

Design Manifesto (For a Design Enabled Technical Education)

1. Introduction

Design is a protean, open ended and versatile term, which, over the years, has gathered many dimensions and definitions within the folds of its discourse. The impetus to formulate a manifesto for a pluralistic discourse such as design, comes from the growing critical reflections on modern dominant paradigms of education as embodied in Indian institutions of technical education, specifically the CFTIs, vis-à-vis the demands of a larger developmental paradigm of the state.

Leading institutions of technical education, while striving towards excellence in developing competencies in specialized fields of engineering and technology, are now increasingly concerned with augmenting opportunities for holistic education. This has at least two implications in terms of content and process of education. One, it concedes that the framework of knowledge needs to broaden to include societal aspirations and needs (human agency) besides an understanding of technology (means of production), and that the latter should be able to adequately respond to the former. Two, such a framework of knowledge implies educational processes that are inter-contextual, inter-disciplinary, and encourage the cognitive fusion of intellect, imagination and empathy. This, in turn, compels an interrogation and re-imagining of academic processes and structures, curriculum and pedagogy for enriching the existing design departments as well as the engineering, sciences, architecture, humanities and management streams within CFTIs.

The stimulus for the Design Manifesto comes from this search for a new, inclusive epistemology in institutes of technical education envisioning the following objectives:

1. To reposition the framework of design education to reflect the needs and opportunities of a developing nation,
2. To create a design spine in technical education to encourage a transformative, empowering and equitable society,
3. To assimilate all forms of design thinking across disciplines by collaboratively working on real world problems,
4. To leverage design thinking to steer and enable research in CFTIs that contributes to public policies,
5. To establish frameworks within which Design thinking could permeate across disciplines in CFTIs,
6. To develop an operational framework that enables progressive implementation of design thinking in the CFTIs.

It is hoped that diverse efforts to address and articulate the rich potential of design education, inspired by concerns of a humane and equitable future, will enable institutes of technical

education to grow from schooling for a developing nation to shaping a sustainable civilization. This manifesto is about such a vision for design education.

2. Design education paradigm

At present, the concepts of design are seen as a functionally efficient and experientially satisfying structuring of process and product towards a pre-determined end. However, the objective of a design education and practice should not just be a structurally efficient response to a given problem; it should be *transformative* in terms of both problem perception and definition in the search of equitable and sustainable solutions. This calls for imagining, planning, preparing and disseminating design education as a holistic entity: as applied knowledge and skill, as theoretical apprehension and underpinning, drawing on the cognitive aspects of science and technology, and the social and anthropological aspects of the arts and humanities. Such an endeavour may require highly porous boundaries between established disciplines and design, and an innovative academic process capable of reflexivity and self-interrogation. What is needed is to position design thinking as a cognitive process central to all disciplines.

The Stanford D-School draws on methods from engineering and design, and combines them with tools from the social sciences and arts for solving real world problems. Real world problems here are based not only on business insights but also for extreme affordability for the world's poorest citizens¹. More recently, the Kellogg School of Management's dual master's degree programme has paved the way for a confluence of design innovation and management studies, offered by the business school in collaboration with the school of engineering. This convergence bodes well for design education for all and may be the ideal way in the present time to insinuate design thinking across departments – by using existing departmental structures, but also recasting them in new, insistently collaborative structures for design education.

This shifts the locus of design education from being merely instrumentalist (a set of alternative choices of technique/process/form) to something empowering (a correlation between form and function informed by an ethical consciousness, aesthetic in experience and productive in its impact). Institutes of technical education need to rethink spaces for such transformative design thinking, which is capable of engaging with and informing policy, reshaping values we live by.

2.1 Designing Education for Development

The enormous potential of design needs to be tapped for imagining and implementing strategies for building systems in the context of markets, governance, social and cultural processes, and knowledge bases. This would advance the cause of equity and justice in ways both individual and environmental, help create dynamic, participatory institutions in a thriving

¹ 'Design for Extreme Affordability' is a course offered by the Hasso Plattner Institute of Design through the Graduate School of Business and the School of Mechanical Engineering at Stanford. This multidisciplinary, project-based course is focused on the design needs of the world's poorest citizens.

democracy, and even, ambitiously, aid the aspiration for a sustainable society and civilization. In the Indian context, grounding and centering of national development goals and challenges in design education and research will provide a powerful impetus to innovation, entrepreneurship and policy systems.

The spur to such design education comes from many sources, a few of which are indicated here, mainly to illustrate the necessity and relevance of revisiting and re-fashioning existing paradigms of design education and the factors that bear critical influence in this process.

- i. **Design for equitable negotiation of contested terrains:** Disparity despite abundance in India often makes it difficult to make a tradeoff between opportunities, pushing design into contested terrains. Social dilemmas manifest in Indian design problems, because design decisions are closely shaped not only by a single, well-defined use, but also by the stakes and claims of multiple beneficiaries with conflicting goals for the same resource. Here, design problems are as much about conflict resolution as they are about need fulfillment of a user segment. For a developing nation like India faced with wide disparities of even basic amenities and essential services, design strategies for accessibility and distribution of primary resources can pay rich dividends in the future, both socially and economically.
- ii. **Design for enabling Rights-based development policies:** Increasing numbers of laws have been enacted to reduce disparity of access and resources, such as the Right to Information, Right to Education, Right to Food Security and the upcoming Lokpal possibility. Though the population is constitutionally empowered, the country is yet to build resources to make these rights accessible in a meaningful manner. Design efforts concentrating in these areas of constitutional empowerment will play a key role in delivering these targets. If different forms of design and technology are suited to distinctly different forms of social and political existence, then a suitable fit between the two should be sought, compatible with conditions of freedom and social justice. How can we develop innovative technologies that promote a civic culture of democracy? How do we decipher the contribution of a particular device or system to the quality of social and political community?² Technology and policy can together create appropriate designs to respond to these new development challenges and opportunities.
- iii. **Resilient skillful population:** 90% of the world's designers work exclusively on products for the richest 10% of the world's customers³. Such a positioning, though significant in itself, overlooks the indigenous system of designing and production of 90% of the world's customers. After all, design and technology in MSMEs, Cottage industries and crafts has been invented, improvised and maintained by *illiterate* producers of hardly any means for centuries. This informal sector contributes to 33% of the manufacturing

²Winner, L. (1995). Political Ergonomics. In R. B. Margolin, *Discovering Design* (p. 163). Chicago: University of Chicago Press.

³Polak, P. (2009). *Out of Poverty: what works when traditional approaches fail?* U.S.A: Berrett-Koehler.

output in India⁴. This grassroots intelligentsia has also been credited for inventing a diverse range of products ranging from low-cost washing machines using paddle-power, weaving looms, to gadgets that make you walk on water! Using – while also upgrading – the skills of this 33% for various design and production requirements is a daunting task for any education system, but also one of the most lucrative employable segments of the nation.

- iv. **Design for tapping the productive potential at the ‘bottom of the pyramid’:** It is estimated that India is home to a third of the world's poor. According to 2010 data from the United Nations Development Programme, an estimated 29.8% of Indians live below the country's national poverty line⁵. Doing business with a third of the world's poorest people (fortune at the bottom of pyramid⁶) requires radical innovations in technology and business models. It requires companies to transform their understanding of scale, from a “bigger is better” ideal to an ideal of highly distributed small-scale operations married to world-scale capabilities. In short, the poorest populations raise a prodigious new managerial challenge for the world's wealthiest companies: selling to the poor and helping them improve their lives by producing and distributing products and services in culturally sensitive, environmentally sustainable, and economically profitable ways⁷.
- v. **Indian Design often requires forward and backward integration of user operated technologies:** The diversity of the Indian design scenario is its boon and bane. It opens up a plethora of opportunities for design intervention but also constrains its use. In India, design and technologies die a slow death because there is always a user segment that has not yet upgraded due to financial, cultural or other impediments. Therefore, a hand-held driller can be used in the same city that runs its factories on Computer Numerical Control (CNC) lathes. If Design has to be inclusive of such varying levels of user abilities, it requires forward and backward integration of technology to maximize its relevance. A good example of this is the rupee symbol that is easy to write by hand or click on the computer. Moreover, it can also be typed on the typewriter – making the design inclusive of old as well as new technologies.
- vi. **Manu-services or Servicing Manufacturing:** Manufacturing is the biggest single investor in design, and spends twice as much on design as it does on R&D. Design is fostered by the strength of the manufacturing sector, which not only reflects on employment in a labour intensive Indian economy but also materializes innovation. Unfortunately, we have not been able to capitalize on either. Lack of innovation in the formal and informal manufacturing sector is a sign of its disconnect with design. Bereft of design, the

⁴Planning Commission. (2012). *Planning Commission Report- The manufacturing plan: Strategies for Accelerating Growth of Manufacturing*. New Delhi: Government of India.

⁵http://en.wikipedia.org/wiki/poverty_in_india#cite_note-2

⁶Prahlad, C. K. (2006). *Fortune at the Bottom of the Pyramid*. New Jersey: Pearson Prentice Hall.

⁷The \$25 Jaipur foot is an excellent example of this idea. Along with the Nano car, it shows that the best design and technologies can be brought to the customers at the bottom of the pyramid.

manufacturing sector has not achieved its full potential in the GDP –a lacuna that can only be filled by the collaboration of technology and design.

As the old boundaries between manufacturing and services are dissolving, manufacturing companies today are involved in a complex ecosystem of tangible and intangible activities ranging from STEM to Supply management, design, and even advertising. They no longer just sell mass-produced products but also make a significant proportion of their revenues from selling services that complement their goods. Service informed understanding of the manufacturing sector or manu-services is a whole new area for design innovation and competitive advantage in a developing country fraught with disparity.

- vii. Repositioning Traditional Indian Design:** More than fifty years after independence Indian design is still indebted to its traditional design sector for identity within as well as outside India. The traditional design sector contributes significantly to the National exchequer even today. According to the Planning commission report⁸, the total handicrafts in 2000-01 registered an annual growth rate of 14.71 per cent in rupee terms. Crafts account for 15 to 20 per cent of the country's manufacturing workforce, and contribute 8 per cent of GDP in manufacturing. But, despite continuing efforts since independence, the traditional designer in India has remained in oblivion with a skill that is languishing – and has even become extinct in some communities. The hegemony of the mainstream market, a lack of technological and design up-gradation, a long supply chain, the changing preferences of consumers and, sometimes, apathy at policy level decisions has hit this highly skilled and exclusive sector severely⁹.

These interpretations of the design environment and its opportunities in India are by no means exhaustive. They are merely indicative of the fact that the Indian design scenario is distinct if not different from its western discourse. Its pedagogy, process and thinking is not a merely a foundation but an agent of change that goes beyond a cosmetic makeover for conspicuous consumption. More pertinently, it enables the industry – manufacturing or service – for a socially, economically and environmentally cohesive growth.

3. Developing a Design spine in Engineering education¹⁰

If design must seriously aim at changing existing situations into preferred ones¹¹, then it must equip students not only with an *ability* to raise and answer questions that matter in the world

⁸Government of India. (2012). *Uttar Pradesh Development Report, Vol.2*. Retrieved December 12, 2012, from <http://planningcommission.nic.in/>: http://planningcommission.nic.in/plans/stateplan/index.php?state=sdr_up.htm

⁹On the other hand some craft based initiatives have also succeeded. Fabindia has repositioned Indian textiles in the retail market, besides generating employment for 40,000 craftsmen – and this through a capitalist model. NID's initiative in Co-optex introduced a new range of design series; Dastakar breathed new life in the handloom sector; Delhi Haat has given an alternate marketing channel, boosting entrepreneurship in these communities.

¹⁰"Design Spine" is the phrase used by Dr. Anil Kakodkar in his report.

¹¹Simon, H. (1969). *The Sciences of the Artificial*. Cambridge: M.I.T.

around us, but also the *disposition* to do so¹². Perhaps more importantly, design must be seen as an *epistemological* concept, not just a technical, or even a cognitive or perceptual training involving a limited skill set. Therefore, Design Education needs to be structured within CFTIs in a way that enables it to be anchored as an autonomous field of study in a Centre/Department, and also to percolate design thinking into their various disciplines, areas of expertise and resources.

- As a first step, a Design Action Group, with the Director as Chairman, and the Head of Design Department/School/Hub as Convener should be set up
 - To decide the national development goals in which the Institute could engage, leveraging their own strengths, skills, and local topography
 - To encourage and monitor the activities of the Institute in accordance with the objectives of the manifesto
 - To steer, plan and disburse funds for design activities annually.
- The Design School/Centre/Department can be the nodal hub for executing/facilitating the execution of interdisciplinary projects, and for disseminating core design skills into the education process. Or else a Design Hub with dedicated faculty members and a floating pool of design professionals can be created. The functions of the Design Hub can be the following:
 - To design and teach an interdisciplinary curricula to inculcate design thinking in undergraduate studies of technical departments
 - To facilitate and encourage the engagement of technical departments with real world issues that requires negotiations with multiple disciplines and stakeholders with conflicting interests.
 - To steer research and teaching within the Institute to match the national development goals
 - To create and maintain open source collaborative spaces both virtual and physical for sharing and improvising ideas, tools and worktables for problem solving
 - To assist and expedite the incubation of ideas into products for social or private sector or as data for informing policies.
- Design Chair professors should be appointed for championing and spearheading the process of assimilating design thinking in engineering education.
- New faculty will be needed to introduce and sustain design thinking in the larger educational sphere for all the design initiatives being planned, and new ways will have to be employed for their training and development. Innovative systems should be conceived to make our schools – new and existing – attractive for the design talent that

¹²Kohn, A. (2003, March). *What does it mean to be well-educated?* Retrieved January 13, 2014, from <http://www.alfiekohn.org/index.php>: <http://www.alfiekohn.org/teaching/welleducated.htm>

is now dispersed and needs to be tracked and brought into the educational mainstream in India.

- The enormous wisdom lying in the hands of the traditional master designers in craft communities, with indigenous architects, metallurgists, natural dye makers and others can and must be tapped not only to preserve traditional knowledge but also to supplement the increasing shortage of experienced teaching staff in most Institutes.
 - Design professionals with industry experience must be valued as faculty members. The excessive emphasis on PhDs skews the balance between academic credentials and real-world problem solving experience that is necessary for both engineering and design. We must redress this imbalance if we are serious about transforming design education.
 - Senior and retired faculty members from established schools of design may be given the mandate to conduct Teacher training programs to mentor young faculty into Design Education.
- Networks can be established through which experts train students, not necessarily in physical classrooms but partially through virtual classrooms and partially through internships. These centers would be about traditional knowledge dissemination as much as they would be about imparting skills and expertise in cutting edge technology. Running sessions simultaneously at premier institutions as well as within industry, learning residencies in remote parts of the country, city classrooms and village centers, could all create a fountainhead program that allows people to up-skill their knowledge through practical, hands on experience with the best in the industry or in academia per a learner's requirement rather than the dictat of a degree education. Each learner chooses his or her own path, in a manner of speaking.
 - Research projects should encourage, even mandate, inter-disciplinary (intra-institutional) collaborations and exploit cross-institutional strengths across CFTIs.
 - Academic linkages with industry and the social sector across domains should be strengthened through participation in live projects. A dedicated position of a facilitator/liaison official to interface between industry and academia can reduce the effort for searching and matching requirements to meet expectations at both ends. This could also be manifested in the form of in-house industrial training within industries/ organizations.
 - Design incubation Stewardships: Some of the designs arrived by students which have potential to reach people/industry/society should be provided additional resources and mentorship by instituting fellowships specifically for this purpose.
 - A core introductory course in Design in the UG curriculum that draws experts from within and outside the Institute to orient the students into design thinking for problem

solving and more pertinently for assisting them to exploring and defining problems in real life contexts. Electives and a Minor in Design should be encouraged. A “Design Spine” would allow students in the engineering programme to select specific design courses (offered as electives) that suit their interests, or complement their needs in these projects. A “Minor” in design may have additional requirements, including the number of courses taken to qualify for a “Minor” and, perhaps, even a design specialization. BTPs should be steered towards developmental concerns that require a technical input.

3.1 Design Pedagogy

Building desirable frameworks for an inclusive, sustainable, innovative and profitable artificial world in India is fraught with dilemmas between ‘significant’ and ‘necessary’ goals. The aspirations of a steadily developing nation are shaping decision-making between multiple possibilities of growth that juggle between development and its social and environmental costs. The competitive position of Indian design lies in designing a pedagogy that can harness the technological strength of CFTIs to convert our adversities into opportunities for an inclusive growth. Such a design spine can encompass – but is not limited to – the scope of the pedagogy elucidated below.

- **Situate engineering problems in an ecosystem:** Many engineering studies are related to a component design of a complex system design solution, for instance, design of a gear or screw of a machine. Here, the screw is the component of a system that could be a machine. As engineering research in India heads towards large-scale complex technological challenges like the LCA, autonomous helicopters, aircraft carriers and such, the specialized core competencies of an engineer no longer suffice. Engineers and designers are increasingly required to be generalists who can innovate across disciplines. In turn, they must also be able to call upon specialists to help ensure that the components developed are appropriate and practical.

Though system design is more holistic than component design it still does not situate design in its life cycle outside the boundary of the workshop. The ecosystem approach of design not only analyses the life cycle but also enlarges the context of the solution outside the workshop into the stakes of real everyday use, wear and tear, and conflict of interests. It considers not only the conception and manufacturing of a design but also its use, repair, and recycling – frequently referred as the ‘cradle to cradle’¹³ approach. The ecosystem approach can increase the life of an object in use. Design thinking can open up the ‘system design approach’ in engineering pedagogy to the ‘ecosystem approach’ for wider and longer social, environmental and economic impact.

- **Real-world concerns are design concerns:** Design disciplines need to reflect the developmental concerns of India not only in the projects they undertake but also in

¹³Cradle to Cradle design (also referred to as Cradle to Cradle, C2C, cradle 2 cradle, or regenerative design) is a biomimetic approach to the design of products and systems. It models human industry on nature's processes, viewing materials as nutrients circulating in healthy, safe metabolisms. (Definition source: Wikipedia)

their very conception. From a conservative point of view this may require re-positioning the current disciplines and, from a radical perspective, it is an opportunity for a complete overhaul of design content. Grounding and centering the vision and goals of education on real world concerns is not an entirely new paradigm. Jawaharlal Nehru and Mahatma Gandhi have spoken of it at large. And, in recent years, MIT's Design for the other 90%, the Center for Frugal Digital at CIID, Copenhagen, Stanford's Design for Extreme Affordability are all gearing education towards responsible and empathetic goals that are challenging traditional market driven pedagogies.

- **Embrace collaborative and participatory methods of problem solving that span across disciplines and courses:** The disciplines of Humanities, Management and Technology can and must be brought together (an entry-level understanding of these disciplines is a life-skill, not just a design education requirement). Initially, this could be done by boosting the number and content of an array of courses targeted at the uninitiated – courses that fall under the rubric of Minors in many existing curricular programmes – in order to introduce participatory and critical methods for designing products, systems, policies, then carrying them through into the real world in effective ways to alter social practices and public life. Whether it is slum design or heritage building refurbishment, a resource management system or infrastructural access, actual design situations offer project opportunities that are too large to be conceived and handled by a single person. Solutions depend on the coming together of skills and understandings of a number of people, and from a variety of disciplines. It is not possible to teach all required skills and processes within the design programme.
- **Augment problem based learning with project based experiential learning:** 'Learning by doing' does two important things: it allows us to immerse ourselves in the environment in which work is to be done, so we can understand the values and expectations of our (target) society; it enables a fresh look at problems, not only at the ways of defining them, but also at the skill-sets that are required to address freshly analyzed issues. A shift from problem based learning (acquisition of knowledge) to project based learning (application of knowledge), where the projects are grounded in problems outside the workshop and labs in everyday scenarios, will involve students in reality, and reality in education.

Tinkering Laboratories: There is a dire need to re-examine the division between the curricular and the extra-curricular, and to encourage the curiosity and involvement that issue from total absorption in a subject of interest. Such immersion is the key to creative learning. So CFTIs must have tinkering laboratories, and these must be situated as autonomously as possible even within current academic structures (including design departments) in an effort to vitalize the notion of inter-disciplinary pursuits and tap into the creativity that ensues through deep involvement. Project based learning encourages students to tinker in an informed manner. Hand skills like origami are a good combination of hand and mind which have found application in cutting edge problems like deploying solar power arrays in a Space Flight Unit or pre-designated crumple zones

in a car to absorb impact during collision. Here, an origami fold moves from craft to contemporary problem solving activity.

Field Trips and Case Studies: Immersion in product, service or systemic issues on the ground is critical to design thinking. Case studies and field trips hone and increase the possibility of connecting with issues and people, allow the opportunity to understand and define problems within local contexts, avail of input from affected populations, and seek and refine solutions alongside users. They sensitize the designer to a collaborative search for solutions within a social and cultural context, which also creates a sense of purpose and participation amongst those who benefit from the design, affecting both the efficacy and longevity of solutions

- **Encouraging analogical problem solving in technical education:** Some engineering problems do use analogical thinking for problem solving. Foremost amongst them is the field of bio-mimetics that uses analogies from the natural world for an emerging range of intelligent products that are constantly evaluating themselves vis-à-vis human intelligence and behavior. Use of analogy, metaphor, synectics, word mapping and other such lateral techniques give technological problems an innovative edge. As emerging engineering disciplines become increasingly interdisciplinary, the cognitive process of transferring information or insights from the analogue or source to another particular subject can open doors to interaction, assimilation and innovation in knowledge.
- **Asynchronous teaching platforms for increased accessibility to diverse information:** With the sprouting of internet cafes even in small towns, the idea of knowledge acquisition, dissemination and preservation is changing. As platforms of reading change, classrooms acquire the role of discussion spaces, problem solving arenas, and mentorship interactions, in which students are active partners in constructing, discovering and transforming knowledge. Therefore, design education should be conceived for synchronous *and* asynchronous platforms of learning.

National Knowledge Network: The massive scale, capacity, and flexibility offered by the National Knowledge Network (NKN) should be used to put design courses online, to make distance learning and collaborative project work and enterprise accessible and available to all. A well-executed programme of design education dissemination via the Web can lead to rapid build-up of talent and knowledge in the formal as well as the informal sector.

This network could also include a dynamic and virtual collaborative space through an “open source” platform for design processes and pedagogy. This would make it possible for anyone who sees a relevant design problem to intuitively create an online process that intelligently allows collaboration with experts, collation of appropriate knowledge bases, and creation of joint design solutions.

4. Conclusion

This transformation of the education process in the institutions of technical education based on design pedagogy will require the active participation of all sources attached to education in India. Such a vision engages into design as an overarching framework for steering education and research towards social goals and economic aspirations, making the CFTIs active partners in the development of the country.

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