Enhancing quality of education in India by 2030

A F.I.T. approach to realising SDG 4

Quality Education Conclave
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Foreword - UNGCNI

Quality Education is an important goal among the 17 UN Sustainable Development Goals (SDGs). SDG 4 pronounces Quality Education for all by 2030. Making India's youth future ready is critical to attain this vision. This is a mammoth task that requires close partnership between all stakeholders including government, policymakers, academia, industry and NGOs to ensure inclusive and equitable education and promote lifelong learning opportunities for all.

In India, the stage is almost set to improve and scale up education at all levels. The Draft New National Education Policy 2019 (NEP) clearly recommends aligning Education with the UN SDGs and forging stronger partnerships between academia and corporate sector to not only ensure the effective implementation of NEP, but also for achieving Quality Education for all in India.

Recognizing these imperatives, our 1st Quality Education Conclave has been designed to provide a robust platform for diverse stakeholders to come together to deliberate on critical issues and recommend innovative solutions to the challenges facing achievement of Quality Education at all levels.

It is our effort to create a roadmap, which incorporates the views of eminent practitioners, academic and business thought leaders, government leaders, civil society organisations and UN bodies, for ensuring that Quality Education reaches to all the people across the country.

This well-researched paper prepared by our Knowledge Partner KPMG offers a sneak peek into the world of SDG-4 'Quality Education for All by 2030' and makes for insightful reading to understand the big picture of education driving SDGs with the help of strong linkages between Industry and Academia.

I am confident that the Theme Paper shall provide a unique opportunity to all participants to further deliberate the Agenda of Quality Education for all and help in preparing a blueprint for actionable agenda towards achieving the targets by 2030.

My best wishes to all!

Ranjan Kumar Mohapatra
Conclave Chair QEC-2019
&
Director (HR)
Indian Oil Corporation Limited

Foreword - KPMG in India

The year 2019 marks the conclusion of the first four year cycle of review of the 2030 Agenda for its Sustainable Development Goals (SDGs). With regard to the Sustainable Development Goal 4 (SDG4) on quality education, India has seen significant progress towards achieving the target. Several policies, measures and investments in the form of new initiatives, with the objective of enhancing educational outcomes across access, equity and quality in education are being witnessed. However, present achievements and interventions notwithstanding, the prevailing gaps in educational outcomes are many.

Given the diversity in the country, a linear or a one-size-fits-all solution to close the gaps will not work. We need adaptable, scalable and innovative interventions across all levels of education beginning from early childhood to tertiary education and beyond in the form of life-long education. Each region comes with a unique set of challenges and hence comes the necessity to localise the global agenda on Education 2030 and facilitate its effective implementation at a state and district level.

In order to address these challenges, this paper identifies three key levers that shall serve as the backbone of driving non-linear progress and effect large-scale transformation: Financing, Innovation and Technology (FIT) solution to achieve the SDG-4 targets. The FIT approach is a pathway framework to help strengthen the current education system, charting the road ahead towards education for all. The paper further looks at those relevant solutions within each of these three pillars and elaborates their need and potential in the Indian context.

With a decade left on the clock, this report offers states suggestions for implementing the FIT approach and fast-track progress towards attaining the (SDG4) Goal. The paper also attempts certain recommendations to non-state actors whose role is immense in achieving the Sustainable Development Goals.

We, at KPMG in India, thank everyone who has helped us in bringing out this paper. We hope this triggers a dialogue to build transformative approaches and help India achieve its SDG4 targets.

Narayanan Ramaswamy

Partner and Head,
Education and Skill Development
KPMG in India

1 Introduction

At the 70th session of the United Nations (UN) General Assembly in 2015, member states adopted the 2030 agenda for sustainable development. The agenda has translated into 17 Sustainable Development Goals (SDGs), including SDG 4 on education with its 10 targets. The goals focus on achieving access, equity and quality in education across early childhood education, basic education, higher and tertiary education, and promoting lifelong opportunities for all by 2030.

The targets of SDG 4 can be summarized as below:

4.1 Quality primary / secondary school education for all | 4.2 Early childhood development, care and pre-primary education | 4.3 Equal access to technical, vocational and higher education | 4.4 Skills for decent jobs | 4.5 Gender equality and equal access for all | 4.6 Youth and adult literacy | 4.7 Knowledge about Sustainable development and global citizenship | 4.a Safe and inclusive learning environment | 4.b Scholarships for higher education | 4.c Professional development of teachers

While these may be global goals, given the varying levels of advancements of each country's education system, it is essential for countries to integrate the goals into their respective state policies and see SDG 4 as a tool to frame education planning. With a decade at hand to realise SDG4 targets, as India prepares to amplify its initiatives to achieve SDG4 against the backdrop of education reforms already underway, it becomes essential to review where the country stands and assess what it would take to align its strategies to aid SDG 4 attainment.

This report attempts to take a quick stock of the as-is situation of India's progress against SDG 4 targets, provides insights on innovative mechanisms that facilitate the transformation required to help attain the targets by 2030 and offers recommendations to states and government machinery to move towards attaining the goals. Given the magnitude of the transformation, the paper also seeks to establish the criticality of the role of non-governmental stakeholders and provides recommendations to stimulate their participation in this transformation journey.

Current context in India

India's progress against SDG4 Targets

Over the past decades, India has taken several steps to achieve its goals towards universalisation of education. Past education reforms, aided by central and state government schemes and policies, have helped in promoting access and equity and inch closer to the specified SDG 4 targets.

While India has done well in ensuring access and universalisation of pre-primary, primary and secondary education, it is lagging behind in many parameters, such as quality of teaching-learning outcomes, enrolments in higher education and the quality of skills imparted to its youth.

The table below gives a brief overview of India's progress against the SDG 4 targets:

SDG	Indicator selected for SDG India	National target value for 2030	Current state value (as on 2017-18)
4.1	Adjusted net enrolment ratio at elementary (class one to eight) and secondary (class nine to ten) school	100[1]	75.8[2]
	Percentage of correct response on learning outcomes for class five student in language, mathematics and environmental sciences	67.891[1]	54.7[1]
	Percentage of correct responses on learning outcomes in language, mathematics, science and social science for class eight students	57.17[1]	44.6[1]
	Percentage of children in the six to thirteen-year age group who are out of school	0.28[1]	2.9[1]
	Percentage of average annual drop-out rate at secondary school	10[1]	17.1[2]
4.3	Gross Enrolment Ratio (GER) for higher education	43 to 45*	25.8[3]
4.4	Average unemployment rate per 1000 persons for males and females	14.8	63.5[4]
4.5	Gender-parity index for elementary (classes one to eight)	1	1.052
	Gender-parity index for secondary (classes nine - twelve)	1	1.02[2]
	Gender-parity index for higher education	1	0.97[3]
4.6	Adult literacy rate	100	70.5[5]
4.a	Percentage of schools with:	100	
	Electricity[2]:		60.8
	Information and Communications Technology (ICT) / computers[2]		14.1
	Ramp for the disabled[2]		61.3
	Drinking water[2]		87
	Functional toilet for girls[2]		94.4

1. SDG India Index, Baseline Report, NITI Aayog, 2018
2. U- DISE Data, 2017-18
3. All India Survey on Higher Education 2017-18, MHRD, 2018
4. SDG India Index, Baseline Report, Niti 2018
5. Literacy Rate (Age 15 and above) - NSS 71st Round ,2014

| 4.c | Percentage of school teachers professionally qualified | 100 | 81.2[2] |
| | Percentage of elementary and secondary schools with pupil-teacher ratio less than/equal to 30 | 100 | 70.4[2] |

*12th Plan Document stated its aim to achieve higher education GER of 30 per cent by 2020 and the Draft National Education Policy (DNEP) 2019 aims to achieve higher education GER of 50 per cent by 2035

India's performance on SDGs (as on 31 March 2018).[6]

Major policies and schemes supporting SDG 4

The Indian education landscape is replete with several central and state-level education schemes aimed at helping the country attain the desired education goals.

Samagra Shiksha (subsuming Sarva Shiksha Abhiyan, Rashtriya Madhyamik Shiksha Abhiyan and Teacher Education), the Mid-Day Meal Scheme, Integrated Child Development Services (ICDS), Rashtriya Uchchatar Shiksha Abhiyan (RUSA), Pradhan Mantri Kaushal Vikas Yojana (PMKVY), National Skill Development Corporation, Udaan, Standard Training Assessment and Reward (STAR), Saakshar Bharat, National Service Scheme (NSS) and the Centrally Sponsored Scheme for Teacher Education are some of the key national schemes helping achieve specific SDG 4 targets corresponding to early childhood, school, higher and tertiary education. They are further supported by schemes undertaken by state governments.

Furthermore, the recently released DNEP 2019 acts as an overarching policy providing the overall direction in meeting various education objectives. It emphasises on quality education, universal access to education, equitable quality education and lifelong learning, all of which are the basic tenets of the SDG 4 agenda.

3.   Quick Guide to Education Indicators for SDG 4, UNESCO Institute for Statistics, 2018

Continuing challenges

While these schemes are helping India in its journey towards providing equitable access to quality education, there are a host of continuing challenges.

Three-fourths of the eligible population still left out of higher education system, as marked by GER of 25.8

Iniquitous growth on dimensions of gender, inclusion of socially disadvantage, religious minorities and persons with disabilities

High teacher and faculty vacancies affecting quality of education delivered

Poor pass percentages / significant drop outs within higher education

limited use of futuristic technologies, resistance to change

Insuffi ient thrust on outcome focus leading to lack of accountability demonstrated by institutions

Disparities in Access education, particularly tertiary education with wide variations between and within states

Poor learning outcome achievements in school education

Inadequate measures targeting teacher quality, i.e., in areas of professional development, career management of leadership / teachers

Challenges pertaining to employability of candidates post completion of higher/tertiary education

Weak monitoring and data capture mechanisms, leading to lower prevalence of evidence-based decision making

Challenges in finan ing such as inadequate funding, inadequate allocation of funds targeting quality improvement

Legend:
- Challenges in Access
- Challenges in Equity
- Challenges in Quality
- Challenges in Effi iency

This report seeks to identify solutions to address some of the aforesaid challenges and details them in the subsequent sections.

3 Tools and enablers for large-scale transformation: the F.I.T approach

## 3.1. Introduction to the F.I.T approach

Achieving the ambitious SDG 4 goals in India will require new and non-linear approaches that help reach children and youth who have not yet been reached, achieve better learning outcomes, impart 21st century skills, all this while ensuring cost efficiency. Overall, while the country has seen innovative interventions over the last few years, several of them have been in pockets, limited in their scale.

In light of the given challenges, it is imperative to think beyond mainstream solutions that achieve linear progress to develop and deploy scalable disruptions that may yield exponential, at the same time, sustainable progress across the identified indicators. There is an urgent need for action and a mission-mode approach not just from state players but also from the entire ecosystem involving academic institutions, donors, philanthropic organisations and the private sector.

In summary, the focus is on creating sustainable, equitable solutions using innovation in education as a tool to catalyse a larger societal impact.

The F.I.T approach to achieve SDG 4 in India
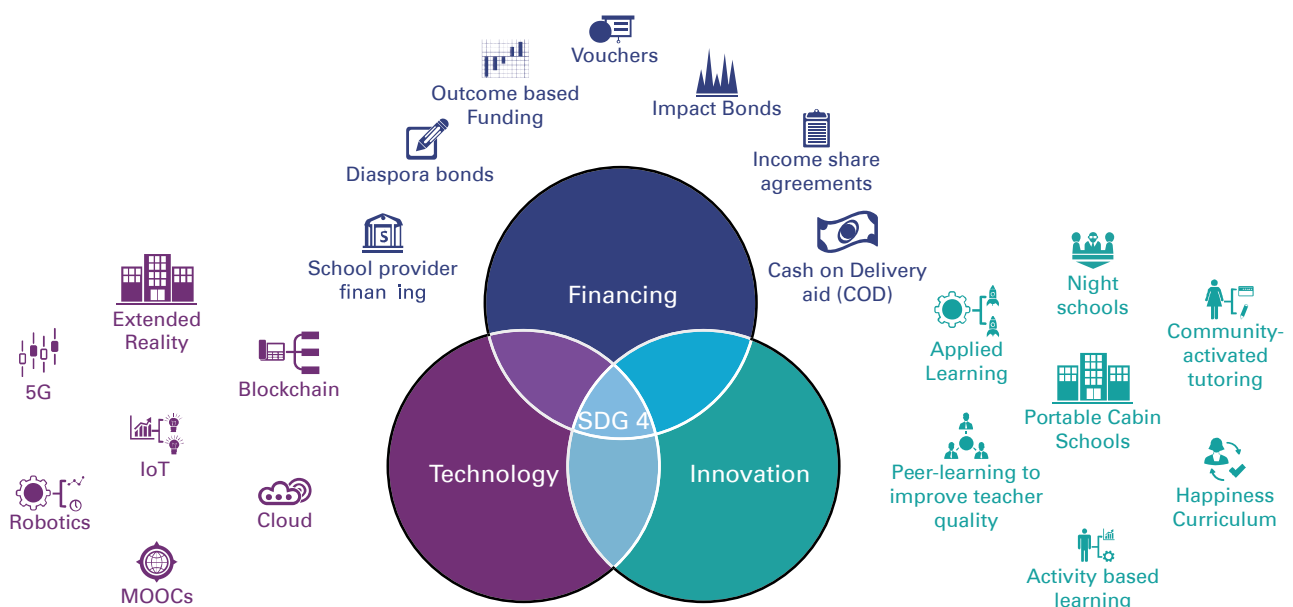
Against this background, KPMG in India has identified three levers that shall be the backbone of aggressively driving disruptive approaches to enable large-scale transformation and facilitate the attainment of the SDG-4 goals: Financing, Innovation and Technology, or a FIT solution to achieve the SDG-4 targets.

Defining the F.I.T approach for quality education

The FIT approach is a pathway framework for states and institutions to chart roadmaps to achieve SDG-4 targets.

While independent interventions in the areas of financing, innovation and technology have been witnessed in the past, a cohesive strategy adopting all three levers are, many a time, missing in system-wide interventions. This paper discusses key solutions across these three levers that hold significant promise for India and provides recommendations for states and other actors to achieve SDG-4 goals by leveraging these solutions in a unified manner.

Guiding principles in solution selection

When adopting the F.I.T approach to solution selection, it is recommended that states assess and select the solutions upon evaluating them against the below-mentioned guiding principles.

Guiding principles for solution selection				
Has high impact on educational outcomes	Objectives met with regard to access, equity, quality, efficiency	High degree of replicability and scalability	Cost effectiveness at scale	Acceptability among relevant stakeholders
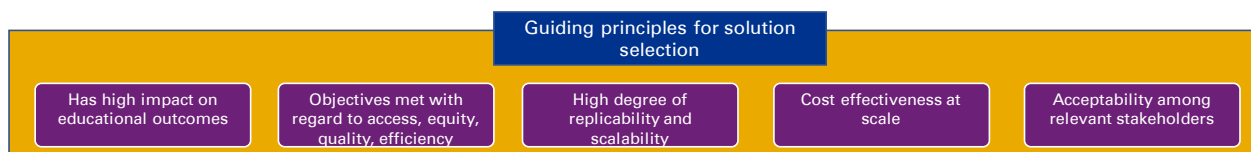
3.2. Financing and its role in achieving the 2030 goal

One of the major barriers pertaining to attainment of SDG 4 is a gap between funding requirements and existing funding. Closing this gap requires action on several fronts: efficient and effective domestic resource mobilisation, outcome-focussed donor efforts to ensure that money is spent well and harnessing private capital for good[1].

In recent years, there has been a rise of innovative financing and funding mechanisms globally. Innovative financing here refers to 'new or novel ways to generate predictable, additional and sustainable finance and the raising of funds from unconventional sources or mechanisms to make existing funds 'go further'[2] . These mechanisms have two cross-cutting themes — their focus on results and the engagement of the private sector in public funding, thereby helping achieve the twin objective of reducing the financial burden on the government as well as helping in attaining education outcomes.

Some of the innovative financing mechanisms include social and development-impact bonds, income-share agreements, outcome-based financing and diaspora bonds as well as the relatively tried-and-tested tools such as conditional and unconditional cash transfers and school-provider financing. In the subsequent section, three such mechanisms, which are in alignment with the FIT guiding principles, are detailed.

1. The promise of Impact Investing in India, Brookings Institution, Ravi, Gustafsson-Wright, Sharma, Boggild-Jones, June 2019
2. Rose & Steer et al, 2013; Interviews with Steer, Gustafsson-Wright, Atinc, March 2014
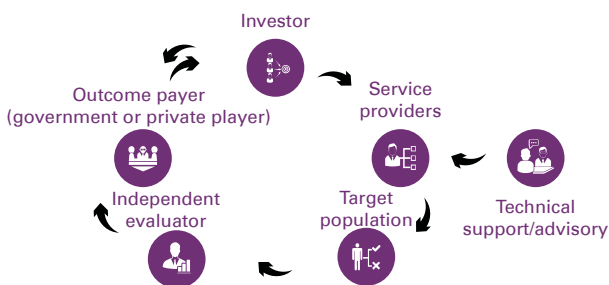
Impact bonds

SDG4 linkage: 4.1, 4.2, 4.3, 4.5

In recent years, impact bonds have been one of the innovative financing mechanisms that have come to the fore to help improve social outcomes and achieve SDG goals. These instruments are currently being implemented in sectors such as health, employment, social welfare, environment and education. Globally, till 2018, 151 impact bonds across 29 countries have been put into effect. Of these, 17 are in the field of education across early childhood education, K-12 and higher education[1].

Impact bonds allow private investors to provide capital upfront to service providers to help achieve social outcomes. The investors are paid back for with capital and interest by an outcome payer – government (social-impact bonds) or a philanthropic organisation/agency (development impact bonds), subject to achievement of pre-specified outcomes. Impact bonds are often executed by service providers and are evaluated for outcome achievement by an independent agency.

Impact bonds are most relevant in situations where there are limited resources, or where the government is unwilling to invest in the project due to the risks involved[2].

Potential in India

- The impact bond market in India is at a nascent stage but is the most active among developing nations, showing strong appetite for the financing mechanism[3]

- India has a thriving environment of philanthropic organisations, national and international foundations in its supporting ecosystem, a key enabler for the success of impact investing

- Post success of 'Educate Girls Development Impact Bond' (mentioned in the following case study) in the Indian education sector and the high return on investment achieved, new impact bonds are being contracted in India and the market is set to grow further.

Case study: Educate Girls' Development Impact Bond (DIB)

The context

The Educate Girls' DIB was contracted in 2015 and ended in 2018. The aim of the three-year programme was to increase enrolment of school girls and improve learning outcomes for both boys and girls in Rajasthan. The target population was 166 schools covering 15,000 children (9,000 girls). The outcome payments were linked to learning outcomes (80 per cent) and enrolment (20 per cent).

Investor: UBS Optimus Foundation – upfront capital of USD2,70,000

Service provider: Educate Girls

Outcome payer: Children's Investment Fund Foundation

The intervention

- Home-based teaching for frequently absent students

- Outreach for older girls as they are harder to enrol into the system

- Exercises and activities that were tailored to the needs of individual students

- Modified programme delivery by increasing the number of teaching sessions, focussing on personalised learning and aligning teaching groups to the student's competency level to improve learning outcomes[4].

Impact created

- The programme enrolled 768 out-of-school girls and the learning interventions reached 7,300 children. This was 116 per cent of the enrolment target of 662 girls. Enrolment rates increased from 38 per cent in year one to 92 per cent in year three

- The learning outcomes, though harder to achieve, managed to reach 160 per cent of the target

- UBS Optimus was able to recover its initial investment and a 15 per cent internal rate of return.

1. Brookings Impact Bonds Snapshot, May 2019
2. Social and Development Impact Bonds, Financing Solutions for Sustainable Development, UNDP, 2016
3. Impact Bonds in Developing Countries: Early Learnings from The Field, Centre for Universal Education, Brookings, Gustaffson-Wright, Boggild-Jones, Segell, Durland, September 2017
4. Educate Girls Development Impact Bond, Instiglio, October 2019

Income-Share Agreements (ISAs)

SDG4 Linkage: 4.3, 4.4, 4.5, 4.6

A major cause of concern for students taking on loans for higher education is the ineligibility to avail the loan, steep interest rates, the inability to provide collateral and a possibility of mounting interest with no avenues for repayment in the absence of procuring a high-paying job. ISAs are a form of financing wherein instead of taking a loan with a fixed rate of interest, the lender and borrower enter into an agreement under which the lender (education institution/independent provider) gives money in return for a percentage of student's future income over a fixed period subject to the future salary of the student.

In recent years, ISAs have gained traction steadily as an alternate financing tool for several universities in the U.S. and the U.K. Universities such as Purdue University, Clarkson University, and the University of Utah have ISA programmes to help support students finance their education and reduce the burden of loan.

Potential in India

- A few Indian startups are providing professional courses using ISAs while also helping students get employment post course completion. Given the population demographic, a huge demand for skilling/upskilling, ISAs are likely to play a big role in this space. By financing short-term, skill-based courses, they achieve the twin objectives of providing students with the necessary finances as well as helping employers meet their skill demand.

- In the absence of requirement of collaterals, it helps advance the equity aspect in India with students from less-privileged backgrounds gaining better access to finances.

- For a student, ISAs are established to be cheaper compared to education loans given the interest rates in several circumstances.

- Unlike traditional loans, borrowers do not need to begin paying until they start earning. While this will benefit borrowers, it also increases the stakes for education institutions to invest in improving quality of input parameters, such as teacher quality and infrastructure, so as to ensure outcomes in the form of employability – a particular challenge in Indian higher education at present.

Case study: Income Share Agreements in Purdue University[1]

The context

The 'Back a Boiler' programme was an ISA started by Purdue University as an alternative to student loans. The programme was started in 2016, providing USD2 million to 239 students in that year.

The intervention

- The students paid a portion of their incomes for 100 months until they could pay back 2.5 times the initial amount taken

- The amount the student owes is waived off if he/she earns less than USD20,000 annually after graduation or remains unemployed. The rate of payback is decided based on the major chosen and the year (junior/senior).

Impact created

- Furthermore, 800 students have received USD9.5 million in funding since the inception of ISAs at Purdue University.

1. 8 Schools That Offer Bachelor's Degrees — and Income-Share Agreements, Student Loan Hero, Andrew Pentis, November 2019

Outcome-based funding

SDG4 Linkage: 4.1, 4.2, 4.3, 4.4, 4.5

One of the shortcomings of the education system in India has been the inordinate focus given to inputs rather than outcomes. With governments increasingly looking to achieve efficiency for every rupee spent, it is time to direct focus towards outcome achievement and even link funding to that.

Outcome-based funding is a mechanism of allocating a budget based on the outcomes and performance achieved by education institutions as opposed to the traditional way of budgeting based on input requirements. States may choose to link a portion of the budget disbursement to pre-fixed outcomes. Outcomes are often aligned with national and state objectives and vision, and the indicators include a number of students enrolled, number of degrees granted, credit hours completed, on-time completion of degrees, number of students from marginalised communities, research grants and others.

Outcome-based funding can help achieve transparency, accountability, increase efficiency of institutions, thereby improving the overall budget efficiency of states.

Potential in India

The concept of outcome-based funding has been gaining traction in the Indian scenario in recent years. NITI Aayog's Three Year Action Agenda had suggested the need to adopt the tiered funding model based on outcomes of public universities[1]. The Ministry of Human Resources and Development (MHRD) has designed RUSA around granting of funds on the basis of outcomes achieved in the areas of equity, access and excellence[2].

- With focus of education shifting to outcomes and given the funding constraints, there are benefits for the state to drive outcome-based funding. This will promote an environment of competition and an attitudinal shift towards striving to achieve excellence among institutions, resulting in overall better performance.

- Moving towards outcome-based funding will automatically drive the culture of data-driven decision-making, thus increasing the levels of transparency and accountability in the education system.

- It will also help weed out under-performers / compel them to perform better, thus enhancing the overall performance of the higher education system – a much-needed intervention given the current state in the country.

- Increase efficiency of institutions' activity, in turn, resulting in budget efficiency.

Case study: outcome-based funding in Hong Kong[3]

- As Hong Kong was taking efforts to become a global education hub in higher education, the country was experiencing challenges in the areas of quality of teaching and learning, quality assurance and oversight of self-financed institutions. The country felt the need to boost its research output. Against this background, Hong Kong established a system of performance agreements to control public funding provided by the university grants committee to institutions.

The intervention

- Determining the level of recurring grants through performance in three areas: teaching (about 75 per cent of the funding), research (23 per cent) and professional activities (2 per cent)

- Colleges submit Academic Development Proposals (ADPs) stating their respective goals and strategic choices. Their performance is measured against plans submitted

- Implementation of a matching grant scheme to encourage higher-education systems to strengthen their fund-raising capacity

- Implementation of competitive grants scheme to fund research.

Impact created

- Improved sense of competition among higher education institutions, encouraging them to perform better

- Improvements in research output

- Improvement in teaching performance

- Strengthened accountability among institutions leading to overall improvement in efficiency.

1. India: Three Year Action Agenda 2017- 18 to 2019-20, NITI Aayog, 2017
2. Report on RUSA by MHRD in association with Tata Institute of Social Sciences
3. Performance-based funding and performance agreements in fourteen higher education systems, Center for Higher Education Policy Studies, 2015

3.3. Innovation and its role in achieving the 2030 goal

A survey of education innovations (outside of the areas of financing and technology) in the recent past in India reveals that the landscape is replete with new ideas and innovative models, all being undertaken by a variety of actors from government to private and spanning the entire value chain of education.

Applied learning in secondary schooling using concepts such as computational thinking, happiness curriculum in schools, schools in the form of portable cabins to help improve access in conflict areas, peer-led or community-activated tutoring to improve learning outcomes and curb drop-out rates, peer-learning and collaboration to improve teacher quality, deepened and new forms of industry participation in skilling and higher education, newer forms of course and credit structuring to suit the needs of the emerging gig economy are a few such innovations across the school and tertiary education systems. The following section details three solutions that have been selected basis FIT's guiding principles.

Applied Learning (ApL) at middle and secondary schools

SDG4 Linkage: 4.1, 4.4

The SDGs and the Draft National Education Policy lay great emphasis on curricular and pedagogical reforms to impart the relevant skills to children and youth suiting the needs of 21st century. An active, student-centred approach to transform the teaching and learning environment through ApL is a key means to achieve the objective.

ApL, particularly in middle and high schools, through methods such as computational thinking, design prototyping/maker spaces, vocational and life-skills training will help impart foundational as well as higher-order thinking skills in children. These activities get students to understand the fundamental concepts in an intuitive manner. This has been validated by the fact that many countries with successful educational outcomes, such as Finland, are focussing on integrating computational thinking across all subjects.

Potential in India

Given the constraints on the infrastructure and technology front and challenges with regards to learning outcome achievement, ApL, through methods such as computational thinking, holds plenty of promise in India.

- It is particularly suited for low-resource settings, such as in India, with many courses not even requiring computers.

- By adopting a problem-based approach, it helps create a mindset change in students, who are predominantly used to rote learning techniques.

- In the long term, it acts as a strong foundation in helping students become employable or taking the journey towards entrepreneurship by fostering inventiveness.

ApL programmes can be rolled out at scale by capitalising on the above aspects and by involving private players.

Case study: Andhra Pradesh Schools Program for innovation, Research and Excellence (ASPIRE) programme implemented in Andhra Pradesh[1]

The intervention

The Government of Andhra Pradesh, in partnership with Ammachi Labs, implemented the ASPIRE programme in 2017 targeting students from classes eight to twelve in 40 residential schools run by the Andhra Pradesh Social Welfare department. The programme aimed to introduce to students through experiential learning a blend of computational thinking, life skills, digital literacy and soft skills.

Impact created

While the impact in terms of learning outcome improvement is yet to be measured, a qualitative study undertaken in 2017 among 15 schools revealed that school leadership and teachers were of the strong opinion that the ASPIRE programme helped in imparting to children the skills needed for the future. High levels of engagement in classroom participation were witnessed among students.

1.   KPMG study and analysis

Peer Teacher Learning (PTL) to improve teacher quality

SDG4 Linkage: 4.1, 4.c

There is a great need to expand and support the education workforce. Evidence shows that high-quality teaching significantly impacts student learning. In Latin America, a study of 15,000 teachers showed that being taught by a strong teacher is more important than being in a good school[1]. Recognising this, one of the SDG 4 targets is to increase the supply of quality teachers.

Teacher quality in India is, however, riddled with a range of issues right from recruitment and deployment to professional development and career management. This section focusses on the role of peer learning and collaboration as an effective means of training and support, in turn, resulting in overall quality improvement of teachers.

PTL can be categorised into three types[2] – coaching activities, collaborative activities and assessment activities. In collaborative activities, teachers work together to reach a shared goal; in coaching activities, they support each other's process in reaching each individual's goal; and in assessment activities, they judge others' performance.

These can be, in turn, achieved through a number of ways — teacher learning centres, spaces outside school equipped with educational sources, voluntary teacher forums/lady teacher forums, a physical collaboration platform that allows teachers to convene and share experiences, 'WhatsApp communities of practice', to have periodic academic discussions through audio, text, photos and videos, gamified mentoring apps for teachers, other tech platform communities to discover new teaching ideas and lesson plans, the hub-and-spoke model to provide video lessons to teachers, among others.

Potential in India

The potential for PTL as a means to improve teacher quality is particularly huge in India given the below context.

- Teacher isolation is a barrier given the dispersed spread of schools and amount of single-teacher schools

- Low teacher motivation levels and a sense of disconnectedness when working in isolation

- Limited capacity of government to engage in quality, continuous development of teachers

- Limited efforts undertaken towards teacher assessments and providing feedback.

Case study: STiR Education

The intervention

STiR Education focusses on assisting teachers with innovation and making a change in their classrooms by focussing on the concept of 'intrinsic motivation'. Their initiatives are aimed at:

- connecting teachers to one another and helping them to see themselves as agents of change;

- encouraging teachers to spread their knowledge and innovation with their peers.

The above is done through teacher-network meetings, groups of 20 to 30 teachers that meet each month and gain exposure to evidence-based ideas for improving their teaching practice, training and coaching programmes. This is supplemented with training and coaching programmes with government officials to seek their buy-in and cooperation.

Impact created

STiR has reached around 200,000 teachers in India across 24 districts across Delhi, Uttar Pradesh, Karnataka and Tamil Nadu, impacting 4.7 million children. Its interventions have resulted in a positive behavioural change amongst teachers, officials and students. It has also demonstrated improved academic performance in the government schools where they function as compared to private school peers. Furthermore, according to STiR's estimates, every USD1 invested in India yields governments USD7 in improved efficiencies.

The organisation aims to reach 40 million children across India by 2025.

1. KPMG study and analysis
2. Innovation and Technology to Accelerate Progress in Education, The Education Commission, June 2016

Alternative credentials in higher and tertiary education

Higher and tertiary education in India is going through a transformation with regard to the way programmes and courses are structured. Rising tuition costs and unemployment rates have changed the perspective of both students and employers on the value of college education with both stakeholders expecting greater returns on investment[1] . Against the backdrop of the Fourth Industrial Revolution, there is an increasing preference and expectation to impart education that is market-linked. This creates the need for academic institutions to transform the manner in which programmes are structured and individuals to engage in, not just one-time, but lifelong learning, thus giving rise to the emergence of alternative credentials.

Alternative credentials refer to the competencies, skills and learning outcomes derived from assessment-based, non-degree activities and align to the specific needs of employers[2]. In higher and tertiary education, this can be achieved through a number of ways – certificate programmes, skill or competency-based short courses and bootcamps, micro-credentials and micro/nano degrees.

While at present, several of these are imparted through online platforms such as Coursera, Udacity, edX and so on, there are also instances of higher education institutions (HEIs) offering them through online and offline media. This trend is likely to result in a big wave of transformation in curricular and credit structuring in HEIs. The DNEP also emphasises this by stating the need for facilitating easy mobility across skilling and general academic streams through clear equivalence of qualifications/ certifications and credit structures.

Case in point

The Tamil Nadu Higher Education Policy has announced the integration of skill development within higher education by offering add-on, employment-oriented certification courses to students of arts and science colleges at a nominal amount.

1. EduTrends Alternative Credentials, Observatory of Educational Innovation, May 2019
2. Demographic Shifts in Educational Demand and the Rise of Alternative Credentials Fong, Janzow, & Peck, June 2016

Potential in India

Alternative credentials hold particular significance in India given the current context in terms of:

- government's goals to add 45 million additional students to the higher education system, accompanied by rising graduate unemployment rates;

- low enrolment rates in higher education, compared to national and SDG target;

- significant proportion of college drop-outs, who discontinue owing to economic circumstances;

- the emerging needs of Industry 4.0 that call for a reorientation in curriculum structuring of college degrees;

- the rising popularity of Massive Open Online Courses such as Coursera, edX, Udacity as indicated by subscription rates.

Case study: Southern New Hampshire University[1]

The intervention

Southern New Hampshire University is a private U.S. university with an innovative offer that combines in-person programmes with online learning. The programmes are aligned to workforce needs   from certificates to doctoral-level degrees in a wide range of areas.

The university also has a programme consisting of training modules and a series of three to six postgraduate-level micro-credentials that can stack into a full master's degree in education focused on a blended and online approach.

In 2018, the university, along with LRNG.org, announced their programme to work with local governments, employers, and community-based partners to identify workforce and educational needs and build digital badges, learning playlists and even entire degree programmes depending on the local skill requirements.

Impact created

Southern New Hampshire University has more than 3,000 on-campus students in Manchester, New Hampshire, and 90,000 students enrolled in over 200 online programmes, thus playing a big role in promoting access. Furthermore, 17 students from Rwanda became the first generation of refugee students who graduated with an accredited associate's degree in the U.S., thus proving the programme's role in achieving equity.

3.4. Technology and its role in achieving the 2030 goal

As governments and world leaders develop various interventions to meet the SDG 4 targets, it is inevitable that technology will be an important lever in developing effective solutions. In contrast, a study of the Indian policy landscape reveals that the full scope of technological interventions is currently not being leveraged by many governments and administrations. It is of burgeoning importance that the next phase of progress towards the 2030 goals employ a high degree of technological support in order to meet the targeted deadlines.

A variety of technologies such as blockchain, 5G, Internet of Things (IoT), cloud, and gamification platforms are likely to have a huge impact on education in the forthcoming decade. This section discusses three technologies that will have the most significant impact basis the FIT guiding principles on the education landscape.

Artificial Intelligence (AI) and Machine Learning (ML)

SDG4 Linkage: 4.1, 4.2, 4.4, 4.6

In today's data-enabled world, as techniques like precision agriculture and precision medicine have emerged to address intra-field and individual genetic variabilities respectively, education is not far behind in developing data-driven individualised learning models.

Student learning has shifted from physical environments to digital devices. With greater amounts of learning data being collected, administrators and institutions across schools and vocational and higher education centres are turning to efficient analytical methods to identify insights about individual learning patterns and to deliver a personalised and equitable learning experience to ensure that no student is left behind.

AI and ML have tremendous potential to address some of the key challenges India faces in its path towards achieving SDG 4.

- **Personalised adaptive learning and drop-out risk detection**

With exponentially growing subscription to online learning, people are shifting from the Netflix model to the Google Maps model[1]. In the former, data is used to analyse and recommend what other similar consumers may have purchased; in the latter, the platform provides a tailored route depending on where the person currently is, the intended mode of transport and the planned destination. This approach allows students to access personalised learning paths depending on individual strengths, weaknesses and, more importantly, interests. This approach is very relevant in India's context given the wide variance in learning needs.

With a greater volume of learning taking place on digital platforms, data across a range of parameters such as attention spans and emotional and retention levels are captured, and are available on dashboards to teachers and instructors, enabling them to assist students who may be either falling back, with timely tailored interventions, or assist outperformers with sufficiently challenging modules. Such personalised learning interventions are applicable to both school and higher education.

AI can also employ student-learning data across K-12 and higher education to identify symptoms of struggling students and then detect these symptoms to identify students at the risk of dropping out.

Microsoft partnered the Tacoma Public School District in Washington to leverage predictive analytics to students likely to disengage and drop out using data across demographics, health records and student performance information such as grades and attendance. Armed with this information of student risk, educators can intervene with the required support to bring the student back on track. The 90 per cent accurate model has helped the school system raise its graduation rates by nearly 28 per cent over six years. A similar solution has been implemented across a school district of more than 60,000 students in Andhra Pradesh by Vassar Labs[2].

- **Natural Language Processing (NLP)**

Today, a significant number of children are inherently disadvantaged simply by belonging to under-represented minorities. The power of AI and ML can be leveraged to deliver content across native languages using natural-language processing to convert content into mainstream languages such as English into vernacular content.

The Travis Foundation's initiative in digitising Tigrinya, spoken in war-stricken Eritrea, by compiling digital corpora and employing ML has helped usher the language into the digital age. This has opened up opportunities in education and continued learning for numerous refugees[3].

Potential in India

- India has observed a stark drop-out rates across lower[4] and higher-secondary education[5]. Risk-detection systems, which have been effective in this age bracket, can help address this issue with success

- Implementing personalised adaptive learning solutions has a great potential in resolving classroom inequity resulting from learning disparity across demographic sections[6]

- Given India's vast diversity and the plethora of languages and dialects, NLP-based solutions can be deployed to deliver learning material and opportunities across native media to the multitude of under-represented communities in the country

- Given the scale of the problem India is facing in the area of students' mental well-being[7], there is an immediate case for introducing AI/ML-based scalable solutions to address this.

Case study: Mindspark shows positive impact on educational outcomes[8,9]

The intervention

The intervention was administered across a randomly selected sample and tested against students not exposed to the intervention. The intervention was a 90-minute, six-days-per-week, after-school study session split into two components: 45 minutes of computer-based instruction and 45 minutes of supervised instructor-led, group-based study. Students were provided a Mindspark platform equipped computer for the computer-based instruction. The platform provided activities for mathematics, Hindi and English.

Impact created

The study observed that students exposed to the Mindspark programme displayed twice the progress in mathematics and 2.5 times the progress in Hindi compared to the students who were not exposed to the intervention. The study also stated that weaker students benefited disproportionately more from the intervention. This showed the promise of computer-aided learning to deliver a 'teach at the right level' instruction that taught all students equally effectively.
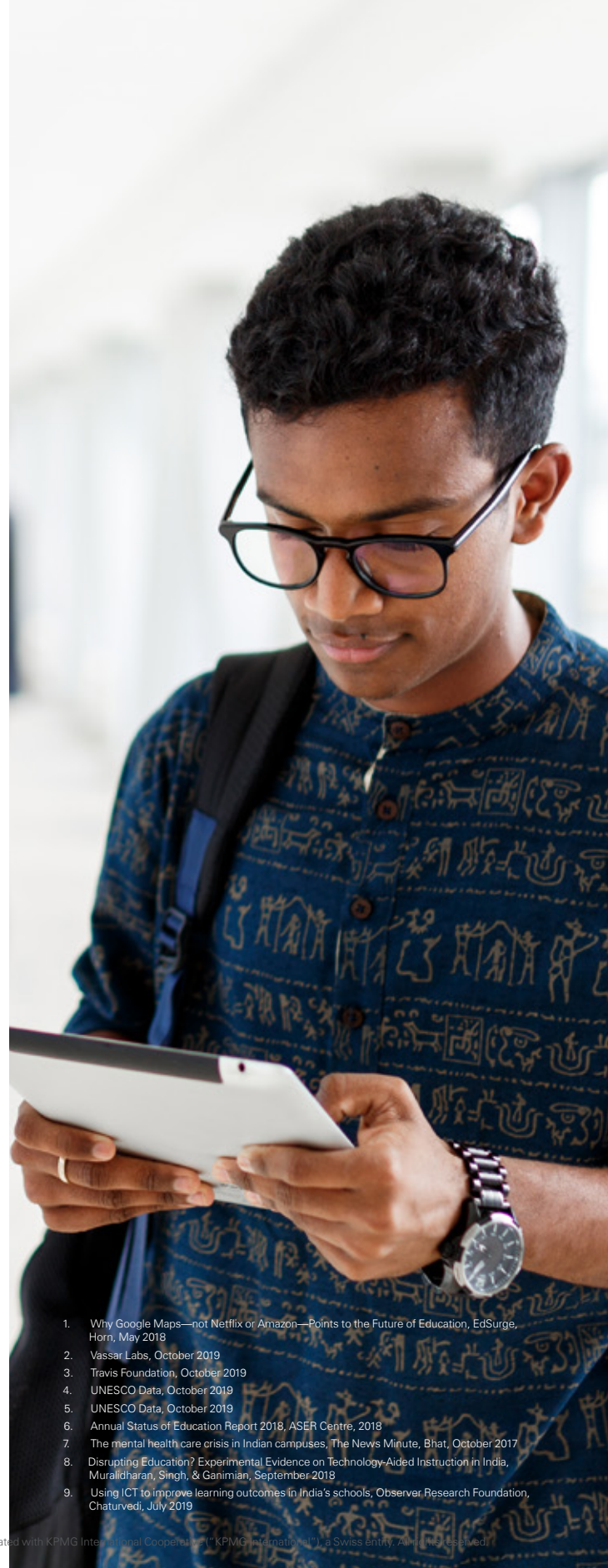
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Educational Robotics (ER)

While online learning enables distance education, it still falls short in the areas where in-person tutelage is required. To fill this gap, innovators in education have turned to ER. ER has specific use cases across early child care and education (ECCE) and STEM education, areas with specialised skill, and in providing an inclusive learning environment for children with special needs.

ER utilises multiple sensors to interact with young children, and children with special needs in specific ways to encourage them and involve them in learning activities. Using ER can specifically improve motor and movement and cognitive and communication skills[1].

Robotics are also used in the areas of specialised education, wherein there is a need to learn skilled procedures, ranging from surgeries[2] to welding[3]. Many studies have identified coding to be a very vital skill in the future and, therefore, there is a greater emphasis on this aspect in STEM education. ER has helped make learning programming and coding skills fun and engaging.

Potential in India

- While the Indian market has a great demand for STEM talent, the skill levels of graduates from higher educational institutions have been found wanting. ER has a great scope in tackling this issue

- The Indian education landscape is severely lacking in terms of interventions to address the needs of children with special needs[4]

- With proven impact in helping students develop a deeper conceptual grasp in science, mathematics and language through increased systems understanding[5,6], introduction for ER can help address the urgent need for improving learning outcomes across K-12[7].

Case study: Robots4Autism has helped kids with Autism Spectrum Disorders (ASDs) develop social and emotional skills[8]

The intervention

The South Carolina Department for Education and RoboKind leveraged two-foot tall robots paired with a social-emotional curriculum to interact with students with ASDs with a specific goal of improving their social, emotional and communication skills.

Impact created

The intervention has exhibited tremendous results so far with 90 per cent of students displaying mastery over social skills in interpersonal interaction. This was enabled by opportunities for repetitive learning enabled by human-robot interactions.

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Extended Reality (XR)

SDG4 Linkage: 4.3, 4.4, 4.6, 4.7

With the increased focus on improving learning outcomes, there is a greater need for the introduction of newer pedagogical techniques to increase levels of student engagement and learning effectiveness. This need has paved the way for extended reality technology to make inroads into classrooms and various other aspects of education.

Extended Reality, or XR, is a broad term that covers the whole gamut of immersive platforms such as Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), 360 video and holographs.

XR has a multitude of applications in school education across history, geography and science education. Traditional textbook publishers such as Pearson too have adopted XR technologies like holograms to deliver immersive school education experiences[1]. In higher education, too, XR has

a multitude of use cases ranging across STEM[2], architecture and design, humanities and social sciences[3], medicine, law[4] and in many more fields. For instance, in medicine, AI/VR models are being used to deliver anatomical education to help improve spatial awareness, explorative learning and accessibility. AR/VR technology has helped deliver the education at only 10 per cent the cost of the traditional text book with greater learning effectiveness and accessibility[5].

XR applications can be employed to specifically reduce the traditional disadvantages faced by students enrolled in online and distance programmes by delivering an experience as close to the in-class experience as possible.

Potential in India

- XR enables a more visual experience to improve learning effectiveness, and this makes it a need of the hour

- India is also home to a large and rapidly expanding distance education market[6], indicating that the country would have a strong appetite for XR solutions

- XR has significant potential to deliver practical education and, therefore, has applications in the growing skilling and vocational education market.

Case study: Labster, Google, and Arizona State University launch fully online biology degree[7,8]

The intervention

In association with Arizona State University and Google, Labster, a virtual lab simulator, has developed 30 fully VR-enabled simulations for the university's undergraduate biology degree. The VR simulations, developed on the Google OS Daydream VR, allows students to fully explore lab-based learning experiences without leaving their study spaces.

Impact created

Labster has been able to assist Arizona State University to launch a fully online biology degree with a complete lab experience where students can conduct experiments, practice on equipment and test samples without leaving their study space. The simulated environment allows students to spend as much time as they want in the virtual lab and repeat experiments as many times as they want. The software also provides specific feedback on the areas of improvement. This allows students to explore the subject at their own pace and fully enable learning experiences while cutting tuition costs by 75 per cent[9] .

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4 Our recommendations

4.1. Ten recommendations to states for implementing the F.I.T approach

India is at an important juncture in the field of education. With a decade to go to achieve the SDG 4 targets, and given where the country stands, it calls for ambitious progress on all fronts, from early childhood to tertiary education, and by all actors – the government, education institutions, donors and private actors.

The current pace of progress and linearity, however, will not be sufficient for attaining the grand vision in time. The government, both Centre and states, as primary drivers of the mission, needs to shift gears in the rate of adoption of new innovations.

We make 10 recommendations to states for implementing the FIT approach to fast-track progress over and above the several transformation initiatives being undertaken at present.

Recommendation 1: think F.I.T

The starting point to transformation is for states to alter their outlook in addressing prevailing challenges by 'thinking FIT', that is looking through the lens of financing, innovation and technology to solve any challenge in education. While states may continue with traditional methods on the one hand, the role of these three key levers in the new initiatives that are to be undertaken by states cannot be overstated.

Recommendation 2: plan to commit

There is no dearth of innovations in the country. India has been a hotbed for new experiments, albeit several of them carried out in pockets. Initiatives like peer-teacher learning, student-led

or community-led tutoring, which are both low on cost and scalable, as well as demonstrated success, have all been witnessed in pockets. A recommendation for Indian state authorities is to take a systemic approach to firstly, incorporate them into state policies and, secondly, ensure a contemporary approach through regular update of plans and, thirdly, oversee their system-wide implementation with clearly defined objectives, scope, timelines, milestones and outcomes definition. A mission-mode project approach is called for to implement such initiatives.

For example, in the area of ICT in education, South Korea has rolled out five consecutive four-year master plans since 1996. The recent update of the USA National Education Technology Plan in 2017 and subsequent ICT master plans in Singapore highlight the need for regular revision of master plans to ensure a dogged and contemporary approach to implementing interventions.

Recommendation 3: strengthen large-scale collaborations with the private sector

Several of the educational initiatives in India today are driven by the private sector – philanthropic organisations, education service providers, the industry – on its own as well as in cooperation with the government. Over the next decade, the role of the private sector in achieving SDG 4 cannot be overstated. With private-sector participation comes new ideas, technical know-how, innovation capacity and efficiencies. Governments must actively have a dialogue and involve them in transformation and create an enabling environment for operating. The involvement must not be limited to MNCs and large players and also the smaller scale social enterprises. On the flipside, the private sector must also realise the opportunity that lays ahead of them in SDG 4 and seek to play an active role.

Recommendation 4: prioritise data

Data is an underlying requirement for implementing financing innovations, technological innovations and any other form of innovation. At present, wide variations are seen among states in maturity levels for data capturing. Some states have recently put in place data repositories to track progress across key areas. The inordinate focus on capturing input parameters, however, continues to be one of the persistent shortcomings. For instance, while enrolments in higher education are captured, a key outcome parameter such as on-time completion of graduation is most often not captured at a systemic level. With the advent of technologies such as AI, ML and blockchain, the possibilities are numerous to identify challenges and course correct in a timely manner. States need to adopt a 'digital-first' initiative and multiply their efforts in setting up comprehensive data repositories.

Recommendation 5: promote learning and transparency

Data and key learnings from various interventions must be analysed and disseminated not only within a state undertaking the initiative, but also actively to other states and other interested actors. The benefits of an intervention in a particular district in one state, unfortunately, are currently not being shared with another district collector in another state. While government think-tanks such as NITI Aayog as well as several private ventures do engage in information sharing, the current practices in this domain are limited and not systematic. More so during this juncture of transformation, it is essential to engage in information-sharing in a disciplinary manner, almost as a mandate. Inter-state collaborations and learnings can be strengthened through creation of periodic forums for learning dissemination, digital repositories to track learning from ongoing innovations at each state, public

database of non-state actors involved in various transformation initiatives and the like.

Recommendation 6: engage in bottom-up planning

"If parents do not care about education, isn't there a risk that such a top-down education drive would just lead to a waste of resources?" ask Nobel winners Abhijit Banerjee and Esther Duflo in Poor Economics. The argument could be extrapolated to include teachers and local administrators and becomes particularly pertinent for implementing new innovation. For instance, when developing an outcome-based funding model, involvement of institutions in the early stages of the process, especially pertaining to fixing indicators and targets, is key to ensuring successful development of the model. This holds relevance for driving all other large-scale innovations, wherein stakeholders at the bottom are most rooted in appreciating ground-level implementation challenges, to be factored in for planning.

Recommendation 7: strengthen governance and monitoring mechanisms

Governance is among the biggest enablers and disablers of transformation. Promising interventions have failed in implementation because of poor governance, while successful interventions have had good governance as their backbone. With foreseen amplification of initiatives, involvement of a multitude of players and implementation of new innovations, the onus is on the state to create an enabling environment for transformation while ensuring the necessary checks and balances. Creation of a decentralised governance structure empowering local governance and using technology to strengthen coordination among stakeholders is key. States can also consider launching standards to guide the private sector in achieving SDG 4.

Recommendation 8: strengthen legal and regulatory frameworks

With innovation comes risks pertaining to compliance, consumer and supplier protection and data security in the absence of legal and regulatory frameworks. As innovations such as ISAs, impact bonds and alternative credentials gain popularity, it is essential to address the regulatory environment. The absence of legislation discourages investors as well as consumers from embracing innovation. Given the promise these innovations hold in India, it is critical for the government to act swiftly in setting in place appropriate legislation to promote stability and protect the interests of all.

Recommendation 9: communicate effectively

As India embarks on a number of systemic transformation initiatives, it is essential to communicate effectively with all stakeholders of education. On the one hand, it is critical to create a comprehensive internal communications plan within the government set-up. It is a necessity to devolve more responsibilities to local government and institutions. In this regard, it is acknowledged that programmes and projects succeed when they are well understood and supported by all internal stakeholders. Externally, it is important to engage in social and behavioural change communication with the larger external community to effect change in institutional cultures and individual mindsets.

Countries have been observed to engage in communication strategy development exercises during such crucial junctures of transformation and it is time for `governments in India to initiate such an activity.

Recommendation 10: advocate actively through senior leaders in government machinery

The importance of catalysing political momentum when undertaking such large-scale transformation cannot be emphasised enough. An important aspect of transformation is to ensure political sustainability when planning initiatives and the other is deep involvement of political leadership in implementing interventions. Large-scale missions have demonstrated success where the nation and state's political leaders become active advocates of the initiative.

4.2. Recommendations to non-state actors

Education providers such as ECCE providers, schools, colleges, universities and online course providers.

- **Co-develop interventions:** collaborate with private players to actively fund and carry out research on the learning outcomes achieved through new methods and disseminate data to help increase the adoption of FIT interventions

- **Train teachers:** regularly train and update teachers and other instructors on, and use of, the latest technological pedagogical tools and interventions

- **Support and supervise:** governance is an important critical success factor for large-scale technological intervention and, therefore, it is important to have 'supportive supervision' for effectiveness

- **Invest in content development:** to make the next phase of technology mainstream, academic institutions, along with governments, need to invest in curriculum and content development on these platforms. Initiatives such as SWAYAM MOOCs need to be replicated across other technology media to ensure maximum reach

- **Enable, do not enforce:** while the intent of introducing technology and innovations might be to facilitate the learning process, some educators inadvertently use the data obtained to force-fit learners into traditional paths of learning. Developers and implementers need to be conscious about this

- **Monitor quality while driving scale:** it is necessary to identify outcomes of learning innovations to set up governance mechanisms to prevent dilution of quality while scaling up.

Private sector partners such as technology developers, curriculum providers

- **Collaborate with the state:** collaborate with public-sector entities to deliver innovative solutions to help improve learning outcomes, improve quality and increase inclusivity

- **Measure data accurately:** many financial interventions hinge on delivering successful outcomes on getting payments released. This would mean that it is important to implement strong data-measurement systems to capture learning outcomes accurately to attract investors and financers

- **Ensure learner data privacy:** collecting large volumes of student microdata is essential for personalised interventions but it is important to have robust governance mechanisms to protect data privacy

- **Develop equitable tech:** tech companies must factor in the wide variance in digital literacy in EdTech products to not further the Digital Mathew effect

- **Develop scalable interventions:** provide financing for innovative interventions to support education outcomes across ECCE, K-12, and higher education that are replicable and scalable across segments of the society.

Donors

- **Disseminate expertise:** provide expertise based on global best practices and provide funding to organisations for educational interventions that are unconventional and cutting edge

- **Set phase-wise targets:** given that learning outcomes are a lag indicator for technology implementation, interventions will have to be monitored across two stages: adoption and realisation. Targets for interventions must also be aligned to these two stages; it is important to measure a successful implementation

- **Ramp up connected educational facilities:** the state of high-speed connectivity at public schools in India needs immediate revamp for the country to be geared up for any large-scale intervention

- **Dispel apprehension:** due to unavailability of credible risk analysis of financial instruments in the education space, it is important to disseminate information on intervention outcomes to dispel apprehensions.

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