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NATIONAL EDUCATION POLICY 2020 : HIERARCHY VERSUS OPENNESS IN HIGHER EDUCATION

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National Education Policy 2020: Hierarchy versus Openness in Higher Education

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I. Introduction

The National Education Policy 2020 is an ambitious and holistic attempt to provide a roadmap for reform in the Indian higher education system. While the NEP 2020 identifies several strands of problems and institutional challenges in the higher education eco-system in India, there is a common theme that covers all these problems and challenges. This theme is that of systemic rigidity that has ailed Indian tertiary education for decades. This systemic rigidity prevails in both the intellectual and the administrative spheres and one can further categorize them under three broad heads, i.e.

a. Pedagogical rigidity: There has been very little serious reform of course design, teaching methods, structure of assessment and examination and incorporation of new technologies and techniques used in the classroom. Individual faculty have very little independence to innovate and very little incentive to do so. No serious attempt has been made to incorporate feedback from industry and other practitioners of skills and knowledge in the design of course work or pedagogical techniques.
b. Institutional rigidity: Robust collaboration between academia and industry or even between higher education institutions, for e.g., between colleges and technical schools or between institutions providing professional courses and those offering social sciences or humanities is largely missing in India. Indeed collaboration between departments of the same institution, for e.g. between natural sciences and social sciences is largely missing. This not only inhibits innovation in course design, but also prevents optimal use of physical assets and academic infrastructure. Something as simple as pooling of library resources, or combining together to create common access to international learning resources and knowledge databases have not happened effectively (for e.g., See Box 2 in section V)
c. Ideological rigidity: An institution of higher education is expected to be place where intellectual churning can take place and new ideas and innovations can emerge from debate and dialogue between different perspectives and approaches. This requires such institutions to provide a platform to a wide variety of opinion and ideology. This is particularly true in the social sciences and the humanities. Hiring of people with same ideological focus or orientation therefore prevents such debate and intellectual churning. It also discourages the challenging of established positions that are true catalysts for new ideas and promotes a unidimensional narrative that is inimical to intellectual enquiry. The domination of the humanities and social sciences by leftist establishment and resultant ossification is now considered a global phenomenon across democracies, and its manifestation is especially strong in India[2].

This paper focuses on the first two challenges and their ramifications for India's overall ability to produce skills. But the rigidities are inter-connected, and one feeds into the other.

A competitive 21st century economy cannot afford to have a rigid higher education system. Rapid technological transformation is fundamentally changing the profile of skills required, and the higher education and skill development eco-system has to be responsive to such changes. Indeed, most

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[2] Prominent examples where faculty members have been isolated, and scholars not hired for taking views contrary to the 'establishment' include the debates around Aryan Invasion Theory or the history of Islamic iconoclasm and temple destruction in India. While these examples are now well known due to political reasons, a million intellectual mutinies have been suppressed by the establishment over the decades, robbing India of fresh ideas, and bright scholars who might have charted a new course in their respective disciplines.

economic initiatives from the government too indicate that policymakers want to lay the foundations of a knowledge economy where wealth will be created primarily by the exploitation of knowledge.

Increasingly today, the production of knowledge and its dissemination has become decentralised and atomised to a degree that is unprecedented in the annals of human history. This of course is the result of the spread of education and the revolution in the Information and Communication Technology (ICT) which has made access to information practically free and production of knowledge less dependent on resources than previously. Also, the willingness of people to donate to voluntary knowledge initiatives, but whose work then becomes available to all concerned, has also created more players who function outside the formal institutions of knowledge production and dissemination but carry out many similar functions.

Thus, in a knowledge society, the production of knowledge is and must be participatory. It follows from here that research institutions, alternative educational institutions supported by citizens' organisations, business associations as well as social entrepreneurs will cooperate and compete with formal bodies (like State-owned Universities and Research Institutes) that produce knowledge. Accessing their knowledge is generally not a problem but institutional rigidities in formal institutions of learning have tendencies to create unnecessary obstructions and this is problematic.

This paper argues that administrators of India's formal educational institutions adopt an "Open Source" strategy in consonance with NEP 2020, i.e., simultaneously allows enrolled students to access any course or teaching learning material and in turn allow others to access any course or teaching learning material that the formal institutions produce. Of course, these formal education institutions will coordinate this "peer production/mass collaboration". Indeed, as examining bodies responsible for issuance of certification of qualification for individuals, the formal institutions have to be the guarantors of quality.

The critical challenge facing India today is make its education system relevant to the demands for knowledge and skills required by the economy. Put plainly, to ensure that the millions of graduates India produces every year are employable and find a productive role in the economy. This paper suggests that the solution might lie in building on the existing higher education resources, but 'tweaking' the existing framework by adopting practical approaches to creating flexible 'learning pathways. Given the rapidity of change of technology and therefore skill requirements of the economy, any suggested pathway may become irrelevant and other pathways become feasible. This strengthens the suggestion for openness which implies flexibility. This would make the adoption of a more appropriate pathway feasible possibly after some iterations.

This paper is organised as follows: In Section II that follows, we give briefly describe India's Higher Educations System. Section III describes the magnitude of India's problem through a discussion on the emerging demand for skills and the skill gap in the economy. Section IV focuses on the program design needed to inculcate new skills and competencies in students to make them more employable. Section V discusses the underlying changes needed to support this program design in terms of curriculum development, pedagogical systems, faculty and infrastructure.

II. India's Higher Education System: A Brief Preview

India has developed one of the most extensive higher-education systems in the world. Judged in terms of sheer numbers, with 37.4[3] million enrolled students in various degree and professional programs, it is the world's largest, ahead of the United States (19.7 million) and China (28.3 million)[4].

3 As per All India Survey on Higher Education (AISHE) Report 2018-19, Ministry of Human Resource Development, Government of India

4 Data is from Statista.com

Developing this extensive system that allows increasingly larger of numbers of young Indians to acquire a degree or diploma has been and remains an important socio-economic goal, and is reflective of India's aspiration to be a knowledge economy with a large endowment of highly skilled human capital.

Table 1: Relative Access to the Opportunity of Higher Education

% of Population aged 15+ with Tertiary Education		
	1980	2015
Brazil	4.3	8.1
China	1.6	6.9
India	2.7	8.4

Source: Lutz et al. (2014)

As Table 1 indicates, India has done an impressive job in this front even in relative comparison to the other very large developing economies. India has the highest percentage of tertiary educated citizens as a percentage of adult population compared to China and Brazil, and in the last three decades the country has managed to substantially increase this percentage despite a rapidly rising population.
But simply producing a large number of graduates is not enough. In order to serve the aspirational aspect of higher education, both at the individual level for the student, as well in a macro sense for the nation as a whole, educational attainment must lead to meaningful economic opportunity. The Indian higher education system has been found to be severely challenged in this aspect. There is general consensus that a vast majority of Indian graduates do not have the relevant skills needed by the market[5].

This lack of employability, already a severe constraint by the early 2000s, might become a serious political-economic challenge as the world transitions to new models of production and consumption characterized by the so-called technology intensive 'Industrialization 4.0'. As robotics and automation render several job functions obsolete, and entirely new sets of skills are required of workers, the Indian higher education apparatus needs a makeover that will ensure that it delivers on the aspirations of its graduates and helps India become a nerve centre of the global economy.

This makeover is not necessarily and always about radical changes, but also covers incremental transformation of the existing system. That would depend on the specific sector of the economy in question, specific skill sets available both qualitatively and qualitatively as well as the institutions producing these. The answer to the skills mismatches obviously requires building on the competencies and capacities already existing in the Indian higher education apparatus and aligning it with the demand for skills of this the new economy.

A critical element of this transformation must be democratization of opportunities arising out of higher education. India has long suffered from having a few 'islands of excellence' whose graduates typically have no problems finding jobs, and thousands of other institutions whose graduates struggle to find employment. In an "open" system which is responsive to market conditions where demand for skills is concerned as well as agents providing training in skilling where supply is concerned, this should be an automatic process. Such a system makes easier to focus on inculcating employable skills across the board would reduce this inequity in access to economic opportunities.

5 India Skills Report 2019, a joint initiative of Confederation of Indian Industry (CII) and Wheebox found that only 46.21% of Indian graduates to be employable. This includes engineering, medicine, and technical programs graduates

III. The Demand and Supply for Skills: The Underlying Mismatch

The Ministry of Skill Development and Entrepreneurship (MSDE) estimated that India's demand for skilled manpower across twenty-four key sectors would increase by 103.3 million between 2017 and 2022[6]. That translates to developing a skilling eco-system that would produce 20.6 million skilled workers per year. Table 2 below re-produces the detailed data reflecting this growth in demand for skills.

Table 2: Human Resource Requirements by Sector in Millions

S.No.	Sector	Human Resource Requirement Estimates		Incremental Human Resource Requirement
		2017	2022	(2017-2022)
1	Agriculture	229	215.5	-13.5
2	Building Construction & Real Estate	60.4	91	30.6
3	Retail	45.3	56	10.7
4	Logistics, Transportation & Warehousing	23	31.2	8.2
5	Textile & Clothing	18.3	25	6.7
6	Education & Skill Development	14.8	18.1	3.3
7	Handloom & Handicraft	14.1	18.8	4.7
8	Auto & Auto Components	12.8	15	2.2
9	Construction Material & Building Hardware	9.7	12.4	2.7
10	Private Security Services	8.9	12	3.1
11	Food Processing	8.8	11.6	2.8
12	Tourism, Hospitality & Travel	9.7	14.6	4.9
13	Domestic Help	7.8	11.1	3.3
14	Gems & Jewellery	6.1	9.4	3.3
15	Electronics & IT Hardware	6.2	9.6	3.4
16	Beauty and Wellness	7.4	15.6	8.2
17	Furniture & Furnishing	6.5	12.2	5.7
18	Healthcare	4.6	7.4	2.8
19	Leather & Leather Goods	4.4	7.1	2.7
20	IT & ITeS	3.8	5.3	1.5
21	Banking, Financial Services & Insurance	3.2	4.4	1.2
22	Telecommunication	2.9	5.7	2.8
23	Pharmaceuticals	2.6	4	1.4
24	Media and Entertainment	0.7	1.3	0.6
	Total	**511**	**614.3**	**103.3**

Source: Ministry of Skill Development and Entrepreneurship (MSDE) Annual Report 2018/19

While the numbers in Table 2 are somewhat dated, they clearly demonstrate rapidly growing demand for applied skills. While some of these sectors might see some of the demand shaved off (for e.g. hospitality, retail) due to lifestyle changes and income shocks due to Covid induced crisis in the short-term, their longer-term prospects remain just as robust.

It is just not government and employers who are flagging huge gap between the demand for specific skills, but also the individual employees. According the to the World 2019/2020 Global Skills Gap Report published by Udemy, 92% of employees in India feel that need to be re-skilled.
While the numbers underline the huge demand for specific industry related skills, it needs to be reiterated again that industry leaders feel that the Indian higher education system is largely not meeting the requirements for producing workers who can be absorbed by industry.

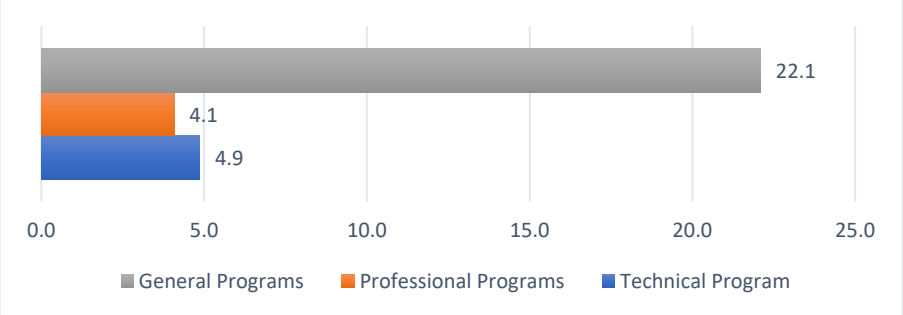
As per the AISHE Report 2018-19 total enrolment in undergraduate programs (including all general degree programs, technical and professional degrees diplomas) is 31.1 million. On average, this

6 Ministry of Skill Development and Entrepreneurship (MSDE) Annual Report 2018/19

would mean that between 10 to 12 million students finish their undergraduate degrees annually and a vast majority of them enter the workforce. If even fifty percent of this number had some level of industry ready skills, this would meet close to a third of the skill-gap, or more precisely the demand for new skills as identified by MSDE.

The interesting fact remains that these undergraduate programs are designed to provide students exposure to core disciplines and subjects that often form the basis for development of further training in industry ready professional skills. Let us examine the distribution of students by total enrolment across different programs in India at the undergraduate level. Figure 1 below provides the break up between general programs (i.e. Bachelor degree in natural sciences, humanities (i.e. social sciences, languages etc.) and commerce), technical programs (engineering and other specialized tech-oriented programs), and professional degrees (that include law, vocational programs).

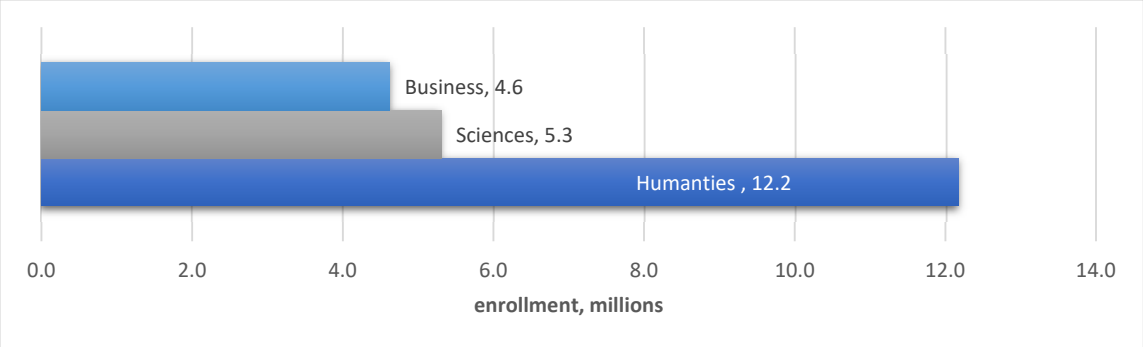
Figure 1: Enrolment across programs-millions of students



Source: Author calculation based on AISHE Report 2018/19

Figure 1 shows that an overwhelming majority of Indian undergraduates (22 million) are enrolled in general degree courses (Bachelor of Arts, Sciences or Commerce). Even more interestingly, only 11% of this number pursue the 'Honours' option, i.e. the requisite academic rigor in their discipline that could potentially lead to a more advanced degree in their fields. Figure 2 details the distribution across disciplines. The majority of students are enrolled in the humanities related programs.

Figure 2: Enrolment in General Bachelor Degree by Discipline

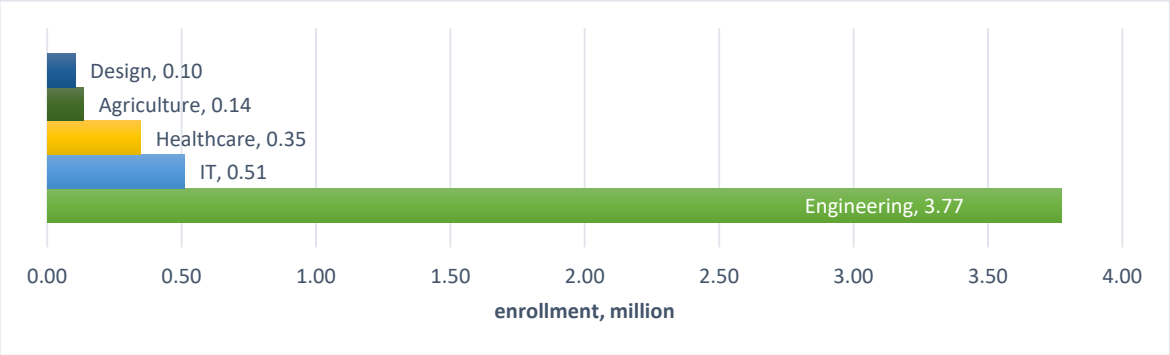


Source: Author calculation based on AISHE Report 2018/19

Figure 3 below details the distribution of students across different technical programs. A vast majority are enrolled in engineering and Information Technology related programs (about 88% of total enrolment). This is significant given the overall observation by leading industry players about the relatively poor levels of applied engineering and IT skills and employability of a majority of Indian

graduates coming from such programs[7].

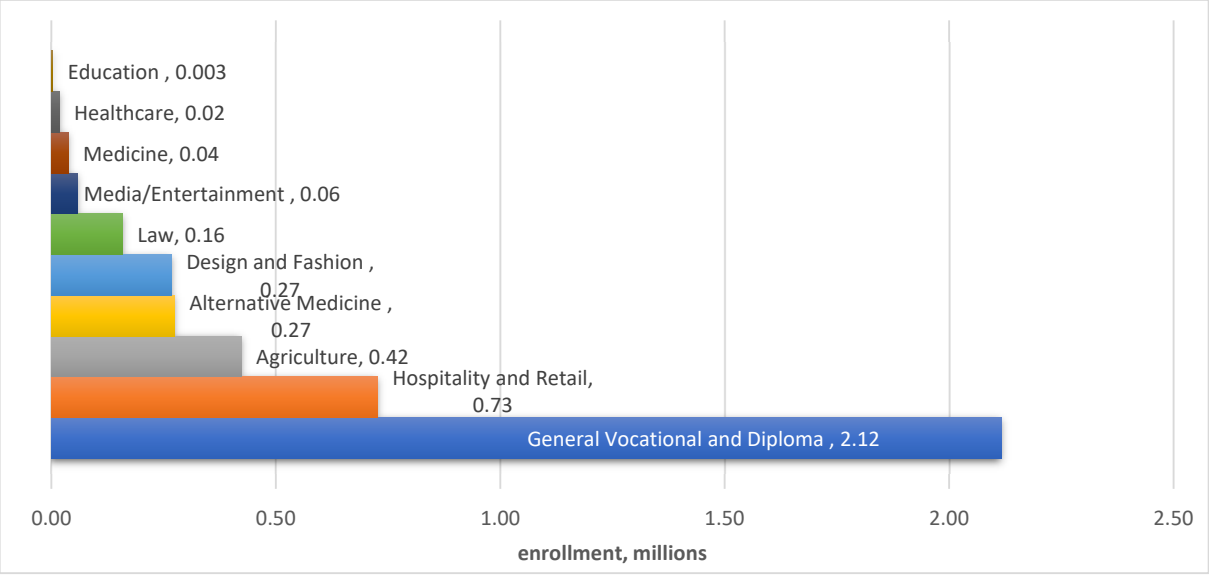
Figure 3: Enrolment in technical programs by type and specialization



Source: Author calculation based on AISHE Report 2018/19

It is interesting to note that Indian higher education institutions are already providing a very wide range of professional degree and diploma programs, many of which are linked to specific industry or industry roles. However, there are several more generic vocational programs with a wide variation in terms of the exposure to actual applied and practical skills required by the industry. Figure 4 below provides a break-up of professional courses by type to the extent this information is available in the AISHE Report 2018/19.

Figure 4: Enrolment in professional programs by type and specialization



Source: Author calculation based on AISHE Report 2018/19

Figure 4 clearly indicates that many programs are already designed to address specific industry needs for e.g. So, in other words, the Indian higher education eco-system has already developed curriculum,

7 NASSCOM-McKinsey (2009) Perspective 2020: Transform Business, Transform India Report said that only 26 percent of India's engineering graduates were employable. The more recent Annual Employability Survey 2019 by Aspiring Minds said that 80% of Indian engineers are unfit for jobs in the new knowledge economy

pedagogy and a set of educators to impart these skills. Examples include programs in alternative (including traditional medicine), healthcare, fashion, hospitality, retail, agriculture and media. Even a casual perusal of the listed programs in the AISHE Report 2018/19 indicates that there has been significant diversification in the last two decades in the kind of programs available to Indian students seeking to pursue a professional degree.
However, the levels of specialization desirable are still not adequate. More importantly, it is limited to a very few institutes and few students. It does not address the basic challenge that there is a burgeoning demand for specialized skills while the vast majority of enrolment is in more generic programs that do little to make their students employable. As pointed out, this need for specialized skills is further aggravated by rapidly changing dynamics of technological shock, production, and consumption patterns. Flexibility then becomes crucial to accommodate these changes and only an open system can impart that flexibility.

It is therefore important to underline that while Figures 1 to 4 detail the output of basic competencies in science, humanities, technical and professional programs, the pathways that lead from imparting such basic subject related knowledge to providing the graduate with some degree of industry related skills is much more complicated. If the Indian higher education apparatus is to become relevant to the modern economy, and indeed accountable for ensuring the students that go through its programs have sustainable livelihoods and acquire a place in the world, then it would need to understand, adopt, and integrate these pathways and it must do so continuously. Section IV and V that follow focuses on the possible design and process of adoption of these pathways.

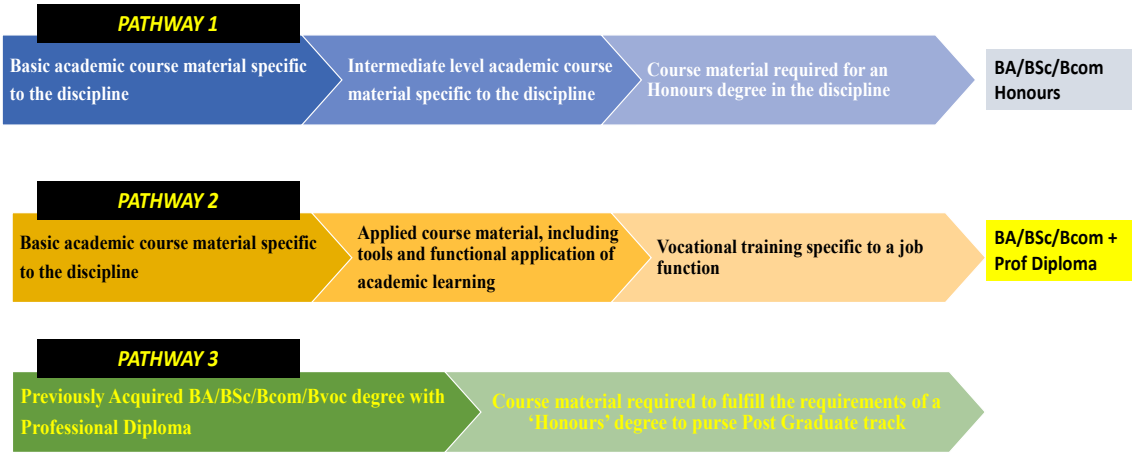
IV. Higher Education for the New Economy: From Degree Centricity to Multiple Pathways

Let us consider the three primary facts that emerge from our discussion in the preceding sections. First, a very large cohort (i.e. the majority) are enrolled in general degree programs in the Sciences, Humanities, and Business and Commerce disciplines which provide them exposure to the fundamentals of these disciplines. Second, a vast majority of this cohort do not want to pursue higher academics and are essentially seeking a college degree as the means to enter the job market. Third, the job market requires skills that can only come from exposure to course material that focuses on application of the basic academic learning of general disciplines to real world practice required in different job roles. This exposure to application of academic learning to practical uses would also add-value to many students in generic vocational programs.

Thus, depending on the need and desire of a student, there is a need for more than one pathway. One pathway is the pursuit of purely academic goals. The student pursues the ‘Honors’ option, and then goes on to a Post-Graduate program in related disciplines. The second pathway is for a student to be able to combine learning from the basic academic course material of her chosen discipline of study with applied course material on industrial/job-oriented applications as well as practical exposure to functional skills required for such job roles.

The third pathway is one that allows a student opting to pursue a the applied/vocational specialization to come back at a later stage in life to pursue academic goals and post-graduate degrees. Figure 5 provides the basic structure of this concept of multiple pathways. We do not rule out the possibility of other even better pathways. What we demonstrate that even with the pathways suggested in this paper, the system has to demonstrate flexibility and change in more ways than one.

Figure 5: Basic Conceptualization of Multiple Pathways Building on Existing Programs



Conceptualized by the authors

The concept of multiple pathways is best explained using an illustrative example. Let us pick the example of students enrolled for an undergraduate degree in Science with an interest in biological sciences. Under the current system one can either opt for a generic BSc pass course, or go through a more specialized BSc Honors course with specialization in Biology/Biochemistry etc. Pathway 1 in figure 5 charts this course.

With multiple pathways such a student could would have the additional option of pursuing say a BSc Pass with Diploma for Medical Lab Technician. This would represent one of the several specializations available what is described as Pathway 2 in Figure 5. A medical lab technician would require familiarity with basics of chemistry, human anatomy and physiology. These subjects are available to first year students in a standard BSc program, so the college offering this option does not really need to rejig anything.

In the second year, this student would need exposure to the more applied aspects of knowledge relevant to becoming a competent medical lab technician, i.e. academic course material associated with medical terminology and applied phlebotomy which sometimes feature in BSc Honours programs, or in nursing programs. In the third year, the student would be exposed to coursework related to the more practical job-oriented functions of a medical lab technician, i.e. clinical practice, use of modern lab equipment, lab process administration and management etc.

As mentioned earlier, the first-year general courses discussed in this example for Pathway 2 leading to a BSc Pass with Diploma for Medical Lab Technician are commonly available in most colleges offering BSc degrees. The second-year more specialized courses are less commonly available in most colleges, while the third-year coursework associated with functional job role skills are almost completely absent. This means that colleges would need to acquire the ability to be able to offer such coursework in their own campuses, or in sister organizations within the wider University system. Making this happen would require a significant level of academic and institutional innovations. Section V would focus on the wide range of interventions that can make developing and offering such alternative pathways for a vast majority of degree granting colleges and universities.

Pathway 3 deserves a brief discussion. Circumstances or current preferences might push a student towards opting for the more professional Pathway 2. But the student might want to come back to pursue a more academic career. In cases where the student has gone on to be a professional for a while, she would be bringing invaluable expertise in having dealt with real-world problems associated with the wider discipline. Having the means for this student to build on previously acquired relevant coursework from her first two years, and build on it obtain an Honours degree, and thus become able to pursue higher degrees, or in some cases simply allowing this student sit for the qualifying examination for entrance to a higher degree is important.

Pathway 3 as illustrated in figure 5 charts the possible course that could be made available. Given the resource constraints and limitation of seats, classroom integration might not always be possible for students who come back to pursue Pathway 3. Once again innovative practices including distance education in combination with some special contact classes would need to be adopted. The discussion on these innovations would also be picked up in Section V.

The Pathway 2 can be called the middle ground. A flexible approach that allows combination of the traditional coursework in natural science, humanities, and other disciplines with more applied professional coursework and exposure to industry practice. The ideation for developing such a middle-ground comes from the US model of Community colleges and coursework available in departments of professional and continuing education, the German Applied Science and Dual University model, and the Korean Junior college model. Box 1 that follows at the end of this section provides a brief discussion on these models. Table 3 below provides illustrative examples of pathways to professional skills using this middle-ground approach that allows for colleges and universities offer advanced vocational skills required by the economy while leveraging and building on their existing core competencies in traditional disciplines.

Table 3: Pathway 2 Examples-Creating HR Supply for Relevant Industry Demand

Degree and Diploma Combination	***Traditional Coursework***	***Applied Coursework and Job-related Functional Training***
B.A with Diploma in Technical Writing and Commercial Communication	Writing and Communication Introduction to Linguistics	Technical Writing Software Tools Technical Writing Simulation Workshops Developing Product Manuals/Online Catalogues
BA or BSc with Diploma in GIS Applications and Geocoding	Cartographic Techniques Basic Statistics	Digital Surveying Techniques Computer Cartography and Visualization GIS Software Use and Coding
Certificate in Appliance Management and Maintenance	Basic Physics: Electrical Circuits Basic Physics: Introduction to Mechanics Basic Physics: Digital Systems and Applications	Basics of Semiconductor Devices Basics of Digital Electronics Maintenance Manual for Electronic Machinery Maintenance Manual for Mechanical Devices
Certificate in Data Analytics and Data Labelling	Basic Statistics Intermediate Statistics Using Statistics Software	Data Analysis Tools and Applications Data Labelling Basic Machine Learning
Certified Medical Lab Technician	Introductory Chemistry Introductory Biology Human Anatomy and Physiology	Medical Terminology Applied Phlebotomy Clinical Practice Lab Technology Applications
Certified Wellness Professional	Introductory Chemistry Introductory Biology	Health and Nutrition Ayurvedic and Naturopathy Treatment

	Human Anatomy and Physiology	Techniques Personal Fitness Training
Certified Tele-medic	Introductory Chemistry Introductory Biology Human Anatomy and Physiology	Medical Terminology Applied Medical Software Applications Digital and Sensor Technologies for Remote Diagnosis Medical Technical Communication and Record keeping

Developed by the authors

The selection of diplomas and the associated coursework was chosen with the intent to showcase the relevance of such Pathway 2 programs to meeting the demand for skills in India. Each of the diploma programs listed here feature in the job function descriptions developed by the Sector Skill Councils set up by the MSDE[8], and this represents industry demand. For example, the certificate in appliance maintenance relates to Maintenance Fitter (national occupation standard CSC/Q0901) developed by the Capital Goods Sector Skill Council and Electrical Technician (national occupation standard ELE/Q6301) developed by the Electronics Sector Skills Council. The certified medical lab technician corresponds to phlebotomist (national occupational standard HSS/Q0501), and the certified tele-medic to tele-health services coordinator (national occupational standard HS/Q5801) developed by the Healthcare Services Sector Skill Council.

As was mentioned earlier, it is also pertinent that many of the applied coursework listed in Table 3 is already being offered by general degree colleges and other specialized institutes, and are listed programs in the AISHE Report 2018/19. For example, there are programs for Ayurvedic medicine (BAM-Bachelor of Ayurved Medicine) and wellness using traditional medicine (BNYS-Bachelor of Naturopathy and Yogic Sciences). There is a program for assistant to a physician that includes pedagogy relevant for both tele-medic and medical lab assistant (Bachelor of Science-Physician Assistant and Emergency and Trauma Care Management).

The fundamental groundwork for programs that build on the knowledge and pedagogy of general natural science and humanities related coursework with more specialized applied job-oriented learning is already there within the broader higher education system in India. It is just a matter of building on this foundation and integrating this concept of multiple pathways across a broad spectrum of colleges and universities. Section V that follows discusses the challenges of program design, curriculum development and pedagogy, faculty, and resource deployment and possible solutions.

8 A total of 24 different sector skills councils (SSCs) have been established by MSDE, and each SSC have developed qualification packs for several different job functions reflective of their core demand for skills

Box 1: Different Models allowing flexible integrated programs combining practical applied coursework with academic programs

The US Community College system

The concept of community colleges (or junior colleges as they were called earlier) emerged in the first half of the twentieth century from twin concerns. The first concern was that trying to provide the standard liberal arts college program to increasing larger numbers would dilute quality and research focus. The second concern was that there was an increasing need to provide quality practical training for the rapidly growing US economy in the post depressions era, and generally make higher education accessible to larger sections of society. The need for providing practical training to large numbers of returning soldiers post World War II to help make them employable, and the industrial boom of the 1950s and 60s in the US increased the importance of these institutions. Junior colleges were now renamed community colleges to reflect their deep connection to the educational needs of their local communities, and were often funded by local city and county governments.

These colleges served as bridge institutions. It allowed access to relatively inexpensive advanced vocational skills to a rapidly modernizing US economy that required a much more diversified range of skilled workers above and beyond generic industrial factory worker skills. At the same time, it offered its students the ability to take their course credits and transfer to four-year colleges and pursue an academic degree if they so choose to after graduation, or at a later date after some years of employment. This institutional innovation that allowed course credits earned in the community college system to be recognized by Universities and be counted towards an advanced degree requirement played a critical role in the development of this dual role.

US model of professional certification programs within mainstream University

Many US universities, especially state universities maintain a separate school or department that offers professional certification in applied and job-oriented fields. In many cases these programs are offered in partnership with institutions that specialize in providing such applied skills training. These certifications are often used as an additional qualification by college graduates to increase their employability, or serve as avenues towards re-skilling workers in new technologies or business practices, i.e. as a means for adult and continued education.

The German Applied Sciences and Dual University Model

In the tiered German higher education model, the classical model of a university geared for academic learning and research is complemented by what are called Universities of Applied Sciences. These institutions offer practice-oriented academic courses with the focus on professional application rather than theory leading to jobs. The credits earned in such institutions are also transferable to academic focused universities, and a student can pursue a more academic career at a later stage.

Germany also has so called 'Dual Universities' that combine academic coursework with on-the-job training programs. There are more than 50,000 dual training opportunities with different German firms that has been developed through this program.

Korean Junior College

Korean junior colleges offer vocational and professional two- or three-year programs in a wide number of areas. Under the flexible Korean model, junior college graduates can seek employment after graduation, or chose to transfer to a regular academic program. Korea has developed an extensive network for such junior colleges with 158 such colleges across the country

V. Implementing the Concept of Multiple Pathways: Program Design and Academic Resource Management

Academic Credit

The critical requirement for developing a flexible system of multiple pathways for a student is to develop a standard system of academic credits that is recognized across the wide spectrum of India's higher education system. Development of such a system has three main institutional requirements:

1. That all individual components (i.e. courses) that lead up to a degree, including those offered through distance or in specialized vocational schools are measured using standardized academic units, i.e. credits that a student will earn if she successfully completes that particular course
2. That such credits are recognized across the higher education system, and therefore are transferable between departments of the same institution or across institutions (under some conditions). This allows the student to combine different elements and streams that in combination enable multiple-pathways leading up to different degrees. In our examples in Section III for e.g. combination of credits earned from first year BSc courses in introductory biology, anatomy and chemistry with phlebotomy courses typical of nursing programs and vocational training associated with clinical practice and lab management all leading to a

degree for a certified medical technician.

3. A system of national accreditation that would establish basic academic standards across the board, and create confidence among university administrators to recognize such inter and intra institutional transfer of credit and development of inter-disciplinary (including vocational and practical learning) credit combination leading to multiple pathways.

Different countries have developed different approaches to achieving this three above mentioned institutional solutions. The fundamental difference is whether such a system is essentially administered and managed by the government, or whether it is largely driven by the academia and associations developed between academic institutions.

The European system is primarily government led. The European Credit Transfer and Accumulation System (ECTS) has been developed by higher education authorities across Europe as a means for recognition of academic credit between institutions across Europe. The accreditation system related to such recognition of academic credit is also developed and defined between governments. Accreditation agencies are also for the most part, government or quasi-government entities. The ECTS has also developed a standardized Diploma Supplement that would be issued by all institutions for recognition of academic qualifications. This standardized format ensures that degrees are recognised by higher education institutions, public authorities and employers across Europe.

The United States system is primarily led by academic associations. The US has traditionally depended on independent accreditation agencies recognized by a coalition of universities and colleges. The Council for Higher Education Accreditation (CHEA) is the national association of colleges and universities that provides the institutional basis for such self-regulation, with over 3000 academic institutions as members. The CHEA recognizes 60 accreditation organizations that certify the academic programs and credit structure allowing for transferability of academic credit between its members. The US Department of Education also has a system of recognition, especially with regard to the administration of Federal level academic scholarships that it provides and administers. But like the CHEA, it also depends on a number of independent accreditation organizations that it recognizes.

India already has an institutional mechanism of academic certification and recognition in the form of the University Grants Commission (UGC) and its standards assessment and certification bodies, the National Assessment and Accreditation Council (NAAC) and the National Board of Accreditation (NBA) which is responsible for technical programs. In addition, the industry led Sector Skills Councils (SSCs) have a role in defining course content and quality of vocational programs. To that extent Indian system is closer to the European model of government led or mediated institutional design.

The UGC is already seriously considering the issue of both standardization of units that measure academic coursework across programs and institutions, as well as developing easy means for their transfer across the system. The Public Notice issued by the UGC in December 2019[9] proposing the concept of a National Academic Credit Bank (NAC-Bank) provides a detailed examination of this issue. It states that the main objective of the NAC-Bank would be to facilitate student mobility across the education system and used at alter points of time for the requirements of partial fulfilment of degree programs. It suggests that NAAC and NBA can provide the structure for accredited academic credits which would be accepted across the board.

In essence this allows for Pathways 1, 2 and 3 as defined in Section III. It underlines that academic autonomy while critical, cannot become a prerogative for institutions to limit the autonomy of the

9 Public Notice D.O. No. 14-31/2018 (CPP-II), University Grants Commission, Ministry of Human Resource Development. Government of India

student, i.e. the student's rights to be able to combine coursework and learning in a manner that best suits their career and academic needs. In other words, the right to have multiple pathways to degrees and certifications.
In addition, the NAC-Bank would provide a unique electronic repository (i.e. account) to each student where academic credits earned across departments and institutions would be verified and stored. These could be checked by institutions for pre=requisites and combined to provide certifications (at which point they would be considered to be redeemed). In other words, a digital system that facilitates the management of multiple pathways for academic institutions.

While the NAC-Bank is at proposal stage, the system of accredited transferable credits, including for vocational and distance programs, and the facilitation mechanism of digital repository are critical building blocks for the system of multiple pathways discussed in Section III, and essential to developing programs and courses leading to the employability of millions of Indian undergraduate degree holders.

Curriculum Development

Another critical component for developing such multiple pathways would have to be curriculum. Indeed it would be more correct to say that the right curriculum is one of the most important goals of these suggested multiple pathways. Curriculum and pedagogy for introductory courses would need be mindful of the needs for not just of academic programs, but also those students who might want to follow more applied and vocational pathways. Crucially curriculum and pedagogy must cater to what the economy requires and must evolve as the economy evolves. This is not as complicated as it sounds. The essential requirement would be to ensure that introductory coursework focuses on providing a sound basis of the discipline or subject they are associated with without making two following extreme assumptions.

The first assumption is that students will pick up the essentials in later coursework assuming they a follow an academic track, leading to dilution of course material and pedagogy. The second assumption is that introductory course needs to prepare students only for advanced academic coursework later, leading to over-emphasis on theoretical material while diluting comprehensive coverage of the basics of the discipline. In systems such as the US, UK or Germany where credit transferability and inter-disciplinary education is common, curriculum design has mostly achieved the right balance between these two extremes.

An obvious solution is to learn from the existing curriculum and pedagogy in these more advanced education systems and adopt them to Indian circumstances. In addition, pedagogy can be further improved by adopting digital tools that support visual and interactive learning that allows less dependence of textbook based approaches to classroom teaching. NAAC and NBA could develop model curriculum, course material, and pedagogy for different units of course work across disciplines. Dedicated taskforce for each discipline consisting of academics, practical trainers, industry HR specialists can be set up for this exercise. It is recommended that Indian origin faculty working in UK, US, German and other countries be included in each of these discipline specific taskforces. The experience of Indian origin faculty engaged in delivering the more practical and applied courses in these systems (in community colleges or vocational institutes foe e.g.) would be invaluable in integrating curriculum and pedagogical techniques from these systems into the Indian context.

Members of the SSCs would also be included in the work of these Taskforces. They would provide industry specific inputs on the applied course-work that would require an interface between academic and occupational learning, while also further develop their existing vocational packs to help make them integral to the practical industry oriented course-work that would be required to attain the degree-diploma combinations of the type listed in Table 3 as examples.

It is also quite likely that with respect to the curriculum, Higher Educational Institutions (HEIs) would have to "let go." The nature of these courses are quite alien to what is currently taught and teachers for obvious reasons do not possess domain expertise in these areas. This is also true for professional and technical institutions as well. For example few Computer Science Departments have the domain expertise to frame a course curriculum for course like Blockchain Technology, Machine Learning or Artificial Intelligence let alone the faculty members to offer such programmes. This is because the locus of knowledge creation in many sectors has long shifted from the Universities to the industry and the pace of change is so quick that even as the Universities gear themselves to catch up, the industry moves even more ahead.

The syllabi would probably be prepared by industry experts with current HEIs administering delivery of these programmes. Moreover the wide array of such vocational programmes as well as their frequent upgradation will make acquisition of domain expertise a difficult and indeed an unnecessary requirement. What is vital is that HEIs become open- that they allow other players/agents to "plug" into the HEIs and offer these courses. At the same time as examining bodies they should also ensure that the programmes being offered are relevant and up to date.

It is quite possible that the sheer number of programmes offered and changes in such programmes exceed the capacity of any standards setting body to either vet or administer. HEIs must also prepare for this eventuality. It must take the risk of allowing new programmes and weed out programmes which become irrelevant – a suggested evidence being fewer students taking up that programme. This is exactly what a smart open system does, allow for new programmes to be offered from its platform without getting overwhelmed.

Faculty Development

The foundational courses in Natural Sciences, Humanities, and Commerce can be continued to supported by existing faculty. A significant effort might be needed in certain areas to help this existing faculty adjust and adopt some of the changes in curriculum design, teaching methodology and pedagogy. While this sounds simple, it represents a herculean task.

One way around it would be to make it mandatory for all UGC recognized entities to make such short duration teacher training mandatory. In order to ensure smoother roll-out, significant portion of the training can be done online using digital tools and videos with model lecturing techniques, including user guides for the use of visual and graphical teaching tools. This could be followed by a series of short-tests which can also be conducted using digital technology. Enhanced assessment techniques that include video-recording of lectures to check if updated teaching methodologies, curriculum and tech-enabled tools are actually being applied in the classroom could also be implemented as post-exam verification of efficacy of training.

While some of the more applied courses (to use examples from table 3 digital cartography, phlebotomy, ayurveda and naturopathy) can be taught by existing faculty already supporting similar courses, the sheer number of such faculty required if one is to plan to offer multiple pathways programs across a wide swathe of colleges and universities would be very large. Therefore, it would critical to substantially increase the number of qualified teachers for such courses.

UGC in collaboration with universities across the country would have to develop a dedicated ten-year program for such faculty development. Regional centres dedicated to training of faculty to deliver such applied course-work would have to be established. Once again, a combination of online learning plus contact classes could help limited resources cover a large number of trainees. Incentives could be offered to Masters degree holders to opt for such training. If an assured job as a faculty is the result

of entering such specialized training programs, there would be enough applicants to take up this opportunity.
Industry professionals and veterans are best placed to teach the practical courses (to use examples from table 3 maintenance and repair of mechanical or electrical devices, data labelling or lab technology applications). They have real-world experience and exposure to actual demands and requirements of the factory, office or shop floor which would be passed on to students. This would help students prepare for the real world and substantially add to their employability.

But in order to integrate industry professionals (including retirees) a flexible program of visiting faculty that provides adequate respect to the experience these professionals, and is mindful of the need for flexibility in terms of timing of classes and scheduling needs to be put in place by universities. Rigorous academic pre-qualification for recruiting visiting faculty typical of academic programs would need to be replaced by practical approaches that puts greater value on industry experience.

Universities would also need to launch an aggressive outreach program to industry professionals to recruit them for such roles. A special program can be developed in this context by the central government under the aegis of MHRD that allows recruitment of retirees from Public Sector Units (PSUs), especially for the more applied technical fields.

A serious challenge is that industries and the professionals they employ are found in clusters, which might often be far way from the locations of college campuses. It thus becomes imperative that a lot of these courses be delivered through online lectures, instructional videos and video assisted practical class-work where the teacher observes the student online. For example, the teacher instructs and guides a student as she disassembles an electrical machine, checks for malfunction in a circuit within, identifies and repairs the flaw, and re-assembles the machine. Using live video streaming into a classroom will also help address relative shortage of such industry professionals. A single professional could support two to three programs over a year.

This again calls for openness where HEIs are concerned. The nature of skill courses are such that if they are to be optimally delivered, then appropriate professionals will have to be given access to this platform. Their educational qualifications may not be in consonance with what HEIs currently hold mandatory. But this mandatory requirement may not be relevant to the demands of the economy where skills are concerned. The HEIs will have to devise means for the participation of such personnel in training without compromising on its core functions and therefore the educational requirements of those who carry out these functions.

Infrastructure and Resource Optimization

Many Indian colleges and universities are resource and infrastructure constrained. Offering a wider array of courses would have to deal with this challenge. While problems would be specific to different institutions, some general recommendations and ways forward could be explored.

Many of the applied and practical courses can be offered in the evening or after-class hours to allow for optimization of space. As is common in some places, colleges can offer their premises the vocational institutions to run their programs at night and allow their day scholars to do their applied and practical coursework. Twinning programs between applied, technical, and vocational schools that allow each other's students to do coursework across this system and optimize the use of their collective infrastructure and teaching resources in order to offer combination multiple pathway programs is another solution.

Another solution might be that a group of colleges in a district/region/metropolitan area pool their

resources to create a consortium to offer such practical and applied courses along with their general undergraduate degrees. They can joint create a common program that allow students to take courses across this common system and maximise the use of their physical and human resource infrastructure.

Box 2: Example of pooling resources: Access to digital repositories of knowledge

Having access to the vast online repositories of knowledge is critical for students, especially those in the applied fields or research. Modern digital libraries are not limited to academic journals, but also to collections of cases studies in medicine, nursing or engineering, online lectures. Access to such online repositories is expensive. But a number of universities can pool resources together to offer such access to students. Or better still the University Grants Commission can leverage the sheer economies of scale of the combined and make such access possible for all students in India. Recently, the British Council is offering access to a vast repository of online resources to any Indian for a very reasonable price of INR 1800 per year. There is no reason that the UGC cannot negotiate a much better price and open up access to digital resources that students in US or UK take for granted, but is not available to students in most Indian Universities.

A special funding program for general undergraduate degree granting colleges who want to offer such applied and professional courses on their own, or a number of colleges in consortium should be part of the overall policy framework for MHRD. Such a fund would support development of online and digital resources, simulators that help in getting practical operating experience, and equipment that help hands-on training. Only colleges that show serious intent on developing such applied and practical streams would be eligible for funding.

Funding can also come from industry. As indicated colleges can work with SSCs and develop a department for professional education which is guided and jointly managed by SSC approved institutions offering industry ready skills. Industry gains from partnership with an established college and through the use of its infrastructure. It also gains because the college academic programs takes care of the foundational coursework, and partially addresses some of the applied aspects as well, and this does not have to be duplicated. The colleges gain from direct connect with industry, industry oriented faculty to teach practical courses, and industry experience to fine tune pedagogy. Industry connect might also help on-campus recruitment.

The recommendations and strategies in section V need to be deliberated and further developed. Detailed strategy papers on each of the items, i.e. developing a well-functioning system of credit transfer, curriculum development, faculty development, and infrastructure and resource optimisations need to be created and implementation plan needs to put in place in order to seriously pursue this important goal of multiple pathway higher education that imparts genuine real-world skills along with general education to India's youth.

Conclusion

India needs to address the challenge of skill shortages and its ensure that its cohort of young workers have employable skills, and thus becomes its competitive advantage and not its major socio-economic challenge. Rapid technological change in production of goods and services means that most in-demand jobs a few years from now in all likelihood do not even exist today. Responding to such rapid change requires a higher education/skilling ecosystem that is flexible enough to adjust to the demands of the market for skills. We cannot assume a rigid inflexible architecture/system can tackle this problem when the rate of technological obsolescence is heartlessly swift and the nature of skills that India needs in the coming years itself is unclear.

It is here that the hierarchy of institutions that the Draft report recommends has to be moulded to retain its consonance with its vision of a knowledge society. For example, the report talks about the evolution into three types of higher educational institutions, research universities, teaching universities and colleges. This division is not unreasonable given the problems in the past and today that India has faced with the quality of research and teaching. However, it is not at once clear whether it is always suitable for the task of taking India towards a knowledge society across time and area.

Given the rapidly changing skill sets requirement that India will need, this implied separation between research and teaching is not what our formal institutions need to do. For teaching purposes, the NEP very correctly calls for lateral entry of personnel and this is useful for new skills e.g., a new programming language. But researchers too need to know this language so that it could be improved and built upon. Therefore, for most part, teaching has to be integrated with research.

Secondly case studies with respect to the environment, governance, traditional knowledge and know-how etc. in many cases will need to be validated by formal researchers before becoming part of what is taught even in an "open architecture." It is also likely that the researcher, in his or her role as a teacher, will initiate the teaching of materials sourced from non-formal/traditional sources. A system, where a hierarchy is created between teaching and research leading to different types of institutions, this is not easily done.

Therefore, in the absence of advice on "openness" of architecture, individual universities *per se* will have to take it up on their own if they are to stay relevant as society keeps on transforming and morphing. If their specific visions are in consonance with that stated in the NEP i.e. the local university will contribute to their region's journey to becoming a knowledge society in its broadest sense, one which not only has modern technology as one its components but more importantly is a free, dynamic, cosmopolitan and liberal society aware of the geographical, social and political environment in which it exists, then its architecture cannot be "closed."

Mere lateral entry alone will not tackle the problem posed by continuous change. More importantly for that is the requirement that the institutions must be open to and collaborate with the new players in the field of knowledge creation and production even while keeping check on the quality and veracity of the information/knowledge generated, i.e., they have to be "open."

ATAL BIHARI VAJPAYEE INSTITUTE OF POLICY RESEARCH AND INTERNATIONAL STUDIES (AIPRIS)

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

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2. To offer short-term capacity-building and training programmes on relevant areas of international studies and public policy for the benefit of policy-makers, bureaucrats, business executives, faculties in the higher education sector, students, functionaries of NGOs etc.
3. To promote exchange of idea through webinars, conclaves, seminars, workshops, public lectures etc.
4. To offer certificate and diploma programmes.
5. To invite distinguished scholars and practitioners as adjunct fellows and experts for sharing ideas and perspectives
6. To publish books, occasional papers and monographs through conventional and digital modes
7. To make impact assessment of government programmes and schemes
8. To offer internship opportunities to postgraduate students and research scholars
9. carry out such outreach activities that enhance awareness and critical understanding of public policy issues and international affairs

"Our aim may be as high as the endless sky, but we should have a resolve in our minds to walk ahead, hand-in-hand, for victory will be ours."

- Atal Bihari Vajpayee