because of four major characteristics:

- **Design Thinking:** ensuring that the correct problem is being solved.
- **Systems Thinking:** cutting across and encompassing all disciplines.
- **Integrative:** blending of practice and theory.
- **Human-centered:** assuring that people and technology work harmoniously as collaborative players.



Core Characteristics of Design...

- ❖ If design is to live up to its promise, it must create new, enduring curricula for design education that merge science & technology, art & business, and indeed, all the knowledge of a university.
- ❖ In earlier years, designers were trained in form, function, materials, and aesthetics. Today, culture and emotions are central, plus knowledge of societal issues, techniques for subtle persuasion, and the intricacies of complex, interdependent systems.



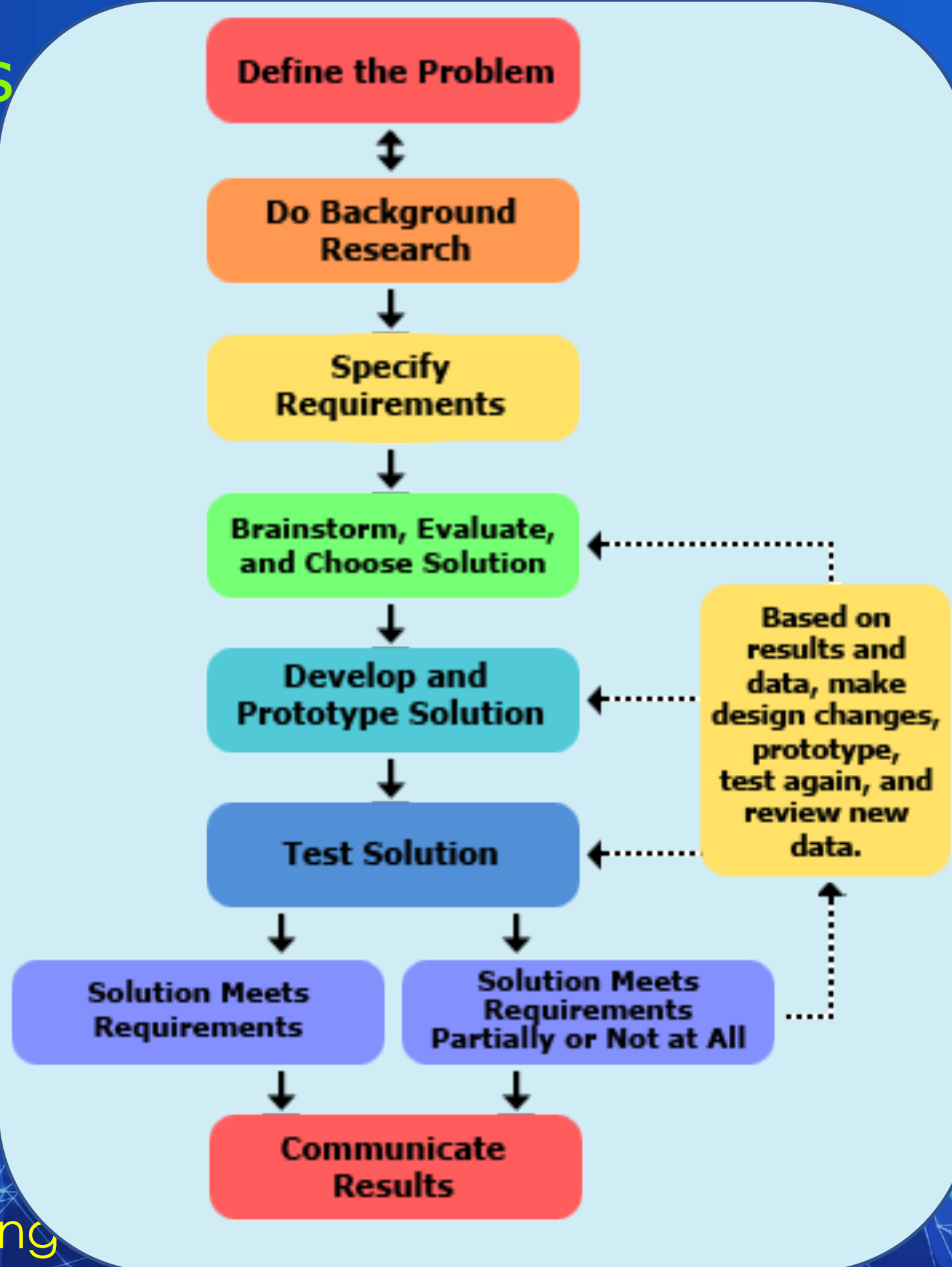
Core Characteristics of Design...

❖ Design is a field of doers and makers. In the practical world, successful products and services require generalists who can cut horizontally across many of the deep, vertical specialties.

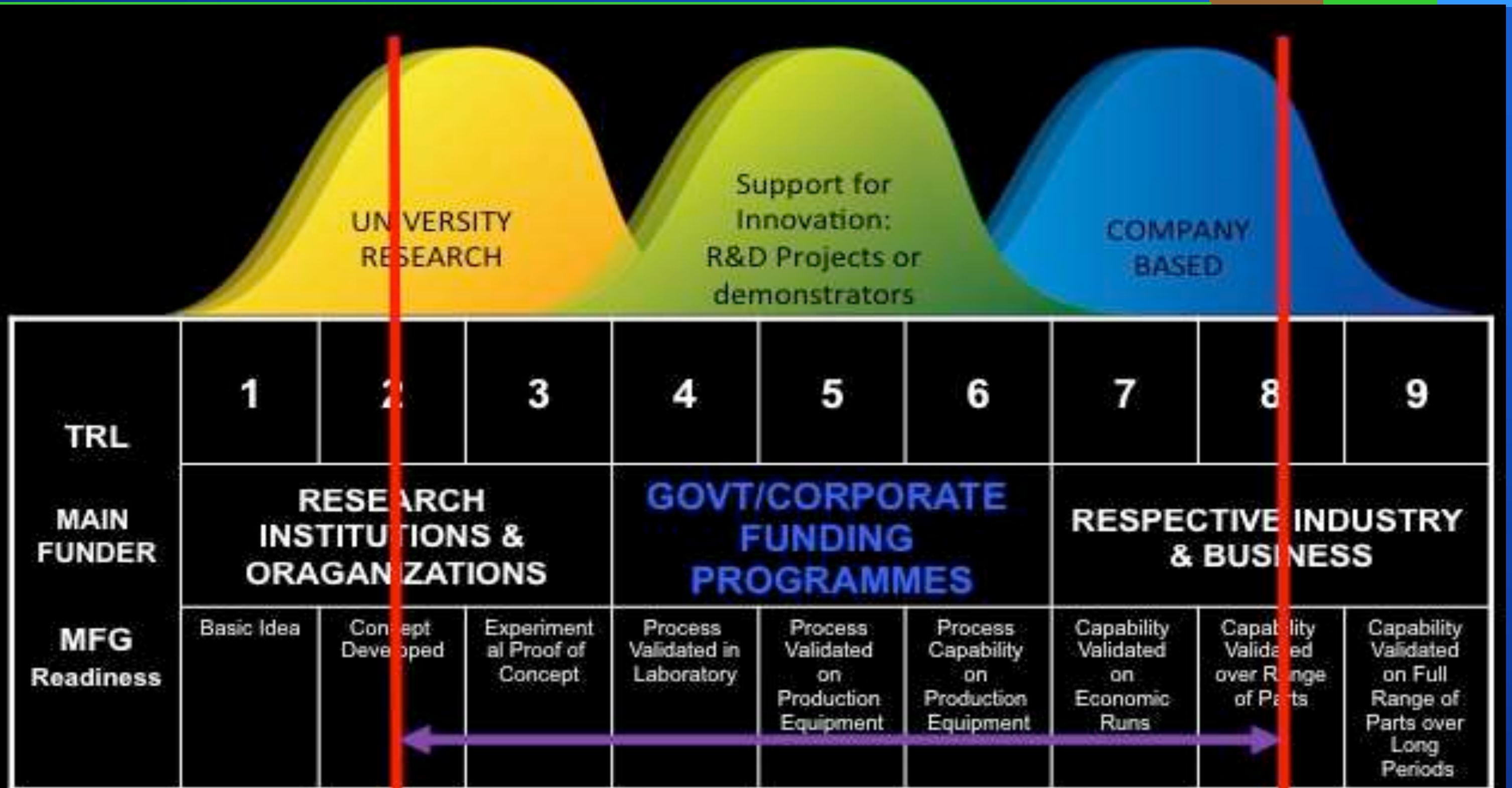
❖ Generalists cannot succeed without close collaboration with specialists, while the knowledge of a specialty is too limited to create an effective service or product for people without the aid of design generalists.



10 Step Design Process



Technology Readiness Level of development activity



Bootstrapping the Competence in Design

Need to address the vital gap in the fundamentals taught and their applications in Product/System Realization thru the understanding of the Design Paradigms.

To leverage all the theoretical learning and introduce the students to the vast applications of the concepts learnt thru the exposure to an approach to the Integration of comprehensive design experience with the Engineering Curriculum.



A few learnings needed... for system Design

- ❖ Grasp fundamental concepts in product architecting like customer needs identification, requirements formulation, functional decomposition as well as function-form mapping during conceptual design.
- ❖ Understand the platform concept and be able to prioritize drivers of modularity and product platform design.
- ❖ Enumerate metrics for quantifying commonality within a product family.
- ❖ Synthesize and analyze existing architecting approaches to enhancing creativity while reducing ambiguity and complexity.



A few learnings needed... for system Design

- ❖ Utilize out-of-the-box holistic system thinking in developing a system's conceptual model and architecture.
- ❖ Define system architecture, modeling, form, function, structure and behavior.
- ❖ Describe how a system's function emerges from its form and behavior.
- ❖ Distinguish between the notions of system, product, service, and project, and how each creates value and competitive advantage for any enterprise.
- ❖ Distinguish between incremental innovation and radical innovation when creating new solutions.



A few learnings needed... for system Design

- ❖ Understand and apply a 10-Step Design Process.
- ❖ Build a knowledge base of the latest technological innovations.
- ❖ Develop new concepts and designs by participating in "Charrette" sessions that focus on a limited set of core issues connected to real-world implementation.
- ❖ Understand & practice the crucial Design Imperatives: Safety, Security, Reliability, Standards, Compliances and Environmental Considerations.
- ❖ Develop a holistic and system-level perspective on smart sustainable electronic designs.



A few learnings needed... for AI/ML...

- ❖ Linear Algebra
- ❖ Probability & Statistics
- ❖ Multi- variate Calculus
- ❖ Discrete Math
- ❖ Graph Theory
- ❖ Design & analysis of Algorithms
- ❖ Random Processes (Advanced Probability)



Cities >> Smart Cities >> Sustainable, Secure & Resilient Cities

M2M to IoT... LTE to 5G Evolution



Big Data

Artificial Intelligence

Quantum Computing

Evolution



designing with secure n sustainable dna

©narnix 2020

IoT 2.0 – IoT Coming of Age...

- ❖ “IoT”, a concept that originally sounded like something out of sci-fi movie -- the "Internet of Things" -- is, in fact, a reality, and one that is bound to become even more widespread.
- ❖ From being considered as one of the most Disruptive Technologies in the early years of last decade to coming on the verge of becoming one of the most Profound Technologies by *weaving itself into the fabric of everyday life until it becomes indistinguishable from it...*



IoT Ecosystem & Value Chain...

The IoT value chain is perhaps the most diverse and complicated value chain of any industry or consortium that exists in the world.

In fact, the gold rush to IoT is so pervasive that if you combine much of the value chain of most industry trade associations, standards bodies, the ecosystem partners of trade associations and standards bodies, and then add in the different technology providers feeding those industries, you get close to understanding the scope of the task.



Key Components of IoT:

- ❖ Sensing Nodes,
- ❖ Local Embedded Processing Nodes,
- ❖ Connectivity Nodes,
- ❖ Software to automate tasks and enable new “Classes of Services”
- ❖ Remote Embedded Processing Nodes,
- ❖ and last but not the least “Full Security” across the “Signal Path”.



Maturity Stage of IoT Components:

To give IoT the required momentum, device management platforms, cloud computing and big data sciences in the virtual world are already flourishing and well geared up to meet the expectations of the designers.

But the physical world needs to catch up. The wireless and networking technologies need to mature very fast; we need innovative approaches in deployment of large sensor (and actuator) networks.



Maturity Stage of IoT Components:

Bringing the “Internet of Things” to life requires a comprehensive systems approach, inclusive of intelligent processing and sensing technology, connectivity, software and services, along with a leading ecosystem of partners.



Indian Design Engineers Skills

- Every true IoT application or solution needs cross-domain expertise.
- Internet, per se, has been considered the forte and playing field of software professionals.
- But, IoT brings new challenges in the way of sensor fusion, communication technologies and energy/power management of the edge nodes.



Competencies Needed:

Unless, a design engineer can design most optimized edge nodes and communication nodes, the solution shall not pass the acid test of reliable and sustained performance in the field deployment environment.



narnix

Competencies Needed:

- ❖ Basic electronics fundamentals, including but not limited to sensors, analog, power, RF and various compliance issues in hardware design.
- ❖ In depth understanding of the different communication technologies, protocols and standards, particularly relevant to the domains relevant to their applications.
- ❖ Understanding of security, privacy and socio-ethical implications of the solutions, services and applications they are trying to develop.
- ❖ *Embedded processing, data analytics and other software skills are already considered as a must.*



Challenges & Opportunities :

Some of the major Gap Areas in design skills in Indian Design Engineers are:

- ❖ Hardcore & Comprehensive Product/System design
- ❖ Hardware Design
- ❖ RF, Analog & Mixed Signal Designs
- ❖ Reliability & Compliances issues in design



Thinking Transformation for Design...

Neither an easy, nor a linear set of requirements but a complex and iterative process that requires careful consideration and cooperation with all the diverse aspects of the design...



The Way Forward:

Design engineers are not paid to make the inevitable happen...

They are paid to make happen, what otherwise won't happen...



narnix

designing with secure n sustainable dna

©narnix 2020

The Way Forward:

If you want to build ship, don't drum up the men to go to the forest to gather wood, saw it, and nail the planks together.

Instead, tech them
the desire for the SEA..



Sustainable engineering...

If we want India to remain a key participant in global supply chain and a hot destination for design & manufacturing of electronic products, then, Indian electronics needs to be prepared to meet the new environmental and social regulations and yet offer quality and a competitive price.

Our electronics industry must believe in and implement the principle of sustainable development, which makes us responsible and accountable to meeting the needs of the present generation without compromising the ability of future generations to meet their needs.



narnix

designing with secure n sustainable dna

©narnix 2020

Sustainable engineering...

Environment and social considerations have influenced the business environment of the global electronics sector, bringing to the fore some new regulations to be followed by the members of all the eco-systems. These include:

- ❖ Restriction on Hazardous Substances (RoHS)
- ❖ Waste Electrical & Electronic Equipment (WEEE)
- ❖ Ozone Depleting Substances (Regulation & Control) Rule (ODS), 2000 - Montreal Protocol



Vision green dna

Leveraging the latest technological innovations in Science & Technology for sustainable development of the society by virtue of developing Products, Systems & Solutions to make the planet “EARTH” a “smart, green n secure” planet.



narnix

designing with secure n sustainable dna

©narnix 2020

Civilization 6.0 imperative

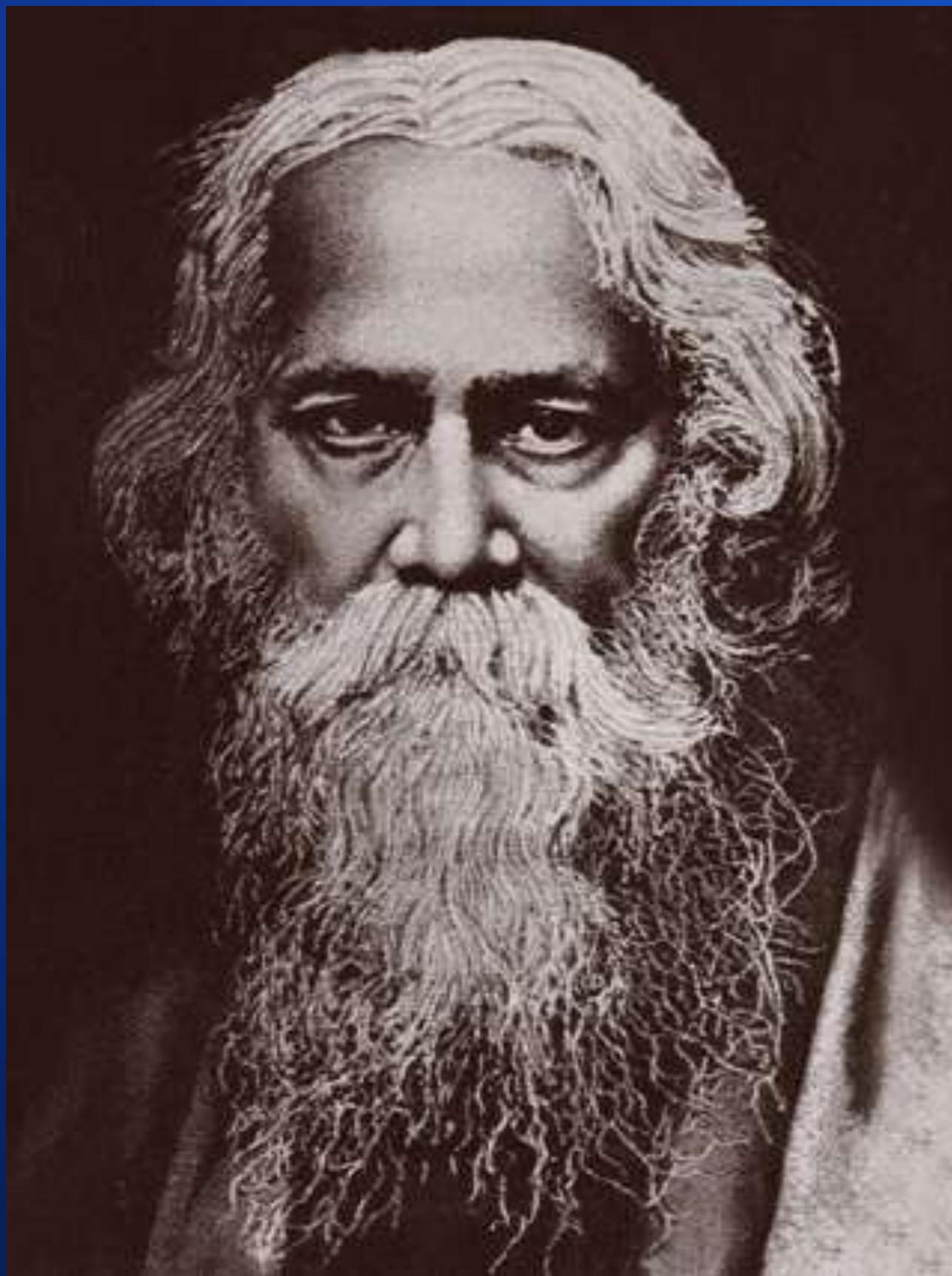
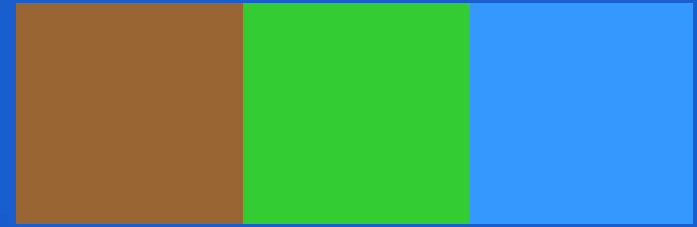
"A Nature-aware society that balances societal, economic & technological advancement with the climate and nature's equilibrium making our planet Carbon Neutral, by leveraging Nature-inspired technology solutions to practice the tenet of Circular Economy".



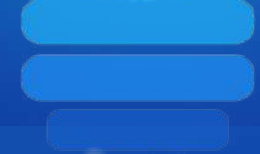
narnix

designing with secure n sustainable dna

©narnix 2020



***Let us not pray to be
sheltered from dangers
but to be fearless when
facing them***



narnix

designing with secure n sustainable dna

©narnix 2020

"Technology is just a tool.

*In terms of getting kids working together
and motivation them,
the teacher is the most important."*

- APJ Abdul Kalam



A FEW MORE QUOTES ON TECHNOLOGY...

- ❖ "You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete." -Buckminster Fuller
- ❖ "It has become appallingly obvious that our technology has exceeded our humanity." - **Albert Einstein**
- ❖ "We have to stop optimizing for programmers and start optimizing for users." -Jeff Atwood
- ❖ "It is supposed to be automatic, but actually you have to push this button." - **John Brunner**
- ❖ "Any sufficiently advanced technology is indistinguishable from magic." -Arthur C. Clarke
- ❖ "Our technology forces us to live mythically." - **Marshall McLuhan**
- ❖ "I do not fear computers. I fear lack of them." -Isaac Asimov



In Conclusion...

**GOOD JUDGEMENT COMES
FROM EXPERIENCE.**



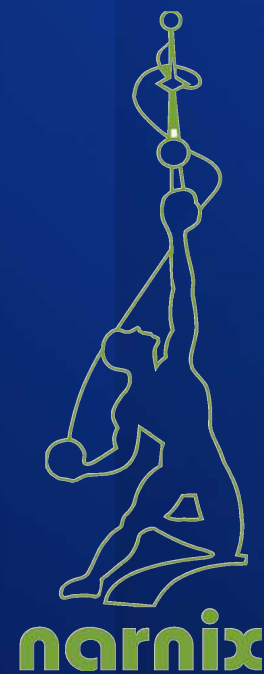
**AND EXPERIENCE? WELL THAT COMES
FROM POOR JUDGEMENT.**



narnix



*design is our religion
&
we are fanatically religious*



narnix

narang n. kishor
+91 9810163990
kishor@narnix.com



narnix:

the founder



narang n. kishor

Mentor &

Principal Design Architect

Technology Philanthropist,

Innovation & Standardization Evangelist...

Technology Consultant, Mentor & Design Architect in
Electrical, Electronics & ICT...

- ❖ Over 40 years of professional experience in education, research, design and consulting .
- ❖ Over 30 years of hardcore Research and Design Development Experience in Solutions, Systems, Products, Hardware, Software & Firmware (Embedded Software) in fields of Industrial, Power, IT, Telecom, Medical, Energy and Environment.
- ❖ Over 10 years of Consultancy Experience to different segments of business & industry.
- ❖ Over 250 Research & Design Mentees in the Electronics & ICT & STI Ecosystems.
- ❖ Leading & contributing in multiple National & Global Standardization Initiatives at BIS, Niti Ayog, TSDSI, IEC, ISO, ITU, IEEE etc....

designing with secure n sustainable dna

©narnix 2020



narnix

Leading Standardization activities @BIS - the Indian National SDO in - Smart Cities, Smart Manufacturing, Smart Energy & Active Assisted Living as the Chairman of **Smart Infrastructure Sectional Committee LITD 28 in BIS.**

Contribution in Global SDOs:

- ❖ **Vice Chair – Strategy in IEC SyC Smart Cities.**
- ❖ **Project Leader – IEC TS 63188 ED1 – Smart Cities Reference Architecture Methodology**
- ❖ **Project Leader – IEC 63205 ED1 – Smart Cities Reference Architecture**
- ❖ **Member Steering Committee – OCEANIS (The Open Community for Ethics in Autonomous and Intelligent Systems)**
- ❖ Co-Editor – ISO 30145 on Smart City ICT Reference Framework
- ❖ Co-Editor – ISO 30146 on Smart City ICT Indicators
- ❖ **Representing Indian National Body BIS & contributing with Indian perspective in**
- ❖ **IEC – SyC Smart Energy, SyC Active Assisted Living & SyC Smart Cities, SyC Smart Manufacturing, SyC LVDC, SyC Communication Technologies and Architectures; IEC SEG9, SEG 10 & SEG 11.**
- ❖ **ISO/IEC JTC1/SC 41 – Internet of Things & related Technologies, JTC1/SC 42 – Big Data & Artificial Intelligence; JTC1/WG11 – Smart Cities, JTC1/WG13 – Trustworthiness, JTC1/ AG2 – Emerging Technology and Innovation, JTC1/AG6 – Autonomous and Data Rich Vehicles, JTC1/AG8 – Meta Reference Architecture and Reference Architecture for Systems Integration.**
- ❖ **ISO/TC 204 "Intelligent Transport Systems"**
- ❖ **ITU-T SG20 – Internet of Things (IoT) and its applications including smart cities and communities (SC&C).**
- ❖ **IEEE Smart Cities & Internet of Things Steering Committees.**

Standards Column Editor - IEEE IoT Magazine

designing with secure n sustainable dna

©narnix 2020

