Future of jobs and its implications on Indian higher education

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FICCI

EY
Building a better working world

Contents

Foreword FICCI

The world is undergoing a technological revolution that is fundamentally changing the way we live, work and relate to one another. In its scale, scope and complexity, the transformation is unlike anything humankind has experienced before. Termed as the "fourth revolution," it has today created a "techonomy community" that believes in technology redefining business and society. The recent examples of start-ups tell us a story of a new approach to economic value creation and social progress. By applying this lens, we can see the historical evolution of a company as a process of invention and innovation. We can also see the university from this prism as a learning center and one that encourages collaboration, autonomous learning and innovations. These changes are today impacting the jobs in the industry, many of which have either become redundant or are getting replaced by automation, AI, robotics and new business architecture. The new era requires individuals to be at ease with technology, uncertainty and, therefore, risks, in addition to delivering in the midst of chaos without getting stressed out.

India's job market is also undergoing these changes, and there is a need for a fresh thinking to address the current and emerging challenges. The education that many students receive today is not adequate for a world that is being transformed by scientific and technological advances. These changes are also impacting education systems and processes. They are altering the learning infrastructure. Faculty's comfort with technologies today is as important as that of the student community. The preparation of students to live in a volatile world is today an important task that universities have to perform.

This year's FICCI-EY report addresses this exponential pace of change, which will have its imperatives on our education systems. Depicting an individual's career story in the past, present and future, the report touches upon the disruptions and drivers of change transforming business models in every industry, with far-reaching implications for skills, jobs and the nature of work. It then reviews the expected effects on employment levels and skills profiles in different job families, industries and geographies. It discusses the consequences of these changes for the adequacy of the existing talent and workforce strategies. The report further highlights the effect of these changes on our education systems and provides a broad roadmap to enable our education system to create future-ready world-class professionals. This report aims to serve as a call to action for the government, academia, industry and individuals to work in cohesion and keep up with the needs of the future job markets.

We would like to extend our gratitude to all government officials, and leaders from the higher education sector and industry who have shared their thoughts for the report. We are also grateful to Ministry of Human Resource & Development, Ministry of Commerce and Industry, Services Export Promotion Council and all the partners and sponsors for their support in organizing the FICCI Higher Education Summit 2016, titled "Education for Tomorrow: Learn in India - Learn for the World," in New Delhi. We hope that the deliberations at the Summit will provide the Government, industry, universities and other stakeholders a perspective to the rapidly changing world and help them to proactively develop approaches to adapt and manage the change effectively.

Prof (Dr) Rajan Saxena
Chairman
FICCI Higher Education Committee

Prof Indira Parikh
Co-Chairman
FICCI Higher Education Committee

Foreword EY

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Dear readers

India has one of the youngest populations in the world – almost 46% people less than 24 years of age. Many of these people are currently enrolled in the education system and would be competing for jobs and employment in the coming decade. Many of them are going to be working in jobs that do not exist today.

Today, technology, industrial automation, robotics and AI are changing the way industries work – making many of the jobs of today redundant. As a result, a lot of the working population would need to reskill themselves to the new jobs emerging from the technology innovations. This phenomenon directly impacts another 40% of the Indian population in the working age of 25-55 years.

The higher education system in the country has a big role to play in the development of the economy. It is this system that feeds the need of trained and skilled manpower for the engines of the industry. With the ever-changing job market and industry, it is imperative that the higher education system adapts itself to the new paradigm of imparting life skills and imbibing analytical thinking process among the learners – to prepare them for any jobs that they may take up in their working lives. The free and anytime, anywhere availability of learning and knowledge resources is challenging the role of higher education institutes as the sole creator and provider of knowledge – thereby necessitating the need for the education system to make itself more open and flexible.

This report takes an initial step toward identifying some of these trends and how they impact the higher education system today. The report provides some pointers as to how the higher education institutes of today prepare themselves to prepare the workers of tomorrow. It also profiles some good practices of countries and institutes that we consider are ahead of the curve in their intent and execution. This report helps by providing some suggestions on specific actions for a quick alignment with the evolving job market.

The transformation toward a truly open education system to meet the needs of tomorrow would need vision, openness to change and strong execution over a sustained time period. But the impact on the individual, the economy and the country as a whole will be tremendous.

We hope you enjoy reading the report

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Amit Sachdeva
Partner, Advisory Services,
Ernst & Young LLP

Executive summary

In the 21st century, the pace of change in the job market has hugely accelerated. The concept of a job for life is passé. The changing job scenario is leading to workers switching jobs more often – in many cases to sectors and roles that they did not study for. Many learners who are currently in school would end up working for jobs and roles that do not exist today. Many people are getting into entrepreneurial roles right after higher education, and many are getting into roles different from their fields of study.

The economic scenario globally is ever-changing, leading to a transformation of the job market across the world. Over the 20th century, there was a major decline in manufacturing and primary jobs – mining and production – majorly due to increasing automation and scientific innovations, which led to a lot of menial jobs being replaced by automated machines. At the same time, the services sector saw a large growth in terms of numbers and also the variety of jobs. New type of jobs emerged that did not exist a generation ago.

The emergence of robotics, AI, cloud technologies and robust computing power is further leading to redundancy of many low-skilled, rule-based jobs, which are being replaced by technology and automation. Lowering costs and improved performance of technologies that are more cost and time efficient and less error-prone in undertaking standardized procedures with well-defined rules, are pushing jobs from the middle tier of basic decision-making to more advanced and complex judgement-based jobs and hard-skill-based jobs. This phenomenon is now shrinking the jobs in the services sector as well. The mix of jobs within sectors is also undergoing a shift – many of the old roles have ceased to exist (such as typist, mail sorter and quality checker for process plants) and new jobs have emerged (such as social media marketer). The job responsibilities and key tasks for other roles are also constantly changing – the job of a bank teller has transformed into a more sales and relationship role since ATM have taken over the core teller functions.

The education sector is feeling the impact of these changes – there is an increasing demand for corporate training services, which cater to the reskilling and upskilling needs of working professionals. The growing preference of students toward liberal arts programs also highlights the fact that learners are looking at the breadth of learning than just in-depth technical knowledge in one subject. Many universities have reworked their curriculum to adopt CBCS to offer the flexibility in learning to the students – so that the students of today have better adaptability toward the jobs of the future. These, however, are incremental changes that do not fully brace the students for the potential impact of the broader changes to the economy and jobs.

In the age of omnipresent information sources over the internet, knowledge has become democratized and the role of the university as the sole custodian of knowledge is under threat. There is global contestability among universities for the best faculty, researchers, students and funds. The regulators that develop frameworks of operations in the sector are slow to counter the impact of these changes, and as a result there is limited flexibility for universities to be agile to the changing global landscape. In the higher education landscape today – with strong emphasis on input parameters and inflexible pedagogical options – the learner is a taker of the system, bound by the rules of the regulators and the limited undifferentiated learning roadmaps of the universities. With information and knowledge becoming accessible without barriers, there is a potential threat that changing learner behavior would make the existing teaching methodologies redundant.

The higher education sector thus needs to transform itself to remain relevant to the changing landscape. The focus of higher education needs to change from providing employability enhancements, to prepare the learners into thinking, complex problem-solving and decision-making individuals. Based on the current trends in the job market, some of the proposed enabling factors for the individual learner are as follows:

▶ Focus on judgement-driven skills: Preparing the student for complex-decision making by inculcating the softer aspects of the job requirements in the curriculum – negotiation skills, analytical thinking, complex problem-solving, communication skills, people management and cognitive flexibility

▶ Personalized learning paths: Offering learning roadmaps aligned to individual constraints of time, location; and customized solutions to gain the skills that are needed, through innovative usage of technology and pedagogical techniques

▶ Pedagogical innovations to promote experiential learning: Optimally using peer-to-peer learning, gamifications, virtual reality and augmented reality, simulators etc. to enhance the learning experience of student and integrating education with real-world experience

▶ Flexible program structures: Developing flexible entry and exit systems for the learners to allow them to gain work experience and upskill as needed

▶ Lifelong learning: Letting the students "unlearn and learn" new skills

To enable the students for this scenario, the higher education ecosystem needs to relook at the way it has been operating currently. Some of the proposed areas of intervention are as follows:

▶ PeStrategic outlook integrating technology: HEIs need to expand their worldview to a global outlook. They have to rethink their strategic objectives in a fully connected world of anywhere, anytime learning, by offering differentiated learning solutions. They have to think of innovative models to finance their operations, while sharing the risks and rewards of education with the learners. They need to look at technology as the enabler and the innovative use of technology in curriculum and pedagogy as a strategic differentiator.

▶ Open systems: Universities today resist change, while the universities of the future would need to encourage change. There is a need to have a modular stackable approach to teaching.

▶ Outcome-driven learning systems (competency-based models): The universities of the future would be outcome-driven instead of input-led. With competency-based input systems, and transparent assessment and standardizations – the HEI of tomorrow would be flexible in approach and stringent on quality outcomes. Technology would be the enabler of this change.

▶ Differentiated cohorts: The cohorts of tomorrow would be a mix of first-time students and experienced working professionals, learning and interacting in a blended model – both online and in the real world. The university needs to be prepared to cater to the varied needs of these cohorts.

▶ There is also a need for the regulatory environment to be conducive to these changes. The regulators also need think global, and need to be agile enough to remain ahead of the curve. There is a need to promote flexibility toward outcome-driven systems, and move toward a self-disclosure and accreditation-based system.

While the paradigm of higher education needs a transformation in its approach and vision, there is a need to break these into actionable areas. In this report, we have recommended some mid-term and long-term ideas to drive the Indian higher education system toward a more agile industry-integrated system of learning. We have looked at some world class practices in HEIs that could hold important guiding reference for the HEIs in India on taking appropriate measures to be better prepared for the learning needs of tomorrow.
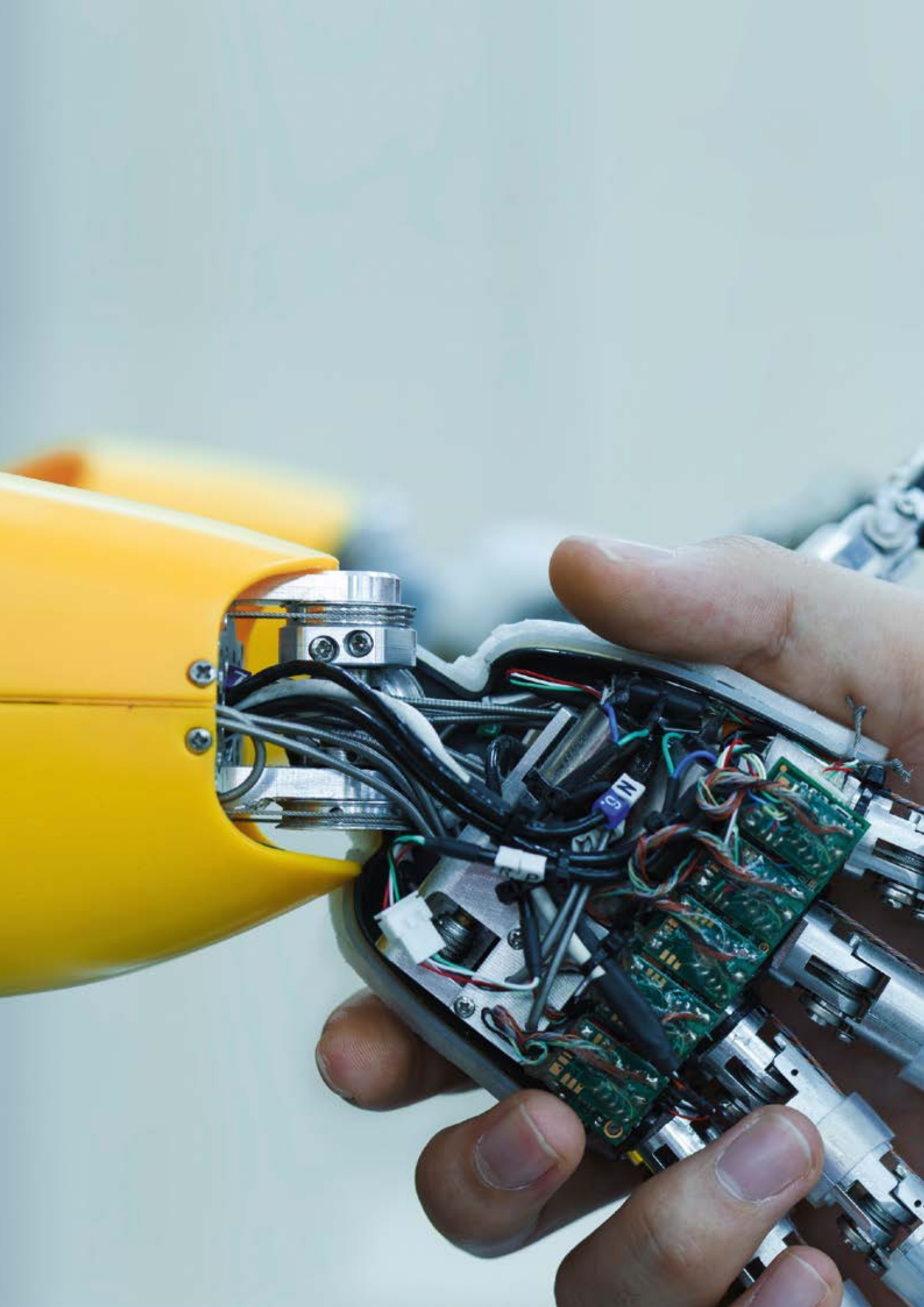
The world around us is changing rapidly. Technological innovations have become faster and cheaper – making traditional jobs and skills redundant.
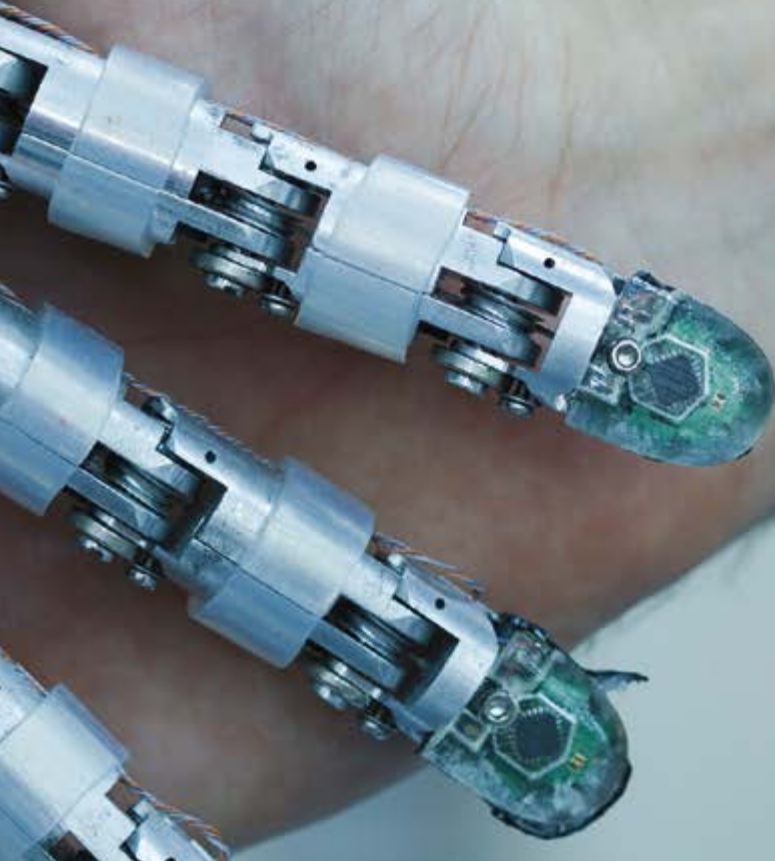
India's job market has witnessed an evolution, with working professionals leveraging this dynamism for their career advancement

## Ramesh – the career growth story

Ramesh, a boy from Ballia, UP...

+

...graduated in science from Purvanchal University			...aspires to study science from Stanford
Scenario 1 The story 20 years back	**Scenario 2** The story 10 years back	**Scenario 3** The story today	**Scenario 4** The story in 2030
Ramesh joins a web-solutions company in Noida, as a software coding assistant	Ramesh joins an IT firm as a software engineer	Ramesh joins an IT firm in Gurgaon and continues to work there for 2–3 years	Due to financial constraints, Ramesh opts for online robotics and microelectronics courses from Stanford and MIT, respectively, instead of physically enrolling
Due to stagnant growth, Ramesh moves to Bangalore, and gets a job with a mid-sized IT company as a software engineer trainee	Realizing stagnant career growth after 2–3 years, Ramesh opts for a full-time MBA course, specializing in IT and operations	After gaining technical experience, he enrols in the CFA course to develop his financial-analysis skills	He presents his ideas around developing a new product to MIT alumni, online
He diligently works with the same firm for close to 18 years and is currently working as a senior project manager in the telecom vertical	Ramesh joins another ERP-implementation firm in a managerial capacity for a small team	Ramesh gets through a multinational bank as a business analyst, where he gets to apply his coding skills as well as financial knowledge	After receiving encouraging response, he sets up a factory and deploys robots to automate manufacturing tasks
	Realizing the importance of holistic management, Ramesh enrols for a PMP certification	Inspired by the surge of start-ups across sectors, he joins one as a marketing manager to nurture his entrepreneurial skills	He enrols in an online marketing course to be able to sell his product well
	He switches jobs 3 times, and is currently working as a project manager in the IT sector	He enrols in an online customer engagement course to improve his marketing prowess	He keeps improving his product and business by learning via online resources

Changes in demography, technology and socio-economic factors are leading to frequent job switches by workers in India as well as across the globe

Gradual shift of global economic power toward developing countries, increasing movement of goods and people across borders, and disruptive changes in business models across industries have already started affecting the job market, and the impact is expected to increase in the future

The world is gradually moving toward **emerging markets**, with a growing **younger population** and increasing consumption by the **middle class**
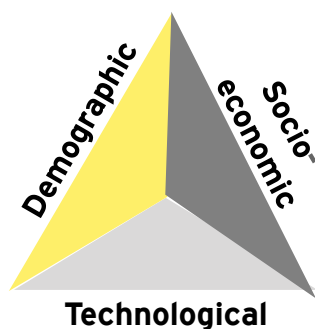
Changing **geopolitical** landscape is having notable implications on global trade and talent mobility, while **climate change** is among the major drivers of innovation today

Demographic

Socio-economic

Technological

The rise of **automation** and the emergence of a **"connected world"** are expected to have a profound effect on the job market

Powered by evolving job opportunities and career streams, working professionals across prominent economies are switching jobs frequently

Key drivers of "job-hopping"

► Upward mobility
► Learning a new skill
► Experimenting with a new industry
► More importance to personal growth

The majority of employees in India spend 2–5 years in their current tenures. Only around 12% employees in India today reportedly serve tenures exceeding 10 years in a single role. In contrast, this figure was around 25% a decade back[1]

	Country[2]	Average tenure (months)	Average number of jobs held during a 30-year career
The average worker joining the workforce today would need at least six distinct skills in his or her working life, compared to less than two for those in the 1980s	**Canada**	103	3
	The UK	64	6
	The US	50	7
	Australia	40	9

The fourth industrial revolution is expected to give rise to a growing need for newer skills and better job preparedness

The revolution, underpinned by the fusion of technologies cutting across the physical, digital and biological worlds, shall give rise to new skill requirements and job roles and specializations that did not exist 10 years ago

65%

of children joining a primary school in 2016 will eventually end up working in a completely new job that does not even exist today

"We must develop a comprehensive and globally shared view of how technology is affecting our lives and reshaping our economic, social, cultural, and human environments. There has never been a time of greater promise, or greater peril."

– Professor Klaus Schwab, Founder and Executive Chairman, World Economic Forum

Highly dynamic socio-economic markets (especially across emerging countries), coupled with technological innovations, have led to disruptions across not just individual lives, but also industries and economies. Some of these social and technological disruption drivers have already made an impact, while several others are expected to make significant impact in the years to come

Expected timeframe of key disruption drivers impacting industries and employment

Impact felt already	2015-2017	2018-2020
► Rising geopolitical volatility	► energy supplies and technologies	► Advanced robotics and autonomous transport
► Mobile internet and cloud technology	► The Internet of Things	► Artificial intelligence and machine learning
► Advanced computing and Big Data	► Advanced manufacturing and 3D printing	► Advanced materials, biotechnology and genomics
► Crowdsourcing, the sharing economy and P2P* platforms	► Longevity and ageing societies	
► Growing middle class, young demographics and urbanization, especially in EMs*	► New consumer concerns about ethical and privacy issues	
► Flexible work environments	► Women's rising aspirations and economic power	
► Climate change and transition to a greener economy		

Subsequently, the global employment scenario has unfolded into newer spheres, especially into services allied industries, with evolving roles and skill requirements
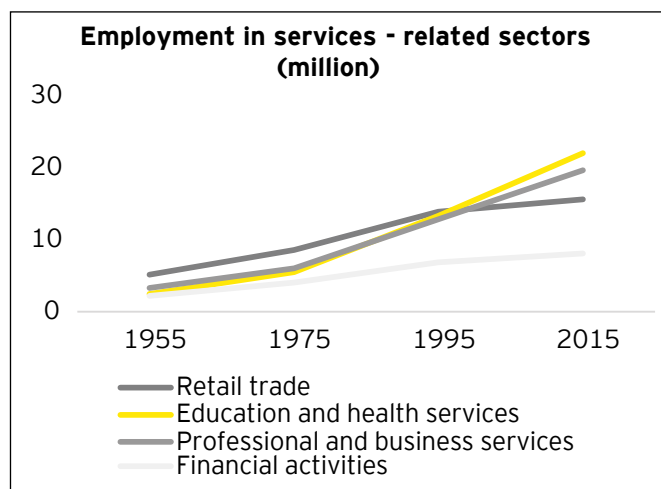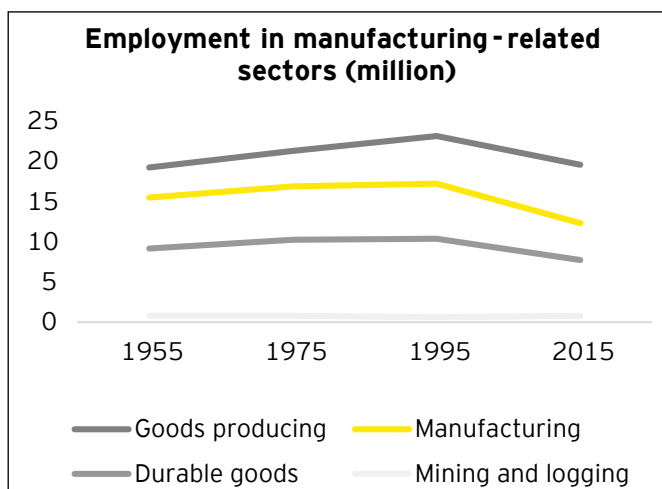
*Source: ""The Future of Jobs," World Economic Forum, 2016. "9 quotes that sum up the Fourth Industrial Revolution," World Economic Forum, accessed 26 September 2016, *P2P: Peer to peer, *EMs: Emerging markets*

The global employment scenario has witnessed significant evolution during 1955-2015, with an increase in skilled manpower and types of skill requirements

Manufacturing-allied sectors, such as automotive, oil and gas, and metals and mining, dominated the job market for close to two decades, during 1955 to the mid-1970s. However, gradually, technological advancements, demographic changes, labor strikes and economic slumps led to a period of consolidation, job losses and declining sales for key manufacturing sectors such as automotive and mining.

During 1979-89, 13 of the 20 most rapidly declining industries (in terms of employment) were in manufacturing. Over the same period, more than 50% of all job growth was in the services sector, with an overall employment share of more than 75%.

Employment in key manufacturing industries has stagnated or declined in the last six decades, while that in prominent services oriented industries has grown steadily[3]

Employment in manufacturing-related sectors (million)

Legend: Goods producing, Manufacturing, Durable goods, Mining and logging

Employment in services - related sectors (million)

Legend: Retail trade, Education and health services, Professional and business services, Financial activities

With rising global talent force participation due to globalization and bulging per-capita income, the appetite for services such as financial advisory, consulting and IT enabled services saw a robust growth after the 1990s. For instance, during 1990-2015, computer system design services and investment advisory services grew by 12% and 11%, respectively. In contrast, over the same period, manufacturing of motors and generators and that of aircraft engines and engine parts declined by 5% and 4%, respectively. Subsequently, service-oriented jobs are expected to continue their domination in the global job market.[4]
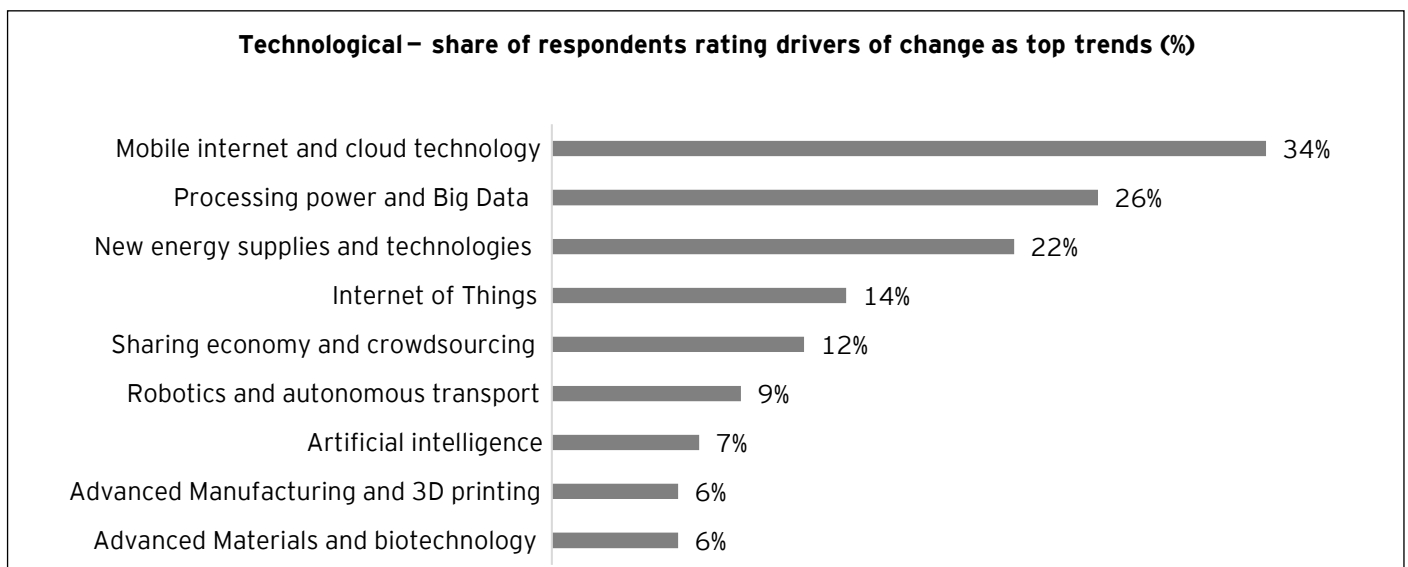
Top jobs expected over the next decade[5]...	...and the key skills required to be "industry-ready" for these jobs
► Software developer and systems analyst	► Coding
► Multiple roles across the healthcare industry	► Soft skills, emotional intelligence and cross-cultural competency
► Marketing specialists and customer service representatives, especially adept at social media and virtual collaboration	► Healthcare allied skills, including expertise in telemedicine and robotic surgery
► Teachers and trainers	► Expertise in social media platforms
► Management analysts, accountants and auditors	► Computational/analytical thinking

The evolving employment paradigm with new job roles mandates life-long skilling to ensure industry-readiness, and will govern the global employment outlook till 2020

Technological and socio-demographic factors are further expected to change employment dynamics, impacting job functions, roles and skills by 2020

According to a World Economic Forum (WEF) report*, workplace innovations such as remote working, co-working spaces and teleconferencing, mobile internet and cloud computing are expected to be the biggest drivers of change in the global employment scenario

Demographic and social– share of respondents rating drivers of change as top trends (%)

Changing nature of work and flexible work	44%
Middle class in emerging markets	29%
Climate change and natural resources	23%
Geopolitical volatility	21%
Consumer ethics and privacy issues	16%
Longevity and ageing societies	14%
Young demographics in emerging markets	13%
Women's economic power and aspirations	12%
Rapid urbanization	8%

Technological – share of respondents rating drivers of change as top trends (%)

Mobile internet and cloud technology	34%
Processing power and Big Data	26%
New energy supplies and technologies	22%
Internet of Things	14%
Sharing economy and crowdsourcing	12%
Robotics and autonomous transport	9%
Artificial intelligence	7%
Advanced Manufacturing and 3D printing	6%
Advanced Materials and biotechnology	6%

*The WEF report surveyed senior executives and chief human resources officers of various companies – more than 13.5 million employees across 9 broad industry sectors, in 15 major developed and emerging economies and regional economies

Source: The Future of Jobs report, January 2016, World Economic Forum (WEF)

The projected reduction in jobs across some sectors would lead to workers in these industries looking for alternates and in other sectors, by acquiring new skills and knowledge

Reportedly, current trends could lead to a total job loss of 7.1 million over 2015-20, due to disruptive labor-market changes – two thirds of which are concentrated in the office and administrative job family

Net employment outlook by job family, 2015-2020			
Employees '000	Job family	Employees '000	Job family
▼ -4,759	Office and administrative	▲ 492	Business and financial operations
▼ -1,609	Manufacturing and production	▲ 416	Management
▼ -497	Construction and extraction	▲ 405	Computer and mathematical
▼ -151	Arts, design, entertainment, sports and media	▲ 339	Architecture and engineering
▼ -109	Legal	▲ 303	Sales and related
▼ -40	Installation and maintenance	▲ 66	Education and training

Share of respondents in the workforce, segregated by job family in the above table* (%)
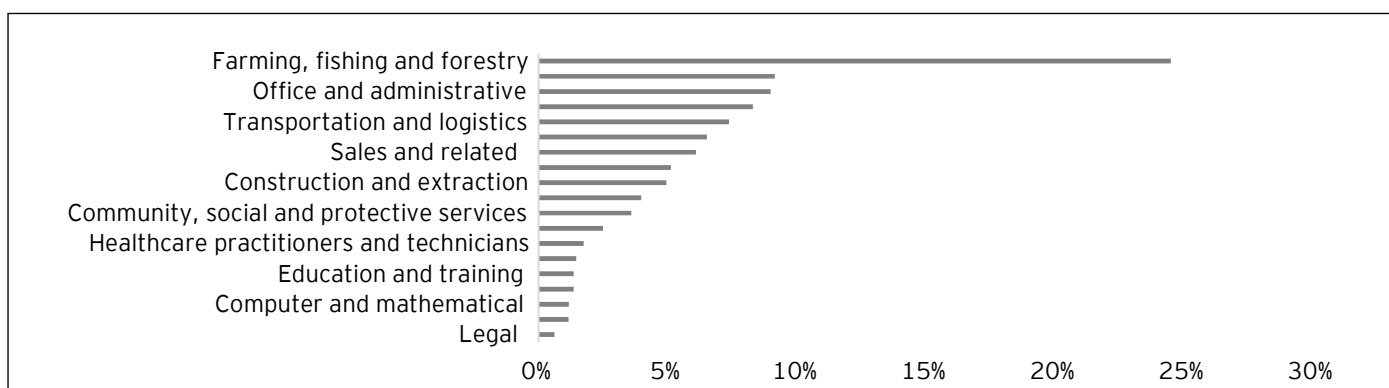
- The speed of change in the fourth industrial revolution is expected to put significant pressure on the evolving labor pool, including in emerging economies such as India
- Without a clear action plan to manage the labor shifts, governments may have to deal with ever-growing unemployment and income inequality, and businesses with lower demand

"We cannot wait until there are massive dislocations in our society to prepare for the Fourth Industrial Revolution."

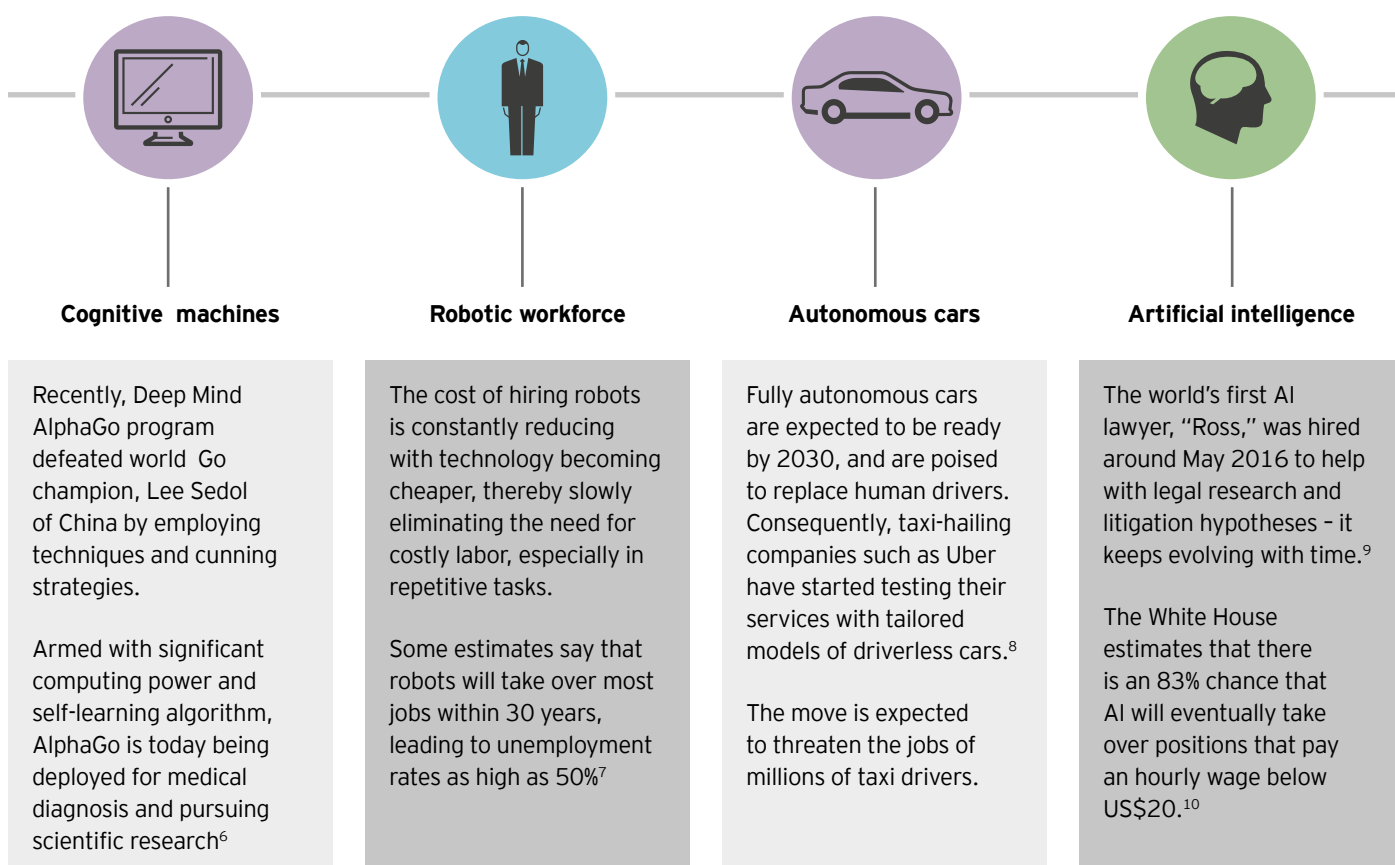**- Robert J. Shiller, 2013 Nobel laureate in economics, Professor of Economics, Yale University**

Source: The Future of Jobs report, January 2016, World Economic Forum (WEF).
Employees from focus countries excluding China), Please refer the appendix section for the survey sample population

Gazing into the future – by 2030, the nature of jobs will undergo a paradigm shift….

Technology is evolving at a path-breaking pace, enabling companies to experiment with new ideas at speeds that were unimaginable even a decade ago. For instance, today a web-based company may introduce new features in an online product and within hours, analyze customer response and feedback on improvement. Several consumer products companies are even doing concept testing online, thereby lowering costs and time efforts. As a result, innovation initiatives that used to take months and substantial investment earlier can now be implemented in hours and at a lower cost. With the cost of failure going down significantly, one may well envisage that innovation will be even faster, cheaper and more efficient by 2030.

Consequently, the nature of jobs by 2030 will be substantially shaped by this rapidly evolving pace of technological change. The impact of this change will be especially higher as compared to today's scenario, because earlier such major shifts across industries were spread over a decade, or even generations, in some cases. However, today, such changes are happening much faster, leaving less room for people to adjust, understand skill requirements and suitably prepare themselves for the job market on a dynamic basis.
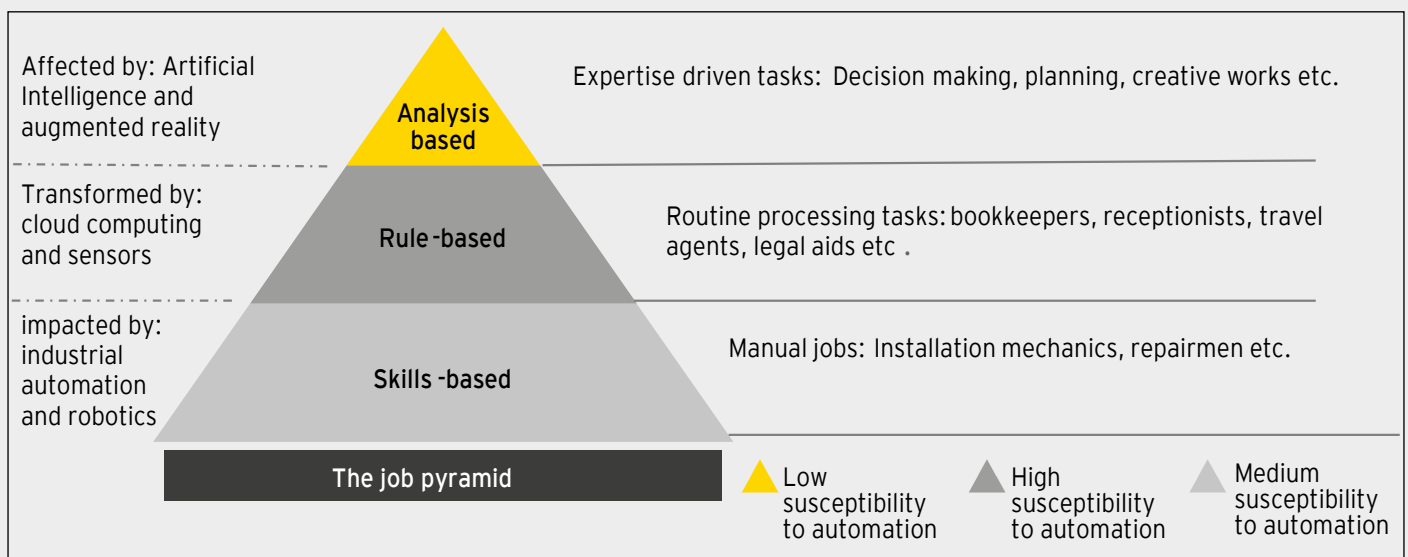
Already, examples abound where technological innovation has either begun having, or has a strong potential of having a deep impact on traditional jobs, partially giving a window to the 2030 scenario

Cognitive machines	Robotic workforce	Autonomous cars	Artificial intelligence
Recently, Deep Mind AlphaGo program defeated world Go champion, Lee Sedol of China by employing techniques and cunning strategies. Armed with significant computing power and self-learning algorithm, AlphaGo is today being deployed for medical diagnosis and pursuing scientific research[6]	The cost of hiring robots is constantly reducing with technology becoming cheaper, thereby slowly eliminating the need for costly labor, especially in repetitive tasks. Some estimates say that robots will take over most jobs within 30 years, leading to unemployment rates as high as 50%[7]	Fully autonomous cars are expected to be ready by 2030, and are poised to replace human drivers. Consequently, taxi-hailing companies such as Uber have started testing their services with tailored models of driverless cars.[8] The move is expected to threaten the jobs of millions of taxi drivers.	The world's first AI lawyer, "Ross," was hired around May 2016 to help with legal research and litigation hypotheses – it keeps evolving with time.[9] The White House estimates that there is an 83% chance that AI will eventually take over positions that pay an hourly wage below US$20.[10]

# ... with automation and technological disruption having a varying affect on roles across the job pyramid...

Technological disruptions are replacing jobs faster than creating newer ones. The impact of automation is visible across the range of job roles, transforming rule-based jobs along with impacting the judgment-based and hard-core skills

Advancements in deep learning and AI and the emergence of smart machines have enabled automation of manual work along with affecting the tasks performed by information workers too. Machines were already replacing many forms of routine role-based jobs but now have become equipped enough to perform some routine cognitive tasks as well.

Affected by: Artificial Intelligence and augmented reality

Analysis based

Expertise driven tasks: Decision making, planning, creative works etc.

Transformed by: cloud computing and sensors

Rule-based

Routine processing tasks: bookkeepers, receptionists, travel agents, legal aids etc .

impacted by: industrial automation and robotics

Skills-based

Manual jobs: Installation mechanics, repairmen etc.

The job pyramid

Low susceptibility to automation

High susceptibility to automation

Medium susceptibility to automation

Impact on skill-based jobs

A combination of technology and advancements in instrumentation is leading to a new era of production that requires progressively less human labor. Industrial automaton and robotics have reduced labor requirements across a number of sectors such as transport and logistics, and retail, putting a substantial share of employment at risk in the near future. However, there are plenty of manual roles that still remain exceptionally tricky for robots or for most of the modern bots
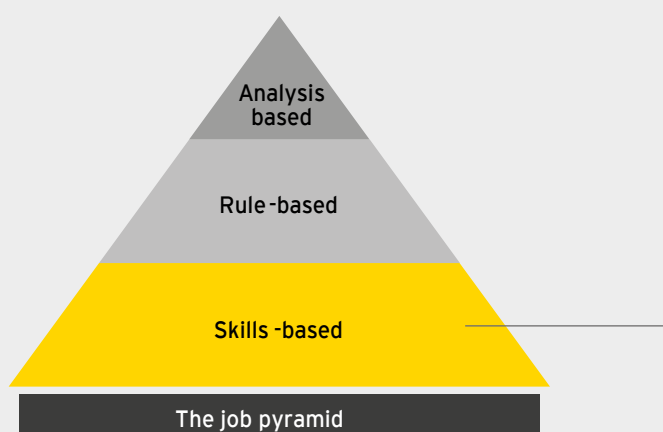
Analysis based

Rule-based

Skills-based

The job pyramid

The phenomena is known as Moravec's Paradox, an observation by leading Artificial Intelligence researchers in the 1980s that computers found hard the tasks we found easy and vice versa. While it might take a human second to fold a towel, a robot took nearly 25 minutes to carry out the task in 2010.

In many cases, technology gradually changes the nature of the jobs at the lower end of the pyramid rather than replacing it altogether, emphasizing on the need for continuous upskilling.

The role of a office assistant has undergone a big shift in the last 20 years – they are expected to use constantly changing devices – from manual typewriters to electronics typewriters to computers to tablets – they have had to learn skills to operate new technologies

Sources: "Why AI could destroy more jobs than it creates, and how to save them, Tech Republic, Nick Health, EY analysis

# ... leading to expansion in the lower and the upper end of the job pyramid — at the cost of rule-based jobs

Impact on rule-based jobs

Rule-based jobs are increasingly susceptible to being automated – with simple software having the ability to complete them in a faster and efficient manner with fewer errors. As a result, many aspirational jobs in the IT, banking and financial sectors are being made redundant by the use of technology. The impact of the shift toward automated roles in testing and software development is very evident in Indian IT companies. While the revenue growth has become flat for the largest Indian IT companies , the hiring activity has also slowed down considerably.
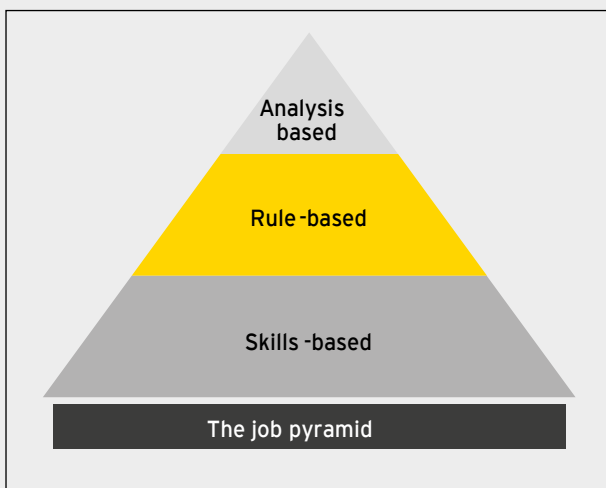
Analysis based
Rule -based
Skills -based
The job pyramid

Sources: "Why AI could destroy more jobs than it creates, and how to save them, Tech Republic, Nick Health, EY analysis

" I already talked to a big law firm and they said they are not hiring bookkeepers or first-level associates because a machine can scan through thousands or millions of documents and find relevant information more quickly and accurately than a human can." **- MIT Economist**

While rule-based roles are bring increasingly taken over by automation and robotics, it is also leading to new jobs being created at the other two levels – to support and monitor the automation. The workers in rule-based jobs need to learn new skills to adapt to these changing job requirements.

Automated teller machines (ATMs) and internet/mobile banking have replaced the routine jobs of bank tellers to the extent that banks such as Citibank charge fee to offer personalized services by human tellers. However, this trend has also created new roles in the cash-management industry at the lower end of the pyramid, and data analytics jobs at the upper end of the pyramid.

Impact on analysis-and judgement-based jobs

Advancements in AI are also threatening expertise-driven roles; however, these jobs are least susceptible to be replaced – mainly due to the cognitive or human judgement element attached to these jobs. Some of the routine high-skilled jobs are more at risk – such as drug-discovery tests using millions of available molecules or weather predictions based on historical records – but the non-routine jobs are relatively safe. New roles are being created due to increasing automation in the middle skill rule-based jobs. So, there are doctors in developing countries like India who are evaluating test reports from the US – a backend role that did not exist earlier.

Analysis based
Rule -based
Skills -based
The job pyramid
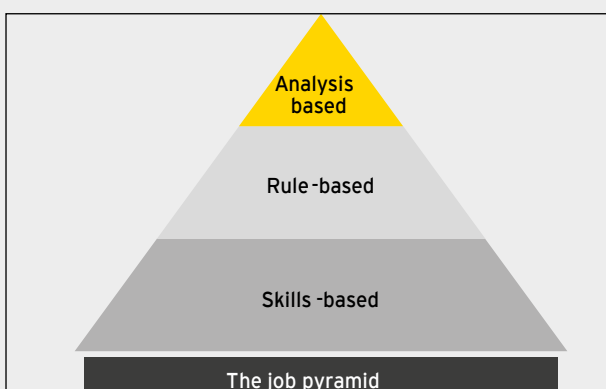
"No office job is safe, as automation is blind to the color of the collar."- **Jerry Kaplan , Artificial Intelligence professor, Stanford University**
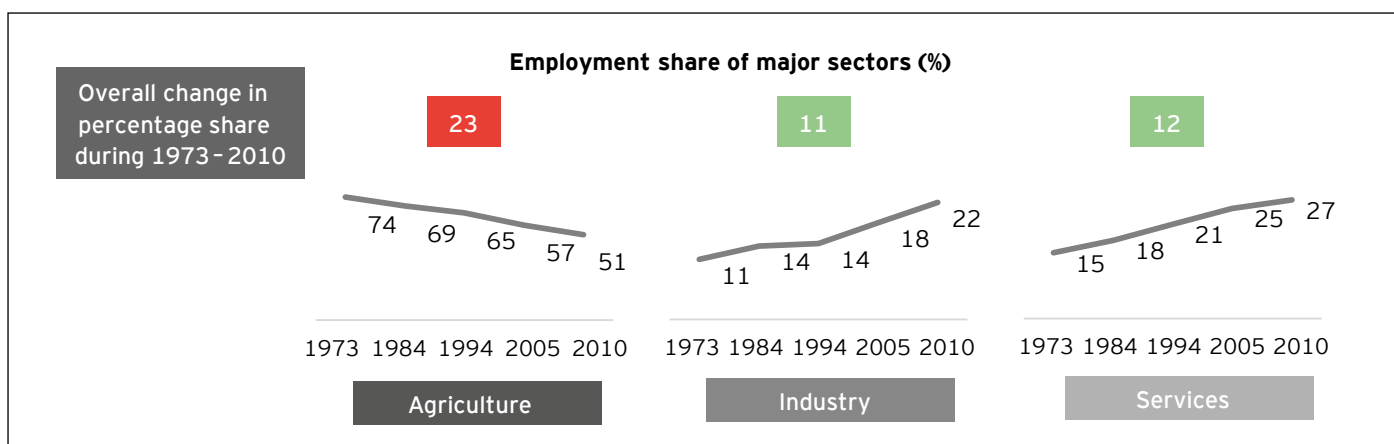
Sources: "Why AI could destroy more jobs than it creates, and how to save them, Tech Republic, Nick Health; The Economist – the impact on jobs, automation and anxiety, EY analysis
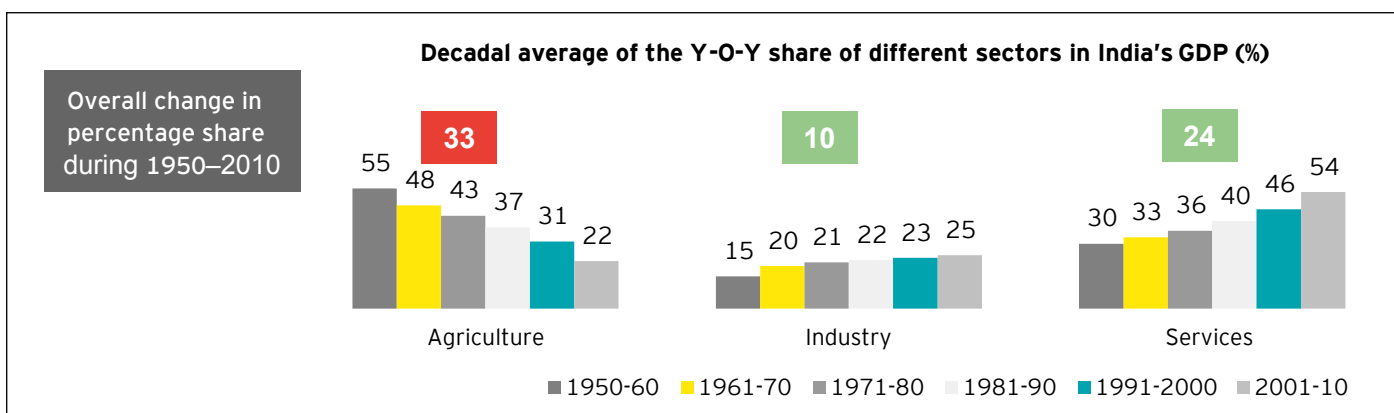
The Indian economy also has moved strongly toward the services sector in the last 50 years

India's services sector has emerged as the dominant employer, supported by the rise of a knowledge economy and a wealth of human capital

▶ India, primarily an agrarian economy in the post-independence era, embarked on an agriculture- and industrialization-based development journey during the 1950s.

▶ With the economic growth slowly becoming stagnant over the next two decades, the Government took bespoke measures to liberalize the economy, which generated significant employment and economic opportunities in the services sector – especially since the 1990s.

Employment share of major sectors (%)

Overall change in percentage share during 1973–2010

Agriculture	Industry	Services
23	11	12

Agriculture: 74 (1973), 69 (1984), 65 (1994), 57 (2005), 51 (2010)
Industry: 11 (1973), 14 (1984), 14 (1994), 18 (2005), 22 (2010)
Services: 15 (1973), 18 (1984), 21 (1994), 25 (2005), 27 (2010)

▶ Apart from being the country's second largest employer after agriculture, the share of services sector in the GDP has almost doubled since 1950, while that of manufacturing has seen a comparatively stagnant growth.

▶ Currently, India is the world's second largest growing services economy.

Decadal average of the Y-O-Y share of different sectors in India's GDP (%)

Overall change in percentage share during 1950—2010

Agriculture	Industry	Services
33	10	24

Agriculture: 55, 48, 43, 37, 31, 22
Industry: 15, 20, 21, 22, 23, 25
Services: 30, 33, 36, 40, 46, 54

■ 1950-60 ■ 1961-70 ■ 1971-80 ■ 1981-90 ■ 1991-2000 ■ 2001-10

Source for both charts: "An Analysis of Services Sector in Indian Economy," International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 3 Issue V, May 2015, p. 148

Till 2020, the next wave in India's job market is expected to be driven by new pillars, including technological growth, government reforms and socio-political advancements...

New technologies

Cutting-edge technologies such as SMAC technologies are disrupting multiple sectors such as e-commerce, content creation and dissemination, e-gov services and retail. Spending on SMAC by Indian IT enterprises and the Government is expected to reach US$10 billion by 2020, growing at 24% annually.[11]

Policy reforms

The Government's decision to relax FDI norms in sectors such as civil aviation, single-brand retail, defence and pharma is expected to help attract big investments and boost job creation. FDI in the retail sector alone will reportedly create **10 million jobs over 2012-22.[12]**

Socio-political issues

With increasing incidences of terrorism, cyber attacks and illegal migration, employment opportunities are expected to increase in niche areas such as **disaster management, business continuity planning and homeland security.**

Impact of regulatory changes: how the UIDAI is creating new job profiles	
The disruptor	The world's largest biometric-based identity system was launched with a vision to empower every Indian with a unique identity (Aadhar card) and provide a digital platform to authenticate anytime, anywhere. More than 1 billion citizens have registered since its launch in 2010.
Impact on job market	▶ The Aadhar project has spawned a significant requirement of skilled workers, including biometric experts, cybersecurity professionals, software architects and data entry operators ▶ The project aims to create a pool of 300,000 skilled workers to support its operations. Consequently, the authority has signed an agreement with the NSDC to train workers from its enrolment agencies.13 ▶ The project is also expected to catalyze commercial opportunities across sectors such as telecom, education, healthcare and financial services.

...which will lead the transformation of India's employment scenario, giving way to specialization in new technologies and skills

Automation is helping organizations make repetitive jobs redundant...

- Automation and AI systems have reportedly helped one of India's largest IT firms, cut costs on productivity, infrastructure and consumption of resources by 30-40%

- India's five large software exporters together added net 24% fewer employees in 2015, due to automation initiatives[14]

IT sector job growth has stagnated [15]

Jobs added **in the IT** sector (lakh)

FY	Jobs
FY10	1
FY11	2.4
FY12	2.3
FY13	1.88
FY14	2.2
FY15	2
FY16E	2
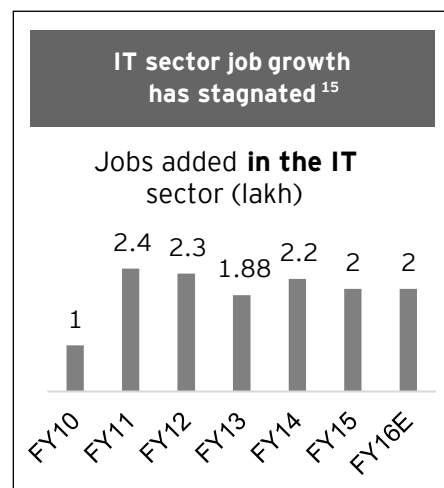
...due to which India's IT services industry alone is estimated to lose 6.4 lakh low- and medium-skilled jobs by 2021[16]

Skill level	Growth in IT-BPO jobs by 2021		Skill characteristics
High-skilled	56%	▲	Creative problem-solving, analytics and critical thinking
Low- and medium-skilled	28%	▼	Problem-solving, with limited human judgement Set process and repetitive tasks

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...increasing jobs for professionals with expertise in latest technologies, as well as with tailored skills[17]

- SMAC: The bracket is expected to create 5–6 lakh jobs by 2020.[18]

- Cloud computing: Estimated to be a US$650 billion–US$700 billion market by 2020, requiring security architects, network engineers, cloud-based developers and specialists.

- Analytics: With around 600 firms and 90,000 professionals, India is among the top 10 destinations for analytics. Jobs growth is expected in areas such as custom visualisation software, predictive analytics and machine-to-machine learning. The required skills include data science, statistics and critical thinking.[19]

- AI: It is increasingly being used for jobs/roles such as data mining, virtual assistants, decision support systems and automated reporting.

An estimated 60%-70% of the current IT workforce needs to be retrained in areas such as biotech, nano-tech, smart technologies and advanced analytical skills, reiterating the importance of life-long skilling/reskilling.

By 2030, India will witness a similar impact on job scenario as globally, owing to the rapid pace of automation and its wider penetration across sectors

India is poised to become the third largest economy by 2030, with one of the largest and youngest workforce in the world. The country will reportedly need to create jobs for around 100 million people who enter the job market over the next decade. This will require a major overhaul in the country's job-creation and skill-development framework in order to make the workforce ready for the evolved nature of jobs.[20]

Technology has already led to the transformation of multiple industries/job roles, and will continue to deepen its impact in the future. The potential disruptive impact on jobs due to technological advances in various fields such as robotics, AI and 3D printing is being closely watched so as to re-align the workforce and be prepared fast enough to face the "skills vacuum" in the offing.

In India, the services sector is the powerhouse of job creation. However, primarily driven by automation of repetitive jobs, India's IT services industry workforce is expected to shrink by 480,000 by 2021, a reduction of 14%. According to industry experts, white collar middle-level managerial and office administration jobs (mostly "middle class jobs")will slowly disappear, largely giving way to automated systems. Only highly skilled jobs requiring significant creativity and analytical thinking such as in data science and analytics, architecture, and media and entertainment will reportedly remain for humans by 2030.[21]

To fully utilize the commercial avenues and opportunities that these technological and demographic changes have to offer, India needs to invest in the next industrial revolution, transforming itself into a nimble, "demand-led skill-development engine." Furthermore, India is a complex and diverse society, with three distinct layers of industry (2.0, 3.0 and 4.0) coexisting – and witnessing selective transition. To remain globally competent and relevant, it is critical that while we prepare our education system to address the industry 4.0 challenges, we upgrade, streamline and facilitate speedy transition from 2.0 and 3.0 industry to 4.0.

Case in point: how India's banking industry has been completely transformed through technological tools such as net banking and mobile banking.

One of India's largest private sector bank, deploys "Software Robotics" in over 200 business processes across various functions. These software robots have reportedly reduced the response time to customers by up to 60% and increased accuracy to 100%, thereby boosting productivity and efficiency and enabling employees to focus more on value-added and customer-related functions.22

Every day, these software robots perform over 10 lakh banking transactions across retail banking operations, agri-business, trade and forex, treasury and human resources management, among others. The bank also plans to more than double the software robots to over 500 by the end of 2016.

The impact of this change is felt by both students and working professionals — who in turn are finding ways to remain relevant for the jobs of future

As the job market transforms, students are finding it increasingly difficult to keep up with the pace of the evolving skill requirements
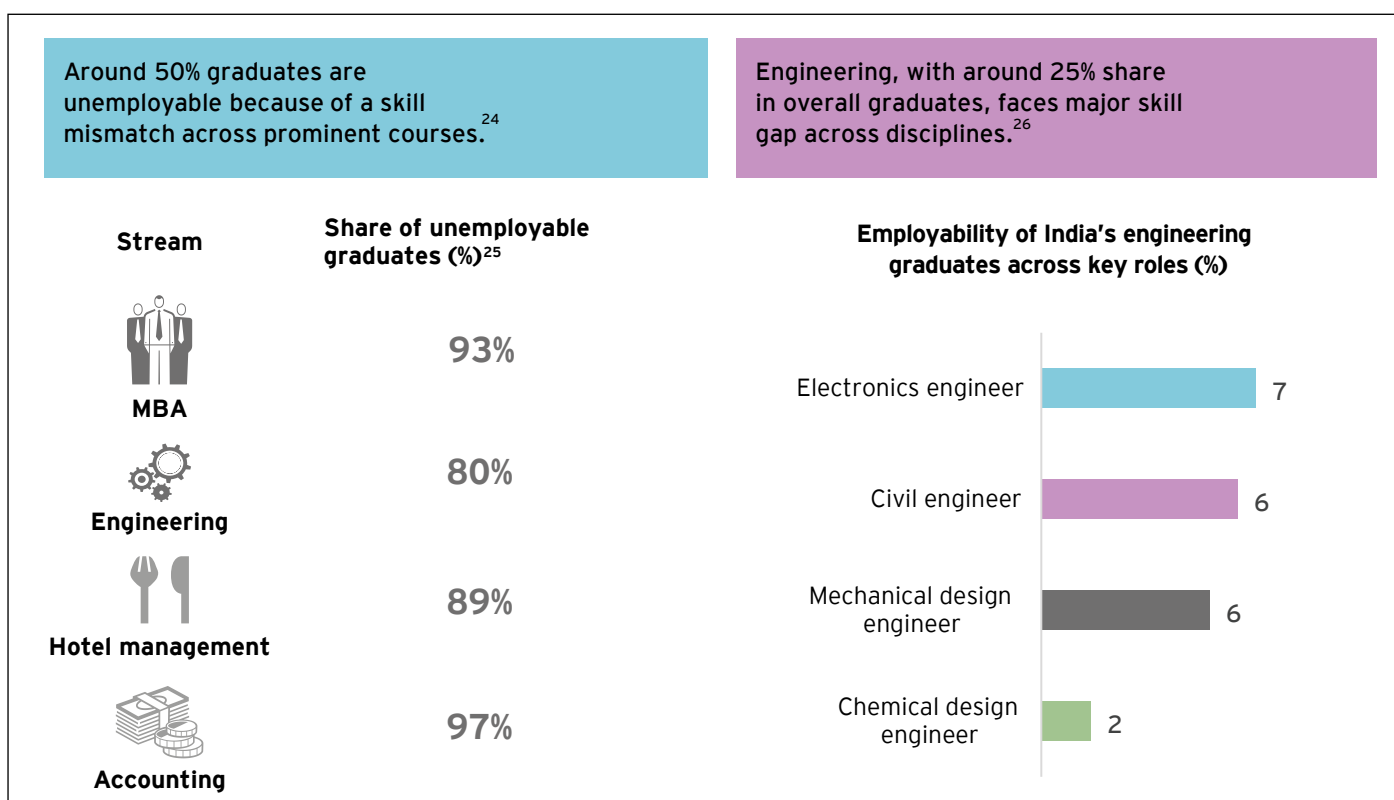
Getting a promising career path for students, rather than just a college degree, is the need of the hour. Although education is considered to be the backbone of economic development, students graduating from HEIs today are not job-ready.

Limited counselling system to guide on available career options and evolving job scenarios

Poor horizontal mobility across institutes and educational streams

Weak linkages and guidance from industry

Challenges impeding students' learning path

Limited/no options to take up more courses of choice

Poor infrastructure and delivery platforms

Focus on imparting technical skills than job skills

...Therefore, an increasing number of students are unable to align themselves with the latest industry requirements and find suitable employment.

Given these challenges and shortage in required skills, corporates across industries are increasingly reporting skill gaps in students...

India produces more than 6 million graduates every year. However, the majority of them are not "industry-ready" because of a skill gap.[23]

Around 50% graduates are unemployable because of a skill mismatch across prominent courses.[24]

Engineering, with around 25% share in overall graduates, faces major skill gap across disciplines.[26]

Stream	Share of unemployable graduates (%)[25]
MBA	93%
Engineering	80%
Hotel management	89%
Accounting	97%

Employability of India's engineering graduates across key roles (%)

Role	Value
Electronics engineer	7
Civil engineer	6
Mechanical design engineer	6
Chemical design engineer	2

The significant disconnect between industry requirements and the workforce's skill set exists because of multiple reasons

Industry-related challenges	▶ The industry has to invest in imparting relevant skills to new entrants as well as lateral entrants during a job change.
	▶ Application-oriented domain knowledge is reportedly missing.
	▶ Soft skills, an essential element in today's business world, is a major lacuna in being "industry-ready."
Educational framework challenges	▶ There is lack of lateral entry for students and working professionals.
	▶ Outdated curriculum is still being referred to in most of the institutions.
	▶ Inadequate infrastructure and poor quality of faculty, combined with old delivery platforms, make it difficult to equip students with relevant skills.

Therefore, a strong focus on continuous learning and upskilling is required, especially to stay abreast with 21st century skills

According to WEF, creativity and emotional intelligence will emerge among the most critical skills, primarily because of the launch of new technologies, new ways of working and high demand for soft skills.

Top 10 skills in 2015	Top 10 skills in 2015	
▶ Complex problem-solving	▶ Complex problem-solving	
▶ Coordinating with others	▶ Critical thinking	
▶ People management	▶ Creativity	⟶ Fastest growth
▶ Critical thinking	▶ People management	
▶ Negotiation	▶ Coordinating with others	
▶ Quality control	▶ Emotional intelligence	⟶ New entrant
▶ Service orientation	▶ Judgement and decision-making	
▶ Judgement and decision-making	▶ Service orientation	⟶ Demand reduced
▶ Active listening	▶ Negotiation	⟶ New entrant
▶ Creativity	▶ Cognitive flexibility	

1. *Based on a survey of chief human resource officers and other senior talent and strategy executives of leading global employers, representing more than 13 million employees across 9 broad industry sectors in 15 major developed and emerging economies and regional economic areas.

The majority of international and a handful of domestic universities are updating their curriculum to include soft skills

▶ **Bharathidasan University** (Tamil Nadu) has included a soft skills development course in its undergraduate programs, with an objective to increase students' confidence while facing job interviews.[27]

▶ **University of Seychelles** plans to include modules on negotiation skills in its Governance and Stakeholder Engagement course, in order to prepare participants for better stakeholder engagement.[28]

▶ **European universities** aim to link employability with lifelong learning, by mandating students to learn skills outside of academic knowledge. By early 2009, 80% of German universities were offering training in soft skills, either integrated in regular courses or organized by their career centers.[29]

With growing requirement for new skills, students are facing situations wherein they need to get into jobs that were never part of their course curriculum, or they do not have the skills required for the most lucrative jobs when they graduate. To address this situation, global education frameworks such as CBCS are gaining prominence.

CBCS helps bridge this gap by providing freedom and flexibility to pursue professional and skill-based courses

CBCS is a customized approach to delivering education, which provides students the flexibility to choose their desired subjects, institutions and pace of learning

Most importantly, CBCS recognizes the importance of individual learning, wherever and whenever it is achieved. By treating students as individuals who have independent academic needs and interests, CBCS helps students in making informed learning decisions, and enables them to opt for courses of choice and learn at their own pace. Through this "a-la-carte" approach to learning, students can undergo additional courses, acquire more than the required credits, adopt an inter-disciplinary approach to learning, and keep up with the rising demand for latest skills.

The system is comparatively more student-centric and focuses on learning-based outcomes, instead of time-based learning. It also gives an opportunity to learn key industry skills/professional courses to increase employability, and helps employers assess the performance of students on a scientific scale.

Prominent global universities are offering students a wide array of courses to choose from, assisting in their overall development

▶ **Stanford University** encourages an '"individual program" of study, through a variety of credit-based courses.

▶ The program ensures exposure in interest areas, by mandating a balance between credits earned in basic and specialization courses.

Moreover, UGC* has also started working toward CBCS with the introduction of guidelines in 2015, though the progress is slow...

Merely
20
754
Central/state universities have **implemented CBCS** till now

▶ **Newcastle University** offers elective courses to complement core areas of study or just to delve deeper into an interest area.

▶ Its **iLead** program lets students earn up to 60 points for participating in an overseas-exchange program.

...with universities reportedly facing several challenges

▶ Inadequate/inconsistent syllabus

▶ Lack of clarity in evaluation method and credit distribution

▶ Absence of clear guidelines to integrate CBCS with existing systems

▶ Reduction in universities' autonomy

▶ Poor infrastructure and faculty

The slow transition of the Indian education system toward flexible and skill-based courses is resulting in a mismatch between the knowledge imparted to students and the expertise required by the industry

Sources: The Hindu website, India Today website, Stanford University website, Newcastle University website, Deccan Chronicle website.
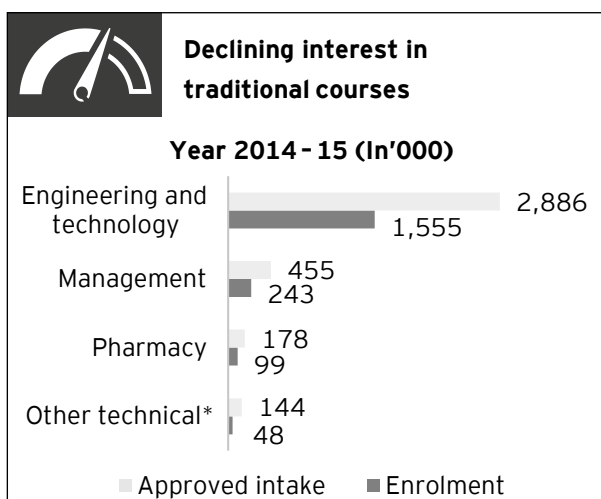**UGC: University Grants Commission*

With rapidly growing job roles, flexible "new age" courses are gaining favor among learners compared to traditional technical programs

Demand side changes	New age career options	Supply side changes

Declining interest in traditional courses

Year 2014 – 15 (In'000)

Course	Approved intake	Enrolment
Engineering and technology	2,886	1,555
Management	455	243
Pharmacy	178	99
Other technical*	144	48

Includes Applied Arts, Architecture, Hotel Management, MCA

Increasing inclination toward newer options to broaden horizon and meet dynamic industry needs

▶ Students are now going beyond the conventional career streams and are keen to pursue lesser-explored courses

▶ Such courses include golf coaching, music technology, social media analytics, motor sports engineering, and media planning and buying.

▶ Credila* has witnessed the demand for different courses go up by 25% annually in the past few years.

Limited HEIs are responding to the changing students' needs and offering new career options across sectors

Liberal arts, soft skills, media courses are garnering interest as a means for holistic development and providing newer avenues for employment. However, only a handful of well-known universities are providing recognized degrees. For instance:

Ashoka University offers Young India Fellowship, a multi-disciplinary PG program in liberal studies and leadership. The number of applicants for this program has quadrupled in five years.

Amity University has integrated soft skills with traditional courses, through certificate courses in foreign business language, values and ethics, art appreciation, golf etc.
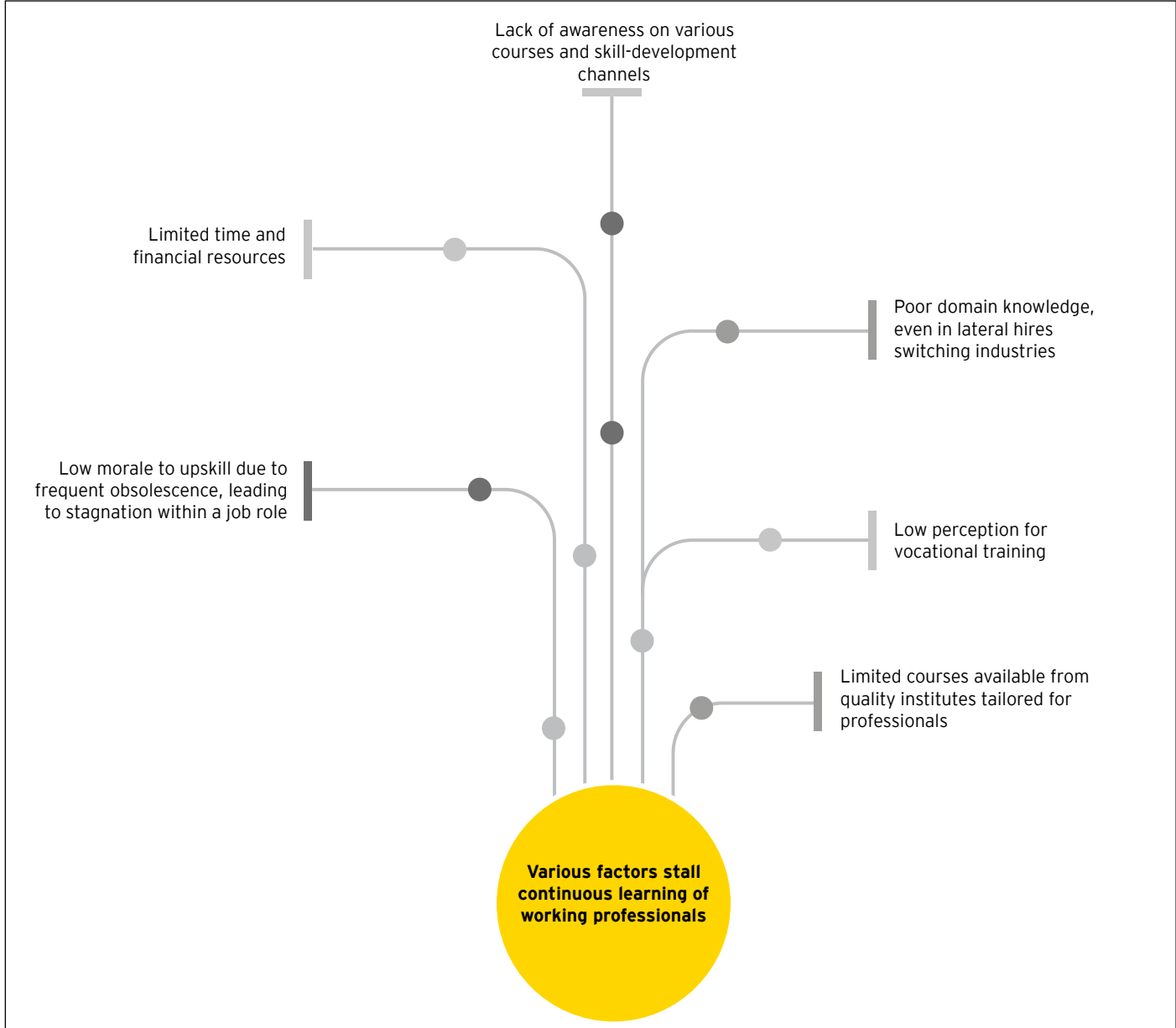
Whistling Woods offers three-year graduation courses in media and shorter-term diplomas in filmmaking and screenwriting domains.

"With 30-40% engineering seats lying vacant every year and the shrinking number of students taking MBA entrance exams, it appears students are increasingly opting for and will continue to choose newer courses and occupations," **- Ajay Bohora, co-founder and CEO, Credila Financial Services, education loan subsidiary of HDFC**

The evolving job scenario is also pushing working professionals toward continuous upskilling and reskilling

Although the dynamic employment market encourages working professionals to revisit their education despite busy schedules, multiple factors hinder their upskilling.

Lack of awareness on various courses and skill-development channels

Limited time and financial resources

Poor domain knowledge, even in lateral hires switching industries

Low morale to upskill due to frequent obsolescence, leading to stagnation within a job role

Low perception for vocational training

Limited courses available from quality institutes tailored for professionals

Various factors stall continuous learning of working professionals

Sluggish learning for working individuals due to these challenges affects their career path. Thus, skill development via various platforms needs to be channelized to ensure that working individuals stay "industry-relevant" over the course of their career.

Continuously evolving job roles offer new opportunities to working individuals but also require constant focus on upskilling

The rapidly evolving employment scenario has resulted in a limited "shelf-life" of skills acquired by professionals as students.

Continuous skilling has become a necessity rather than a competitive advantage...	...making employees across leading economies strongly believe in regular upskilling

The "shelf-life" of traditional course is reportedly diminishing with evolving job roles and skill requirements.

Share of employees who believe that refreshing their skills and competencies every five years will enhance their employability (%)31

91%

Indian employees feel that their skills will be obsolete in the next five years[30]

*Based on a May 2016 survey of 2,055 respondents, including 272 CEOs or senior leaders, 532 middle managers and 1,251 general employees

Country	Value
Singapore	91
Hong Kong	85
New Zealand	81
Australia	80
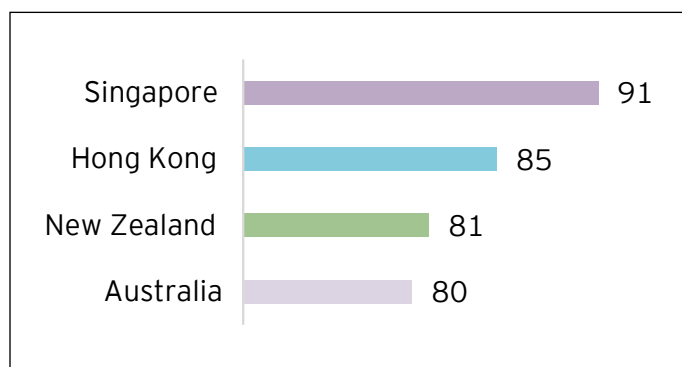
Results based on an online survey, among a population aged 18-65, working a minimum of 24 hours a week in a paid job (not self-employed). The minimal sample size was 400 per country*.

Some countries and organizations have acknowledged these challenges, and have attempted to overcome this skill gap through an institutional response. For instance, the Singapore Government's SkillsFuture Credit program is facilitating continuous learning for citizens.32

| About	The program aims to encourage individuals to plan their lifelong learning journey and take ownership of their skill development.
Salient features	▶ Citizens aged 25 and above will receive an initial credit of S$500 from January 2016, with periodic top-ups on the credit.
	▶ This credit can be used on top of existing course subsidies to pay for a wide range of skills-related courses, approved by key government bodies such as Singapore WDA and MoE.
	▶ Employers are also eligible for 50%-90% subsidies on sponsoring their employees for training in WDA-supported courses.

Technology has significantly altered the job scenario. Technology-enabled MOOCs are among the best channels for lifelong learning as of today

Online course facilitate self-paced learning, with flexibility in geographic location, lower costs and the opportunity to virtually interact with global peers.

Popularly known as MOOCs, online courses provide an opportunity to take up courses of choice (often for free) offered by some of the world's most elite universities, such as MIT, Yale and Princeton.

600+ universities   **100+ specializations**

The top 10 searched keywords for courses include Python, Java, writing, statistics, English, computer science, machine learning, healthcare, data science and marketing.

Size of global MOOC market (US$billion[33])

Growth rate | 42% | 52%

2015	2019
2	8

Number of courses offered by MOOCs

2016	4,030
2015	2,154
2014	990
2013	182
2012	5

CAGR: 433%

MOOCs are gaining significant prominence in India

▶ India is the second largest user base (after the US) for the "Big Three" MOOC providers: Coursera, edX and Udacity.

▶ The Government has launched its MOOC platform – SWAYAM, initially with around 2,000 free courses and 250,000 hours of content.[35]

▶ The MHRD has funded A-View, an indigenous e-learning platform developed by Amrita University, which has been installed in over 2,000 colleges and universities in India.[36]

Registered users in India (2016, million)[34]

Growth 2015-16 | 70% | 96%

Coursera	edX
1.6	0.9
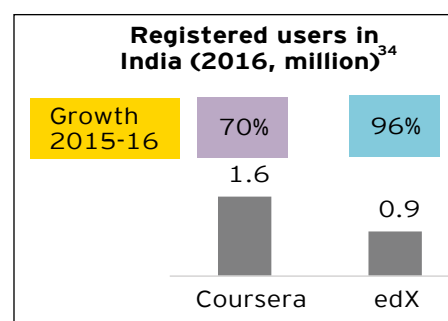
Prominent examples of online courses being offered in India[37]

Institute	Course details	User base
IIT Madras	Building web/mobile applications	57,000+ registrations
BITS Pilani	To offer 40–60 courses by 2017, in partnership with edX	Will potentially benefit 100,000 students
IIM, Bangalore	18 MOOCs on business/management, in partnership with edX	0.25 million enrolments worldwide

Organizations are also banking on customized trainings to keep employees abreast with the latest skillsets, often delivered by HEIs

Currently, technical training accounts for around 70% of the corporate training (CT) market. However, the share of non-technical training is poised to surge, with increasing demand for soft skills and managerial skills.

Global CT market revenues (US$ billion)*

Growth rate →		8%	8.4%	8.9%	9.2%	9.7%
	54	58	63	69	75	82
	2014	2015	2016	2017	2018	2019
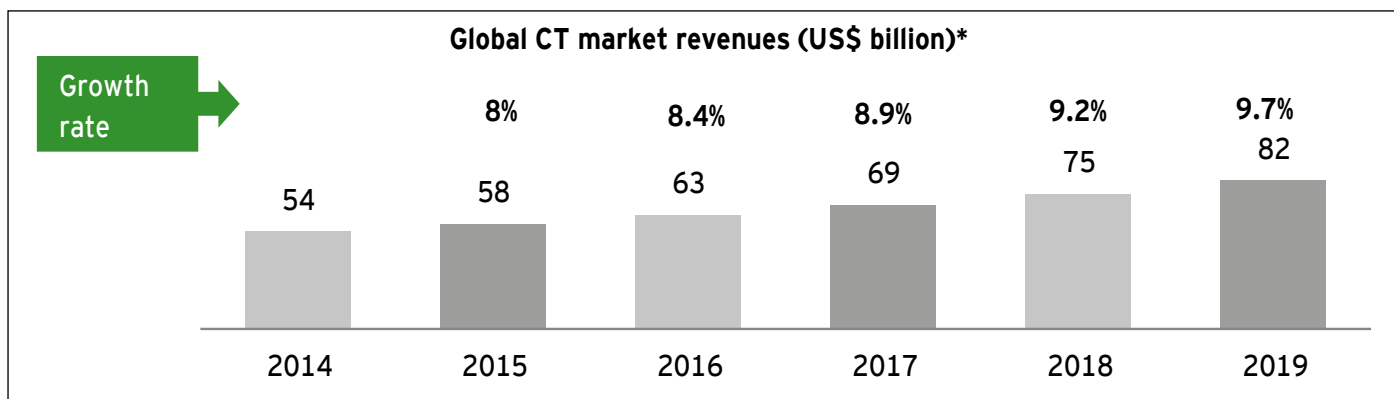
> APAC is expected to witness a higher growth in the CT market until 2019 (10.4%), led by China and India

> In India, organizations are investing in interactive and objective-based trainings to enhance employee satisfaction and engagement

CT market share by region (2015)

- RoW, 8%
- APAC, 10%
- Europe, 31%
- North America, 51%
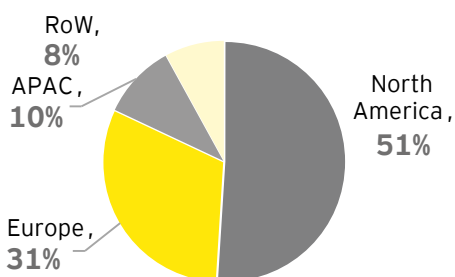
▸ The overall CT market in India is expected to reach US$5 billion by 2020.

▸ IT/ITES and telecom are among the leading sectors for technical training – primarily at the entry level. Focus is also increasing on "train the trainer" programs.

▸ Growth is expected to be fueled by:

　▸ Niche modules on Big Data and machine learning, with penetration of data-intensive applications

　▸ Rise in SMEs and start-ups

Case in point: India's largest Automaker working for its employees' holistic development

Provides a training plan encompassing functional, behavioral, safety and environment trainings	Collaborated with G-Cube, an e-learning solutions provider, to offer online programs to its employees	Adopted 29 industrial training institutes (till FY14), with plans to steadily increase the number

Additionally, select progressive HEIs are offering courses to support life-long learning among working professionals across levels

Off-beat programs[38]
Narsee Monjee Institute of Management Studies

▶ **Dual PG degree specialization:** Three-year integrated course of M. Pharm + MBA giving specialization in both technical fields and managerial skills

▶ **Distinctive course offerings:** MBA in Social Entrepreneurship & Sustainability Management for development sector professionals

Part-time programs[39]
Indian School of Business

▶ **Weekend programs offering flexibility:** PG Programme in Management designed to meet the career aspirations of mid-career working professionals

▶ Classes held on alternate weekends and through online modules for a few hours in intervening weeks, requiring no absence from work

Leadership development
Stanford Business School of Graduate

▶ **Programs to prepare for the next level:** Comprehensive leadership programs to prepare high-level executives assume greater responsibility

▶ **Study Trips:** Off-campus learning opportunities to meet the leaders who are currently shaping the organizations, industries, countries providing practical exposure leading to development of leadership capacities

Short-term executive programs[40]
Symbiosis Center for Corporate Education

▶ **Quick learning modules:** 2-15 days short-term programs in leadership, communications skills, project management, business dynamics, effective selling skills etc.

▶ **Executive certificate programs:** Five days to six months customized courses in business dynamics, managerial effectiveness, campus to corporate, finance, HR and operations etc.

In essence, students as well as working individuals constantly need to upskill via various platforms to be able to tackle the disruptions in the employment scenario

The highly dynamic job scenario emphasizes that education/skilling is not merely an outcome – it is a continuous process, wherein multiple channels contribute toward lifelong learning and enable professionals to stay ahead of the "expiry date" of their skill sets

Formal / higher education

Students may leverage foundation/core courses to acquire basic skills and/or specializations

Facilitates transition into the industry, via placements, live projects and career workshops

Transferability between job and formal education system

Students/professionals need to exercise seamless movement between professional and educational frameworks, giving freedom to pursue discipline of choice and enhance employability

On-the job training

Working individuals may leverage this as an effective medium to boost skills, ideate and innovate

Encourages quick learning and productivity

Continuous professional development

Industry engagement

Students need to proactively engage with industry in marquee processes such as curriculum development, placements and apprenticeship programs to stay industry-relevant

Multiskilling

Students/professionals need to equip themselves with multiple skills, empowering them to handle expanding job requirements that demand a blend of technical and soft skills

Mentoring and peer-to-peer learning

Individuals may deploy this to enable knowledge sharing and leverage ideas and experience between peers

Could be a very cost-effective learning channel under stretched budgets

Sources: "When the shelf life of employee skills is less than a slice of bread," Epiphany Education, accessed on 15 September 2016

The rapid changes are challenging the higher education system to keep pace with the industry requirements and learner aspirations – and HEIs have to transform

The higher education system has to align itself to the changing world

With a changing economic scenario – where individuals are less averse to industry- and job-hopping – the higher education ecosystem also needs to transform to support shifting socio-economic paradigms. The regulators, HEIs and individual learners form the three pillars of the higher education ecosystem. The shift needs to be at all levels – the regulators need to think innovatively regarding the regulations to stay ahead of the curve. The individual, being the most agile unit, would be switching to non-formal modes of learning as it becomes available.

Higher education landscape		
External regulations	HEIs	Individual
Defining guidelines for the overall education ecosystem along with outlining the interplay between the higher education institutes and the students	Educational service providers delivering, assessing and certifying formal learnings of individuals at an economical fees	Students are the individuals with the zest for learning and developing capabilities to transform the skills acquired at HEIs into expertise required by employers/society
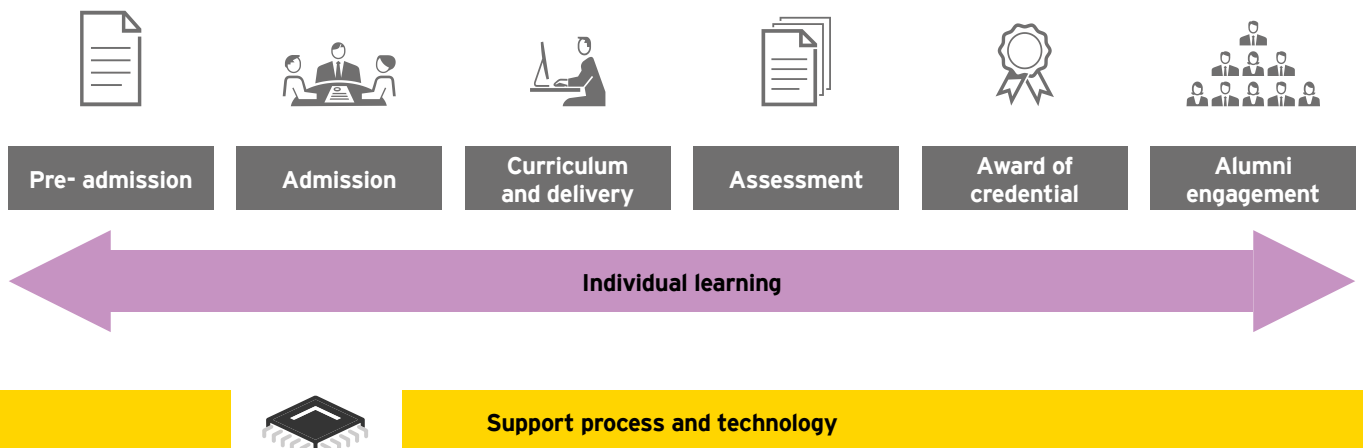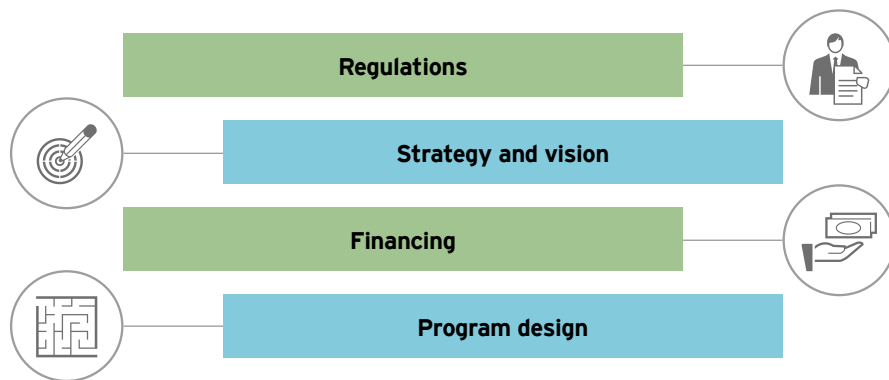
The learner today is a taker in the higher education system, with limited flexibility to learn beyond the defined curriculum

Higher education landscape today

We are living in a dynamic world – a world where a cutting-edge technology today becomes obsolete in less than a decade, where distances are being challenged by video communications and collaborative workspaces, and the industry, which is the end user of the higher education ecosystem is becoming truly global. Individuals – both currently in the education ecosystem and economically productive workers – are breaking away from the existing paradigms of learning and working. The yearn for new-age programs, better curriculum and global exposure, and lack of quality opportunities in the home country are leading to a surge in transnational students. Ever-emerging workforce requirements have led to frequent job switches and constant reskilling needs among the working professionals.

Faced with this dynamic socio-economic landscape, HEIs of today should critically assess the viability of their current business model in light of the emerging trends within the overall ecosystem that they operate in. The onus for this transformation is equally upon the regulators of the higher education system – who need to drive this transformation through forward-looking regulatory requirements, enabling innovations in the broader education ecosystem.

The learner today

Across the world, higher education is fairly tightly regulated. Most regulatory regimes lay strict guidelines for the input parameters of a university, leaving little room for innovations in the core of University workings.

Currently, HEIs, individuals and allied organizations are largely "takers" of the regulatory framework, with little authority and flexibility

Across the world, higher education is fairly tightly regulated. Most regulatory regimes lay strict guidelines for the input parameters of a university, leaving little room for innovations in the core of University workings.
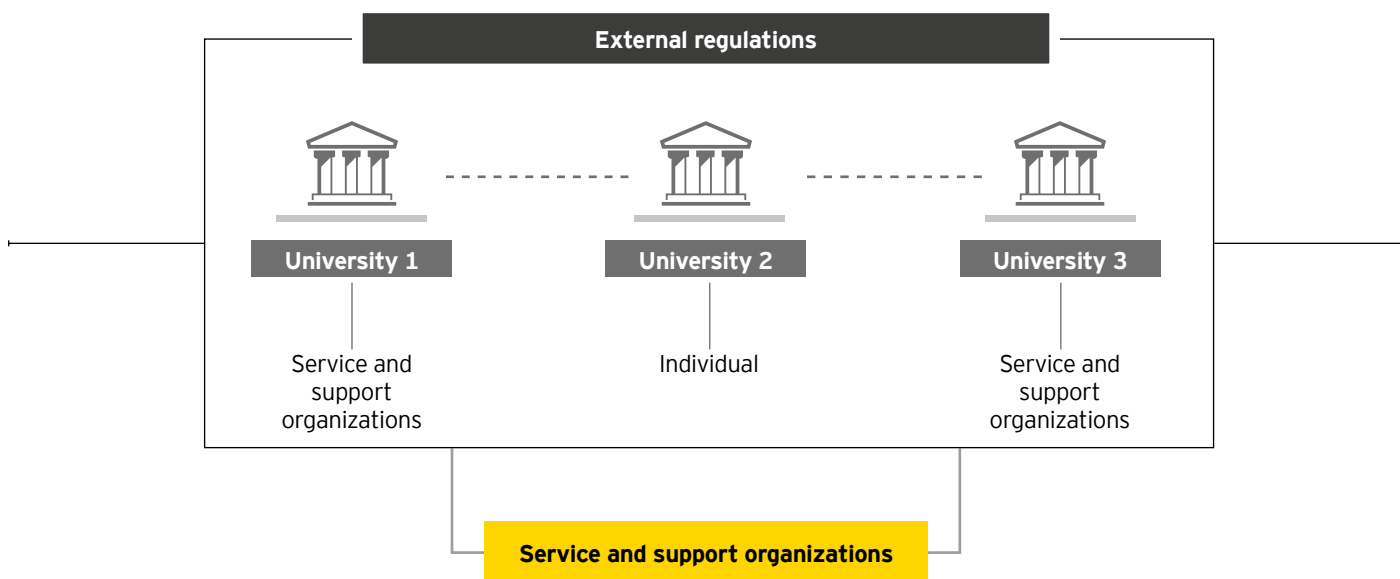
The regulators are far behind the innovation curve, leading to outdated pedagogies and suboptimal leverage of technology

Regulators are market-makers. They should be the first ones to identify trends and innovations, and develop a regulatory environment. Unfortunately, Most regulators lack agility in setting regulations.

While MOOCs took off in 2007–08, most regulators do not recognize them even now. So, while over 35 million people completed MOOCs in 2015, and over 550 universities launched their MOOCs, less than 100 fully online degree awarding courses exist globally. MOOCs still function as uncredited alternatives, augmentations, and supplements to traditional modes of higher education.

In many regions, there are multiple regulators with overlap in jurisdiction or regulations set at cross purposes.

India has UGC and AICTE setting the rules for technical education. The US has the option of a university being accredited by either national accreditors or state/regional accreditors – each of which has varied degree of academic standards, leading to credits not being transferable across colleges in many cases.
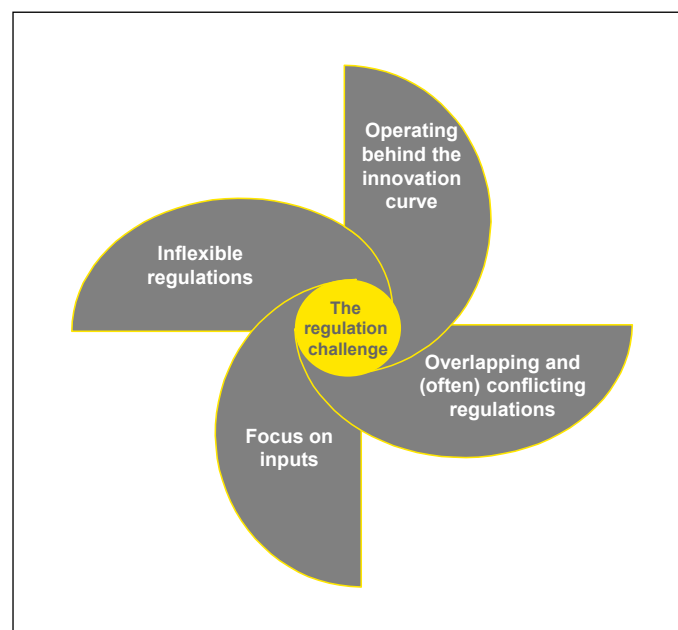
Inflexibility in core education design is the unintended consequence of overemphasis on inputs. Degree completion is linked to classroom time. With technology enabling anywhere, anytime learning, an individual can successfully complete programs faster than prescribed. However, there is limited flexibility provided by the regulators for such a learning model. Also, in the future a lot of working professionals would get back to higher education to learn new skills.

The policy makers have to recognize that today's typical students are no longer 18-to-24-year-olds studying full-time on-campus

Most education systems in the world are input-driven. Outputs are rarely monitored.
Many countries have a peer-accreditation system for output benchmarking. However, the accreditation system comes with its own challenges and in many cases (including in India) is again largely input parameters-driven.

Indian regulations define the minimum number of books and journals required in the university library for recognition. Many universities get away by having decades old versions of books with outdated content, as it is the "count" that counts.

The status-quo of the university of today is challenged by disruptors emerging from technological innovations democratizing knowledge sources

While regulators are the market-makers, universities are at the forefront of the change. The disrupters emerging from the technological innovations and changing socioeconomic context are putting a lot of pressure on universities to transform or perish.

Challenges for universities

Decline in rule-based jobs
- University curriculum geared toward rules-based teaching

Digitization and democratization of knowledge
- Omnipresent content
- Increasing access

Emergence of micro economies

Competition for funding
- Declining government funds
- Competing for new sources of funds
- Rise of MOOCs

Global market contestability
- Global outlook of students
- Best in region not good enough

Digitization and democratization of knowledge

The advent of MOOC and internet has led to information and knowledge being omnipresent, and is providing learners with alternate and supplementary means of knowledge-absorption. Social media and online discussion forums offer peer-learning opportunities for learners. The increasing access to education in emerging economies is further adding to the legions of learners who have the basic knowledge of using mobile devices to access this knowledge online.

The universities' privileged status of originators and keepers of knowledge has been lost to a large extent.

The explosion of technology since the 1990s has changed the way universities operate. Today universities are available on the individual devices in the form of MOOC, online content and technology-based learning models enabling streamlining of processes and learning systems. EduTech innovations are further having an irreversible impact on curriculum development process and pedagogy.

This transformation poses a big challenge to universities – they could invest in technologies to support the platforms, but the change management of the instructors remains a burning issue

The faculty – who were learners from a previous generation – have to adopt to the changed pedagogy and delivery approaches that are alien to them. Instructors need to be prepared to become change-agents for embedding the new-age skills among students.

Sources: ClassCentral 2015 MOOC Report

There is a growing need of complex judgement-based skills for the future worker, driven by automation across rule-based tasks

Decline in rule-based jobs

There is a disproportionate emphasis on subject teaching – while soft judgement-based aspects such as communication, problem-solving, team working and analytical problem-solving take a backseat in the curriculum. As a result, the current teaching methods in the higher education system focus on creating individuals who conform to rules and are best suited for rule-based jobs. The curriculum is defined to provide a lot of depth in a chosen area of study – while the majority of the job requirements are cross-functional in nature.

With the increasing automation of rule-based jobs, the number of jobs aligned to the current education paradigm is shrinking. The decline in job creation in sectors such as banking, IT infrastructure software testing highlights this trend. There is a need to change the curriculum and pedagogy so as to include judgement-based skillsets along with motor skills and rule-based learning.

> While the turnover of all scheduled commercial banks in India increased by 132% between 2009 and 2015, the number of jobs has increased by only 35%.

Turnover of Banks — Increase in Employees

Analysis-based

Rule-based

Motor skills-based

The job pyramid

Current HE programs lack soft skills, which are behavioral and intangible

Current HE programs are focused on hard technical skills that are rule-based and tangible to measure

Skills meeting the job requirements of future

Low susceptibility to automation

High susceptibility to automation

Medium susceptibility to automation

Sources: ClassCentral 2015 MOOC Report, EY analysis

The learners have more choices to learn at their own pace in a global setup

Emergence of micro economies

Large service corporations are on a decline. Global IT giants have seen sliding revenue and jobs. These large corporations are giving way to distributed micro economies, where entrepreneurial ventures would include individuals working on their own and working at remote locations. The rate of this change is rapid − giving the learners less time to adjust.

This shift challenges the classroom of yesteryears. From an instructor-led teaching to a cohort of students, technology has now enabled an individual learning path for each learner − where they can learn at their own pace, anytime, anywhere, on a device − at home or at a work location. They can learn from peers and other workers. Learners could spend more time on a lesson, and fly through others − a far cry from the "one size fit all" approach of the traditional cohort teaching style. This is a big change from the traditional way of teaching − and universities need to make themselves relevant to the learner in the onslaught of freely available courseware and knowledge sources. "Individualization of Learning" is the way forward.

Global market contestability

Increasing exposure to global trends is reshaping the aspirations of learners. The easy availability of information over the internet allows students to identify and connect with institutions of their interest in a seamless and low-cost manner − something that was not possible a decade back.

The growing trend of transnational education highlights this fact − in 2015, over 5 million students enrolled outside of their home countries for education, a jump of over 150% over the last decade.[41]

Today, the best institutions in a country or region are benchmarked against international universities − leading to more competition to attract the best students, faculty, researchers and industry partnerships. Many of the talented faculty and researchers from emerging economies are moving toward top-ranked institutes in other countries.

The increase in the full-time faculty in the US's degree-awarding institutes underlines this fact. The number of faculty with foreign origin has increased from 15% to 26% in a little over four years[42]

Full-time faculty in degree-granting post-secondary institutions in the US, by race/ethnicity ('000)*

Growth in share of foreign faculty

	2009	2011	2013
Share	15%	25%	26%
Non-resident alien	31	33	38
Non White, Non Black	107	190	207

Non-resident alien   Non White, Non Black
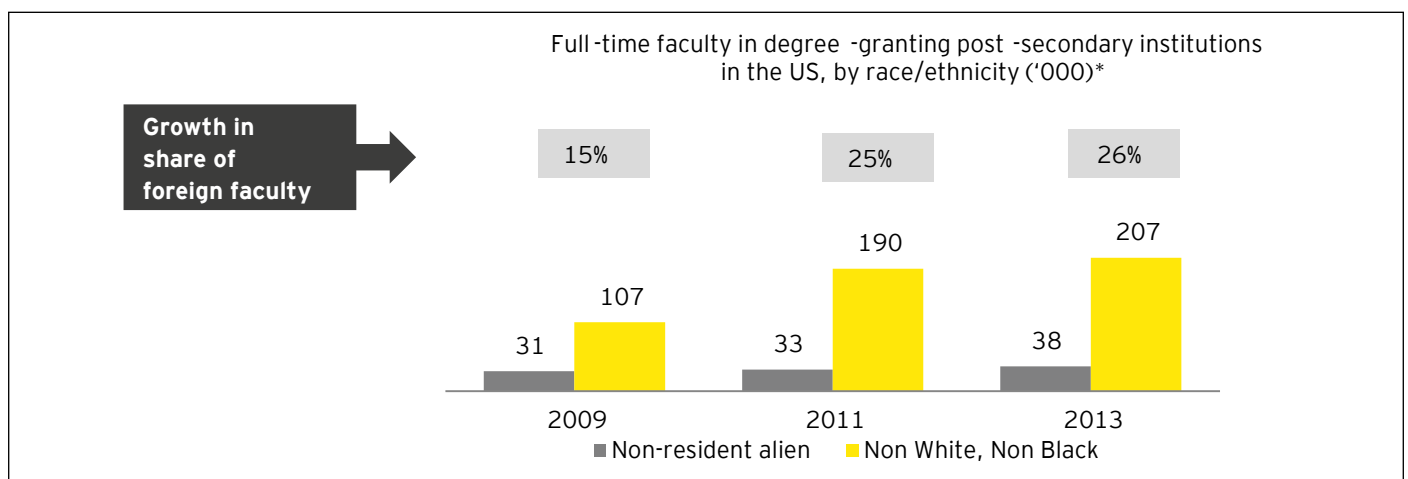
Universities have to compete for funding sources, and need to transform to face these disruptions

Shrinking funding options

Traditionally, the largest sources of financing for universities globally have been fee income and government funding, with the exception of some top-ranking universities. However, state funding for higher education has been going down across the majority of the countries. This has led to an increase in student fee, reduction in research budgets, and reduction in faculty size.

While fee increases have helped universities tide over the government funding cuts, the fee revenues also face challenges from low-revenue technology-enabled learning models. As potential students move toward online and distance-learning models, the fee realized per student also shrinks.

Universities, therefore, need to relook at their financing options and, at the same time, reduce the cost of operations – without compromising on the quest of inquiry and academic rigor.

Government expenditure per tertiary student as a percentage of GDP per capita (%) [43]

Region	2000	2006	2012
The European Union	29	27	24
Europe and Central Asia*	29	27	24
North America*	30	24	20
South Asia*	94	62	31
Australia	26	21	19
France	35	34	29
India	94	55	53
The UK*	32	27	22
The US*	32	30	24	20
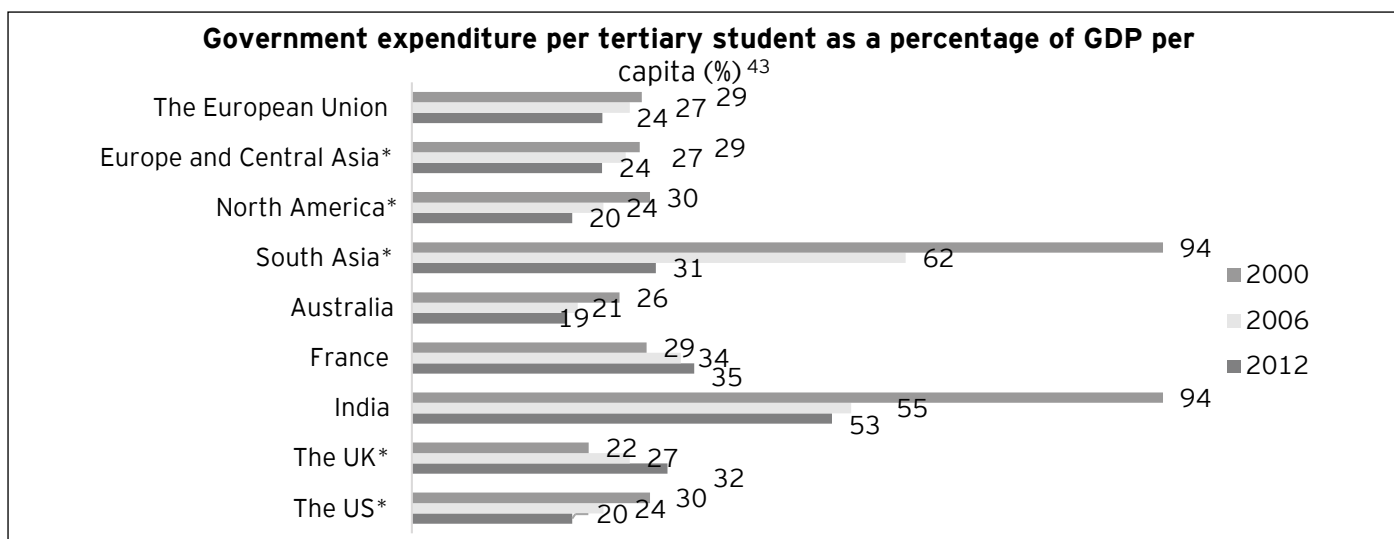
Individuals

Individuals in the current higher education landscape are "takers" of the ecosystem, with limited choices, lack of awareness and subjected to a "one-size-fit-all" approach. The iron-clad inflexible models of learning and one-way lectures from teachers to students obstruct the individual streak, leading to their passive participation in the higher education landscape. The fixed courseware – based on outdated curriculum and negligible emphasis on life skills and analytical thinking – is preparing a mass of "educated" but "unprepared" students who are left on their own to face the challenges of a rapidly evolving job scenario once they graduate or after years in an existing job.

Higher education is in a flux. The larger society that HEIs operate in is changing, with changes in the profile and behavior of learners. Access to knowledge sources and digital outreach are threatening the existing teaching methodologies. Therefore, HEIs need to be agile and flexible to ride this wave of change. But high inertia among academic administrators, coupled with limited autonomy and late appreciation of technological innovations, is restraining them from making the best use of this opportunity to reinvent themselves for the next generations.

A paradigm shift in the higher education system toward enabling an individual learner with the skills of tomorrow – and universities transforming to align with his objective

To prepare the learners for the future, there is a need to enable the individual and transform the university system

Preparing the workforce for jobs of the future

Enable individuals

Transform universities

- Focus on judgement - driven skills
- Pedagogical innovations to promote experiential learning
- Personalized learning paths
- Flexible program structures
- Lifelong learning

- Strategic outlook integrating technology
- Open systems
- Competency - based outcome - driven learning systems
- Differentiated cohorts
- Agile enabling regulations

Strong governance and management structure

Learners need to pick up life skills as a part of their education – that would help him in any job that they work on

Focus on judgment-driven skills

As many of the jobs these individuals would get in do not even exist today, no curriculum can be developed for them. Industries are in a state of flux, new technologies and business models are evolving and stakeholder behaviors are changing. Individuals need to assess and quickly respond to big shifts in the way companies operate and how work must get done.

Entrepreneurship options also require a cross-functional operational skillset, which cannot be taught in the class. GMAC has found that 45% of 2010–2013 grads started businesses directly after finishing B-school, while 80% of self-employed alumni from years past worked several years for an employer before embarking on entrepreneurial ventures.

The curriculum of a business school cannot teach operations to these learners – it is the analytical thinking and earning through live knowledge models that a business school can impart to the individual – Teach them how to fish, than teaching them about the fish.

The focus of education institutes needs to change from just providing employability-enhancement skills to enabling development of thinkers, complex problem solvers, decision makers among others. These skills will help individuals in being better prepared for their race with technology and reduce their rate of obsolescence – currently, individuals are falling behind due to the inability of educational institutions in maintaining pace with the rapidly evolving technology.

The major focus in addition to technical subject knowledge should be on the ability of the institutions to transform individuals into innovative and dynamic learners with the capability of quickly adapting to the changing environmental conditions.

The curriculum of future, therefore, must include the following as the learning objectives:

Learning to learn

1
- ▶ Resist bias against trying new things – Knowing when not to fall into the trap of "The old way works just fine for me. I bet it's just a flash in the pan."
- ▶ Learn from the inter-dependencies in the surrounding ecosystem
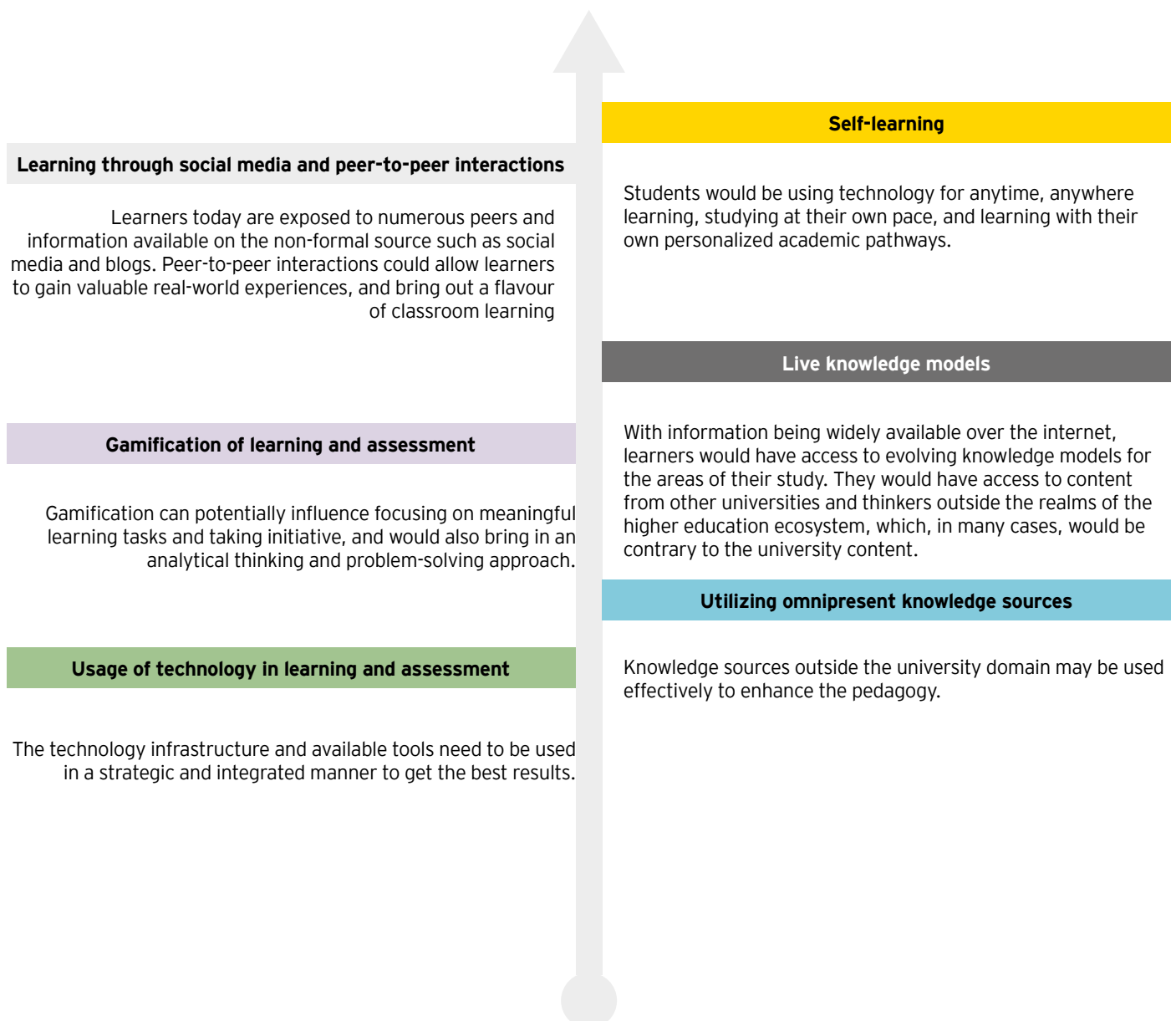- ▶ Have an open outlook to unlearn existing experiences and acquire radically different capabilities

Source: "At Harvard, Wharton, Columbia, MBA startup fever takes hold," Fortune, "Learning to learn," Harvard Business Review, accesses 2 November 2016

Transition from hard skills to cognitive thinking is imperative for learners to keep pace with the continuously evolving global workplace

Life skills and analytical thinking

2

▶ Life skills – including linguistic capabilities, soft skills, and basic quantitative abilities. Social interaction skills, collaboration and interpersonal behavioral aspects should also be included as learning objectives

▶ Analytical thinking and problem-solving – the ability to identify and structure problems and develop solutions; universities need to focus on students' ability to devise effective solutions to real-world problems

There is a need to equip learners with increasingly complex analytical skills to prepare them for a broad range of jobs across sectors, and allow them fungibility across changing scenarios.

Higher order skills

Routine skills

▶ Judgement and decision-making
▶ Cognitive load management
▶ Virtual collaboration
▶ Creativity
▶ Transdisciplinary

▶ Computational thinking
▶ Novel and adaptive thinking
▶ Cross-cultural competency
▶ Emotional intelligence

▶ Social intelligence
▶ Domain-specific skills
▶ Sense-making
▶ Problem-solving

▶ Hard skills
▶ Ability to follow instructions
▶ Coordination

Global outlook

3

▶ With the world getting tightly integrated and national boundaries getting irrelevant for businesses and services, its important for students to think global while looking for solutions.

▶ The ability to appreciate cultural differences and behavioral dissimilarities is an important trait for the learners to inculcate during their education. The curriculum should, therefore, include information about these differences and gamifications and activities to develop solutions across these differences.

Source: "At Harvard, Wharton, Columbia, MBA startup fever takes hold," Fortune, "Learning to learn," Harvard Business Review, accesses 2 November 2016

Students can learn at their own pace anywhere using technology innovations – and anytime during their working life

Pedagogical innovations to promote experiential learning

Till the end of the last decade, education was limited to the confines of a classroom. It was constrained by the availability of teachers, school infrastructure and class schedules. The application of technology in the pedagogical domain, coupled with innovative usage of technology, has the power to transform the pedagogical element of higher education beyond recognition. The following are some of the ways learners in the future would complete a university program, in addition to the classroom learning environment. Universities of the future will have to think about these models while designing programs and delivery channels.

Learning through social media and peer-to-peer interactions

Learners today are exposed to numerous peers and information available on the non-formal source such as social media and blogs. Peer-to-peer interactions could allow learners to gain valuable real-world experiences, and bring out a flavour of classroom learning

Gamification of learning and assessment

Gamification can potentially influence focusing on meaningful learning tasks and taking initiative, and would also bring in an analytical thinking and problem-solving approach.

Usage of technology in learning and assessment

The technology infrastructure and available tools need to be used in a strategic and integrated manner to get the best results.

Self-learning

Students would be using technology for anytime, anywhere learning, studying at their own pace, and learning with their own personalized academic pathways.

Live knowledge models

With information being widely available over the internet, learners would have access to evolving knowledge models for the areas of their study. They would have access to content from other universities and thinkers outside the realms of the higher education ecosystem, which, in many cases, would be contrary to the university content.

Utilizing omnipresent knowledge sources

Knowledge sources outside the university domain may be used effectively to enhance the pedagogy.

Tailored courses with flexible completion timing will enhance students' inclination toward learning

Personalized learning paths

Present offerings of institutions focus on stringent timelines demotivating the learners by reducing their mobility and exposure. Changing aspirations, growing awareness about the global trends and easy access to quality content has increased individual's inclination towards skill oriented courses, completing the credits as per their convenience. Universities of the future need to transition towards a learner centered education model while making learning and work inseparable providing due credit to experiential learning along with developing interactive learning modules.

Customized learning modules focused towards imparting competency based knowledge leading to creation of adaptive life long learners, dynamic and agile should be the focus of the universities

Flexibility

The university of future has to provide flexible entry and exit - the competency based models need to come into the entry points as well. Experiential learning needs to be factored in, and there need to be objective assessment criteria to benchmark and provide credit for these learnings. Working professionals may be given credit for the tasks they perform at their workplace in lieu of coursework or live projects.

Credits and degrees should be based not on number of teaching and contact hours, but on the completion of learning objectives which can be achieved from anywhere and anytime.

Recognition of prior learning

There are no programs that could prepare a person for a job with a start-up – therefore, what would be helpful for workers employed in one of the formal sectors looking for a switch to an e-commerce company is to create their own program of learning – picking courses from academic areas as diverse as finance, supply chain, marketing, psychology (to understand buyer and staff behavior) and languages (to work with the global customer service departments). They also get due credits for the current responsibilities and skills that they exhibit at their current workplace as "recognition of prior learning". The university provides them with an academic pathway that incorporates these courses while also adding soft aspects like analytical thinking and working in diverse teams.

Flexibility in entry and exit help working professionals to get reskilled for the next job

Flexible program structures

The present educational ecosystem is dominated by a concentrated learning model emphasizing on fixed duration courses. But the technology-dominated lifestyle of the learners and their ability to comprehend the benefits of their investment in education necessitate the transformation of institutions' offerings. Programs should not only focus on culminating into a degree, but enrolling learners for a lifetime with the flexibility to come back and attend more courses over a duration of, for example, 10 or 20 years as per their convenience and learning needs. In essence, the programs should be designed in a manner that there are no alumni but only students enrolled for perpetuity.

Illustrative operating model: flexible program structure for early graduation

Flexible structure Advanced standing credits from High School	Earning credits counted toward the graduation depending upon the school curriculum or diplomas earned before enrolment – for example, qualifying International Baccalaureate examinations enable a student to earn up to 8 credits for an 128 credits course
Flexible structure Transfer credits from another college or university	The College of Arts & Science Policy at BU allows a maximum of 80 transfer credits for a 128 credits course depending upon the coherence between the courses offered at college and the credits earned at other accredited colleges or universities
Duration Early graduation	Opportunity to complete the credits during breaks and through online courses leading to early exits, financial savings and quicker start of professional career – for example, A two-year masters can be completed in one or one and a half years.
Accommodating offerings Multiple exit points	The Department of Dermatology offers multiple exits in the Master of Science and Doctorate of Science degrees, wherein a diploma is equivalent to one year and a masters degree is equivalent to two years of the four-year doctorate degree

Illustrative operating model: mid-course corrections in learning objectives IIIT, Hyderabad

It offers flexible lateral pathways to undergraduates to pursue research along with the engineering degree.

▶ Second-year engineering students can pursue research along with engineering either in the computer science or electronics domain without the need to re-enroll for the research course

▶ Students can get two degrees in just four years: B.Tech along with MS by research

New education paradigms are needed to ensure options for students to come back for preparing for the next jobs – anytime during their productive lives

Lifelong learning

The education lifecycle of individuals is front-loaded today. They spend around 12–18 years getting themselves educated during the initial periods of their life before entering the productive working phase. The only exceptions are students who return for a postgraduate course later in the life. However, this paradigm is up for a change. Learners in the future would have lifelong learning needs – where they come back to the education ecosystem to reskill themselves for their next job. They would need access to the education ecosystem to learn new technologies and their applications, and the higher education system needs to be prepared to develop innovative learning lifecycles to support these lifetime enrolments. There would be no "alumni" passing out of the institute – there would only be only student admissions for a lifetime.

Open-loop university paradigm at Stanford

Stanford University provides a peep into the future circa 2100. The open loop university has age-blind admission criteria for learners, and allows students to study up to six years over a lifetime instead of a four-year front-loaded degree model. The learners, termed "Populi" instead of "alumni," could pace their learning, coming back to the university to upskill or reskill themselves, getting credit for their learning on the job, and gaining currency credits for giving back to the university.

Learning		Admissions		Alumni connect	
Today	Future	Today	Future	Today	Future
In class	In class and anywhere	17+	Any age	Select events, after course completion	Always

Course completion

Today	Future
4–6 years	Over lifetime
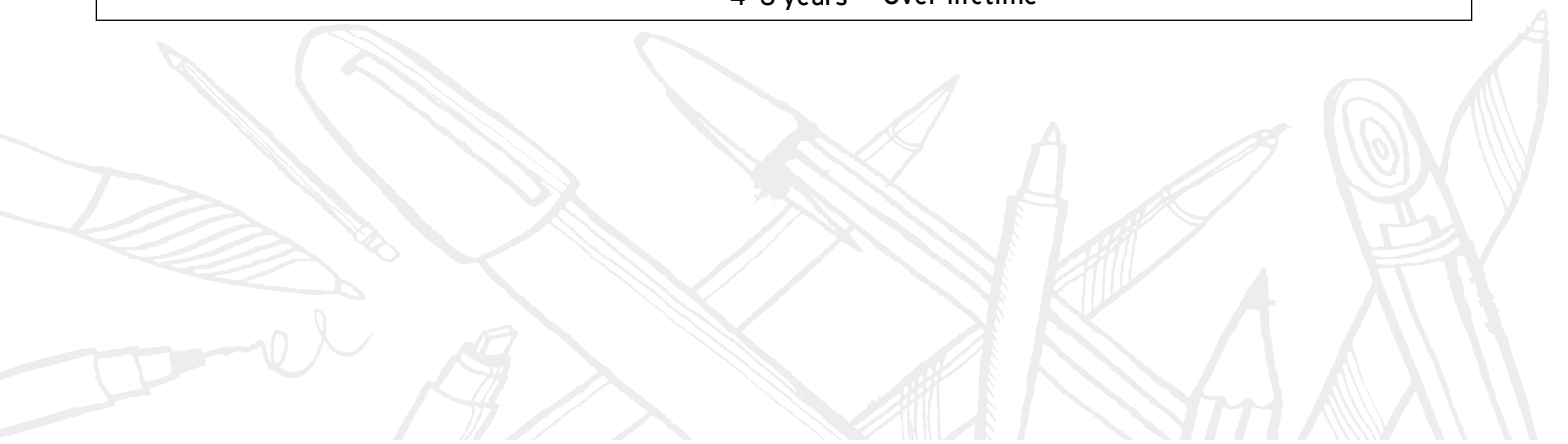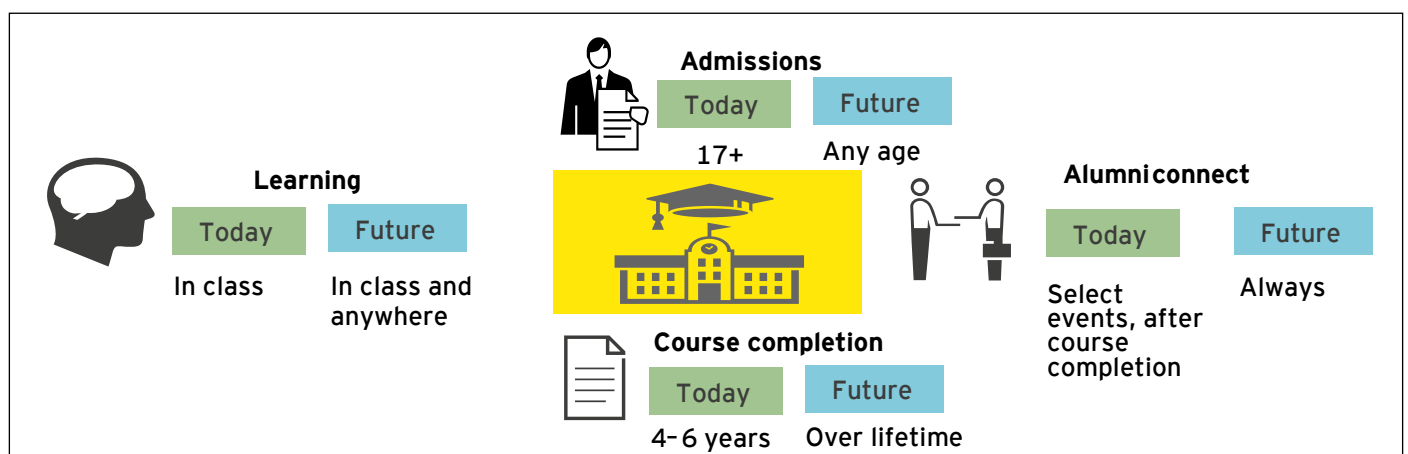
Universities need to align their strategies to counter these disruptions and meet the learners' aspirations

Transform university – the university of the future

The universities as we see today are up for a complete makeover – the university of the future would be a million-student virtual entity with a localized physical presence. Unless a university is too specialized or niche, it needs to move along this path of transformation.

Strategic outlook integrating technology

Strategic outlook

Universities need to have a global outlook, serving the global community than the local communities of its physical location. MOOCs and online courses are the outreach that universities offer to the world. The biggest change that the academic community faces is in transitioning from a localized strategy based on brick-and-mortar models to an omnipresent global institution, without losing the spirit of inquiry and rigour in academic and research.

This strategic shift needs the university leadership to look forward, embrace technologies and new innovations in learning, content and pedagogy, and develop courses that are global in outlook.

Differentiated offerings

The program offerings would be differentiated for catering to the varied learner profiles. The brick and mortar university would offer cross-functional programs for roles that require judgement and high degree of complex problem-solving. SPOCs would provide an opportunity to working professionals to learn these skills for their next jobs. These premium offerings of universities would provide intellectual learners the knowledge capital for research and innovations. The programs would be competency-based instead of being subject-driven.

Flexible cross-functional programs on an online medium would be available for the rest of the learners, who are looking at upskilling and cross-skilling. Thousands of these learners would provide a peer-learning platform for the universities' students.

Institutes across the world have innovative models to provide learning flexibility and financial assistance to learners

Illustrative model: using public content/knowledge sources MOOC2Degree by Academic Partnerships

MOOC2Degree is an initiative to connect individuals and universities with the help of a virtual platform. It leverages technology platforms based on third-party content, creating an ecosystem of lifelong learning.

A virtual platform that enables universities to recruit students and provides working adults with a low-cost, easier method of getting credits in an online program from a group of partner universities.

How it works	Select online degree programs will be converted into a MOOC. Each MOOC will be the same course with the same academic content, taught by the same instructors that teach the currently offered degree programs at participating universities.
Outcome	Students who successfully complete a MOOC2Degree course earn academic credits toward a degree, based upon criteria established by participating universities.

Illustrative operating model
Risk/reward sharing by Purdue University

Under the Income Sharing Agreement, the college advances money to applicants based on its estimate of their future earnings. Money for this initiative comes from the university's endowment

How it works	▶ Students sign a contract agreeing to repay a fixed percentage of their income to Purdue after graduation for up to nine years
	▶ The payback percentage is based on the estimate of the students' expected earnings.
	▶ Forgiving the due payments for individuals earning less than expected after nine years
	▶ Increasing payback for individuals earning more than expected
Benefits	▶ University sharing the earning risk with the students, encouraging enrolments
	▶ No fixed and variable interest and, therefore, less expensive that private loans
	▶ Less cumbersome application process than for federal student loans

Illustrative operating model: upstart loans based on future earning potential

▶ Upstart, an online lender, considers students' graduation performance or SAT score while offering education loans to students without any credit history. The loan tenure varies by the earning potential of the student as against fixed tenures by banks.

▶ Apart from providing flexibility in repayment, Upstart provides alternate options to individual who are unable to find a job or run into financial trouble.

Outcome-driven academic systems with focus on interdisciplinary learning would lead to open systems – universities without boundaries

Open systems

Universities today resist change, while the universities of the future would need to encourage change.

The universities of the future would be global – learners from across the globe enrolling for programs, and the enrolments could be in millions. Out of these millions, a small proportion would be on-campus students. Strong technology infrastructure, innovative pedagogies and increasing standardization would make the universities enabling systems for learning.

This would further lead to democratization of knowledge – with resources being available to all. Differentiated offerings built on this knowledge would allow universities to create programs and offerings for learners of varied academic and learning needs.

Outcome-driven learning systems: competency-based models

Outcome-driven learning system

With most of the action moving online – where students access universities over the device – the outcomes as credentialed by universities need to be robust and assessed in an impartial and independent manner. The university programs need to look beyond the class and program boundaries to allow students to learn at their own pace and develop programs by choosing from a bouquet of individual courses that suit their requirement. Universities assess the outcomes of the program and, subject to the frameworks defined (as opposed to the defined curriculum), award the credentials.

Competency-based models

Moreover, the approach toward learning is increasingly turning modular, which will, in turn, support interdisciplinary learning. Such a unique and customized learning framework will equip learners to examine a theme or an issue via an analytical framework derived from more than one academic discipline, and systematically develop a holistic and coherent model that offers richer understanding of the topic in question.

Life skills and cognitive soft skills would form the core of the competency-based model. This would ensure that the learners are future-ready for a variety of jobs, some of which are not even known as of today

Universities of the future would be enabled by technology and a lean infrastructure

In an era of individualization of learning, the pedagogy must support this shift. Own online courses and recognition of credits for open courses from other universities offer the learners a choice of courses. Gamification would provide the much-needed experiential aspects of learning. Synchronous teaching over the web would move toward AI-driven teaching, allowing learners to study at the time and place of their choice, without missing out on an instructor-led teaching model. Augmented reality and simulators could provide practical classes and enhance the creativity of learners.

Peer-to-peer learning further enhances the learning experience of student by helping them gain insights from the experiences of others. Universities should be able to make imaginative use of the omnipresent knowledge so as to enrich the learning and also reduce the cost of content and knowledge creation.

Impact

Convenient and adaptive learning with The help of analytical technologies peer -to-peer learning and experiential learning

Digitization of content leading to omnipresent content and delivery

Implementation of LMS, enabled transition of content to online platforms

Presentations and videos used to deliver content in a time and place restricted environment

2000s   2010s   Underway currently   Upcoming/future

Diversity in cohorts – across ages and demographics – would allow better peer learning, with alumni students enabling better industry interaction

Differentiated cohorts

Cohorts

Nothing would showcase the transformation in education than the cohort for the courses. The cohorts could comprise a diverse age group – early students who have met the intake criteria for the course, regular students and students who are back to the university after spending years in the industry. While some of the students would be based in the classroom, most others would be learning through synchronous and asynchronous modes using technology. The course cohort setup should be conversant with this diversity, and ensure that the pedagogy is tweaked to support the diverse learning outcomes. This would allow infusion of ideas and enhanced peer learning

Research and industry partnerships

Technology has allowed better collaboration among researchers based across continents today. This trend would further strengthen. VR/simulator-based research would be mainstreamed, and more peer-to-peer and industry–academia linkages would be through the secured technology platforms. Universities with restricted or confidential research agendas would need strong investments in information security. The physical research labs may be limited to some specific research subjects and to develop the final physical prototypes of the research outputs.

Another large area of industry engagement would be the development of competency-based programs specific for the industry partner. There would also be a much larger industry connect in developing curriculum and program delivery. As students could learn on their own without even applying for a credential, universities could be the assessors of the competency of individuals.

There would be platforms where industry partners would offer programs to partner universities – designed, developed and delivered by the industry – where learners would be able to learn from industry experts, get assessed by them directly and earn credits from the enrolled university. The platform would thus be the ideal industry–academic interface.

Illustrative model: industry partnerships UPES, India

UPES collaborated with industry players, launching industry-aligned courses and increasing faculty exposure

Agreement with Industry Players to launch futuristic engineering programs	▶ Upskilling students by introducing "B.Tech" with project-based learning with industry mentors, enabling learning at their own pace, anytime and anywhere ▶ Practical exposure through live industry-relevant projects with focus on addressing the required as required in the industry ▶ Organization of short-term continuing education programs
Internships for faculties	▶ To enhance the practical experience of the faculty and ensure the development of application-driven curriculum, UPES has collaborated with industry for faculty internships ▶ Moreover, 27% of the faculty are industry fellows, i.e., professionals with corporate experience

The regulators need to think ahead of the curve – developing transnational regulations while fostering flexibility and agility (1/2)

The need for knowledge and skills is growing. Learners are able to connect to the most optimal knowledge source for their learning using the power of the internet and digital innovations. Technology innovations could transform the universities of today into million-student, global institutions of learning. But unless the regulators outpace the technology innovations to build the enabling regulatory framework for the universities of the future, learners would simply deviate to non-formal sources of learning. The regulators as the "architects" of the universities of the future need to develop the blueprint of what the future would look like.

Agile enabling regulations by the regulators in the future

Regulatory regime open to global changes	With learning turning transnational, regulators need to think beyond national boundaries. There needs to be the advent of a global regulator – probably a consortium of national regulators who would set up frameworks and standards for transnational education. They would enable fungibility of credits, learnings and programs across countries and universities. Omnipresent MOOC-led education models have their own challenges of content and thought – content developed in one country or university may be unpalatable to residents of another, especially in areas of history, finance, art and culture. The national regulators would need to take up the role of the regulator for content in some cases to maintain educational and knowledge sovereignty.
Enabling regulations for future learning models	The universities of the future have to be agile organizations. The regulations thus have to be aligned to agility, giving flexibility to the universities to operate while keeping a constant watch on the outcomes and standards. Some of the areas of enablement could be as follows: **1. Encourage and reward standardization:** The various models of universities in the future – brick and mortar, blended, online and virtual – could be at cross-purposes to each other if not standardized in terms of outcomes and measurements. The regulator should encourage it by developing a suitable incentive structure for the universities that works toward standardization. **2. Enable, not inspect:** Self disclosure should be promoted instead of audits and inspections. In an age of freely available information and digital media, inspections become redundant. **3. Strengthen accreditation system:** Peer-driven accreditation may lead to diffusion of good practices among institutes, and also ensure quality. The accreditation system should measure outcomes and processes that foster innovations. **4. Enable alternate funding systems:** Universities may be allowed to get funding from specially formed EITs, with the regulators developing a framework for it. There could be VC/PE funding for the education sector based on a transparent ratings basis.

The regulators need to think ahead of the curve – developing transnational regulations while fostering flexibility and agility (2/2)

Promoting outcomes to foster flexibility	For a constantly changing economy, which needs unconventional programs, an inflexible input-driven system is passé. Universities need to be given the flexibility to meet the evolving socioeconomic needs of skilled manpower with clear and measurable outcomes. Some of the areas where flexibility would help are as follows: **1. Recognition of technology-based learning out of the classroom model:** Most of the learners in future would be studying out of the physical confines of the classroom. The regulations need to appreciate and recognize this trend. **2. Program design and delivery:** Duration and content of the program, delivery over distance and online models, global programs agnostic to the physical location of the university and the student should be promoted **3. Entry requirements:** Age is no bar for entry into a program – competencies to complete the programs are. Students of the future need not be bound by age or academic prerequisites for entering a program. The regulators need to recognize out-of-class learnings, obtained through work experience or MOOC completions. **4. Physical Infrastructure:** Technology makes the physical infrastructure redundant. The need for classrooms, physical labs and faculty can be reduced substantially using technology-led models. Therefore "Usable bandwidth available to university resources" is a more apt parameter for developing the university infrastructure than "area per student". Similarly, the faculty-student ratio does not represent the academic infrastructure as appropriately as the ports of "AI instructor-student" ratio.

Sources: "Draft National Education Policy, 2016; Higher Education in India, Stanford University; NCAA: National Collegiate Athletics Association

The emerging technologies could even prompt the "Uberization of learning" – a platform to learn that owns no assets, or variations thereof

"Uberization" reflects on how a technology platform can transform the consumption of services by providing a simplistic and convenient interface between the concerned stakeholders anywhere and anytime. Uber, Airbnb and Amazon exemplify platforms enabled through cloud technology, removing the inefficiencies in the traditional systems of cab booking, holiday accommodation, buying and selling respectively. These are all capital light models of service delivery without owning the inventory under consideration.

On a similar model, "Uberization" of learning is a radical rewiring of the higher education system moving toward providing customized on-demand services enabled by a technology platform. In the future, millions of students will stop learning within the confines of classroom walls with stringent course timelines and will transition toward a more global and mobile community of education suppliers and consumers. This unbundling of education highlights a shift toward education as a service, wherein instructional designers, subject-matter experts and quality content in the form of MOOCs reach the seekers in the form of short, personalized learning to be consumed as and when needed.
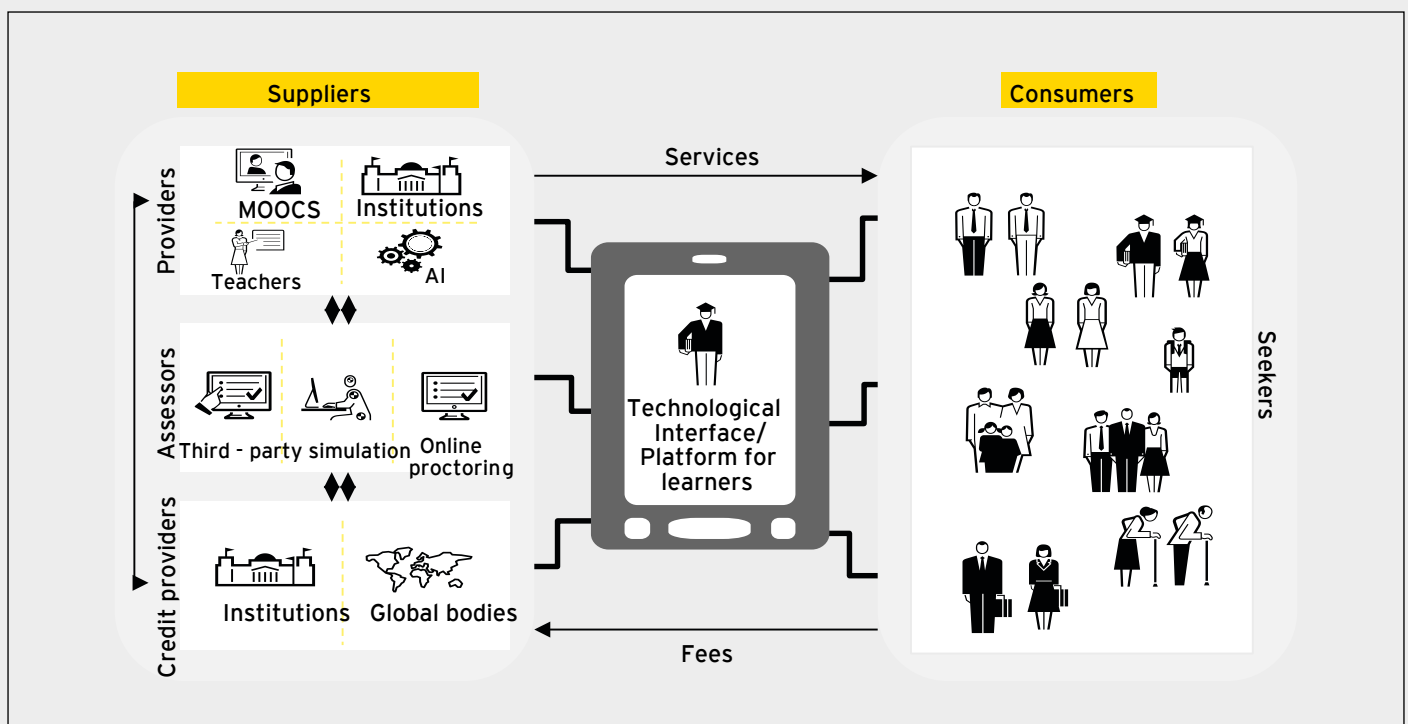
A platform provider "EdUber" brings together potential learners with course providers – through paid or free online courses – uses third-party assessors to measure outcomes and collates credits earned from various providers to stitch together a program and provide credentials on its own or from another provider. EdUber may only own the platform and the frameworks of the learning pathway.

Who would the EdUber be? Can it be a university that takes the lead – a physical university with an online presence such as Georgia Tech (which innovated with a fully online masters program) or an online university such as the University of Phoenix opening its learning platforms? Could it be one of EdX, Coursera or Udacity tying up with a critical mass of MOOC and credential providers (MOOC2Degree has moved in this space)? Or could it be a non-education player such as Microsoft–LinkedIn combined looking to build on their combined knowledge and connects of skilled profiles, industry and technology? Only time would tell!

In the changed paradigm, the learner is the center of the knowledge universe

"It is not the most intellectual that survives; it is not the strongest that survives; but the one that survives is the one that is best to adapt and adjust to the changing environment in which it finds itself."

Leon C. Megginson, Louisiana State University

The paradigm of learning is evolving constantly. In a working environment where start-ups and entrepreneurship are equally cherished as a job with a leading corporate, it is the skills and competencies that are sought after, rather than just degrees. Individuals are switching jobs to sectors and roles that have no linkage with the academic qualifications they have, and thus more than subject knowledge the most important skill that the higher education system needs to impart to learners is the ability to learn itself. Learners should be able to learn from the peers, available knowledge sources and finally from the higher education system as well.

Different learners have varied learning needs, at different stages in their lives, either as a first-time undergraduate student or a working professional returning for a graduate/postgraduate course. Learners are spread across the world – across time zones and linguistic regions. The tectonic shift in the paradigm of education is to make the individual learner the center of the education ecosystem rather being a taker of education.
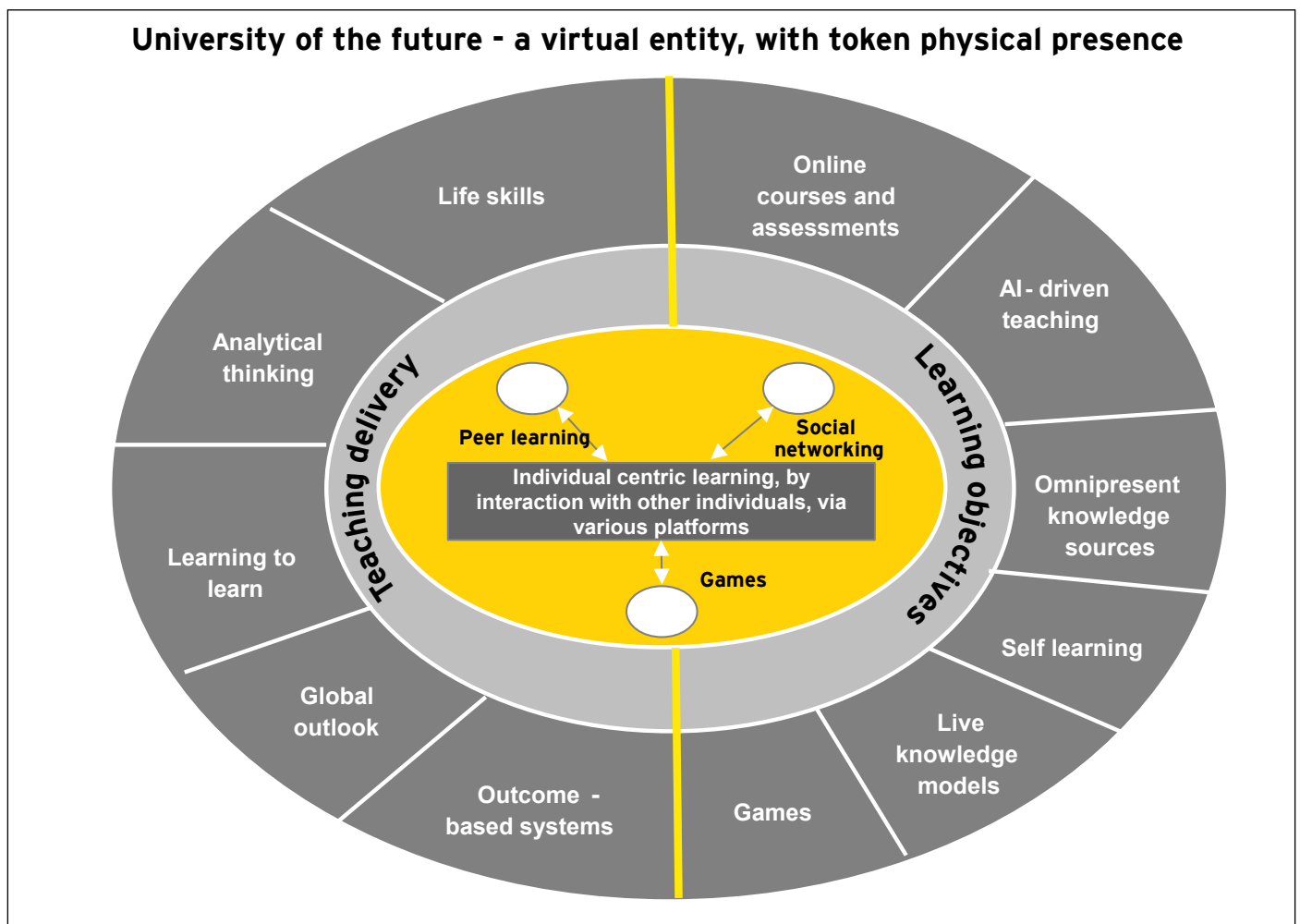
University of the future - a virtual entity, with token physical presence

HEIs in India need to chart their own path of transformation – aligning to the future while being cognizant of the challenges of today

Recommendations for Indian HEIs

India is not averse to the changes modifying the education ecosystem globally. The growth in the number of enrolments in executive education programs and liberal arts courses, and students going in for foreign education institutes highlights the increasing inclination of the learning needs of the Indian students and working professionals. There is an impending need for the Indian higher education institutes to transform in line with the global evolving workplace.

The Indian higher education system has huge challenges related to access to the education system for a majority of people. The socio-economic disruptions underline the huge need to change to keep higher education relevant to the stakeholders – individuals, industry and society at large. Access to HEIs is limited, and the distribution of education opportunity among different social groups is uneven. Most institutes are laggards in the use of technology, and investment in faculty development is far below the requirement. There are hardly any programs directed toward the needs of working professionals. Many of the universities and colleges have poor infrastructure – both in terms of hard infrastructure and teaching resources. There are challenges with telephony and connectivity outside of big cities. Any transformational roadmap for Indian higher education system needs to be mindful of these issues.

However, the policymakers are trying to elevate the higher education system through forward-looking regulations – the New Education Policy attempts to create frameworks for investing in faculty development, soft skills and technology. The Union Budget for 2016 allocates funds for rural connectivity and promotion of MOOCs. Many of the new-age universities are innovating in their approaches, and the learner is more aspirational and willing to pay for good learning outcomes. Internet connectivity is getting ubiquitous across the country, and available on low-cost mobile devices.

> The impending change thus offers an opportunity – to invigorate the system toward a complete transformation instead of opting for incremental tweaks to counter the challenges individually.

Recommended roadmap for Indian HEIs

Immediate/mid-term action items (0–5 years)	Long-term action plan (year 6 onward)
Strategy	
▶ Improve industry involvement in learning needs assessment ▶ Include technology and industry engagement professional in strategic decision-making ▶ Roll out better alumni-involvement programs, such as offering loyalty discounts/credits for returning students ▶ Use freely available content/knowledge/MOOCs online to develop programs and credits for new areas of interest ▶ Focus on applied research to stay abreast with upcoming industry trends	▶ Co-opt industry trainings and in-situ programs – designed by industry and delivered by universities ▶ Offer interaction platforms for industry and practitioners to create content and program assessment ▶ Use technology innovations to develop online programs and virtual university models ▶ Build lifelong enrollment models and flexible entry/exit programs
Finance	
▶ Offer credits to alumni for engagements, such as internship, mentoring and lectures ▶ Offer loans/grants based on future earning potential ▶ Work with regulators to allow PF advances for reskilling or further studies	▶ Use EIT funds as loans for financing ▶ Offer risk-reward based fee waivers and loans ▶ Diversify sources of funding by focusing on Industry research and grants
Program design	
▶ Develop programs with credits for last completed programs ▶ Develop advanced credit systems using MOOC completions ▶ Work with regulators to create policy interventions for flexible programs ▶ Invest in life skill modules development ▶ Standardize framework for "recognition of work learning" to provide credits for on-the-job training ▶ Utilize publically available knowledge resources to augment program services and design	▶ Develop programs in flexible learning pathways spanning over 10-20 years ▶ Migrate to stackable credit systems to promote self-paced learning ▶ Co-opt industry into learning platforms developed for designing of learning objectives and curriculum
Admissions	
▶ Roll out framework for competency-based admission systems to create education pathways for lateral entries	▶ Develop long-tem learning pathways with flexible learning – say 6 years across a 20 year period

Recommended roadmap for Indian HEIs

Immediate/mid-term action items (0–5 years)	Long-term action plan (year 6 onwards)
Curriculum design and delivery	
▸ Invest in faculty development for technology-led learning methods	▸ Offer digital media-based collaboration and peer-to-peer learning tools as part of curriculum, for social learning and life skill development
▸ Move toward technology-led delivery and content-development platforms	▸ Collaborative tech-driven platforms for industry to directly offer courses and conduct assessments
▸ Develop a platform for industry interface in curriculum design and delivery	▸ Move toward including innovative tools in the curriculum design stage itself
▸ Create blended/virtual programs	▸ Virtual anywhere, anytime AI-enabled learning models as a part of program design itself, incorporating real-life data and insights
▸ Utilize tools to create learning data to dovetail into automated learning systems	▸ Include VR/AR/simulation-driven learning environments and media-rich content
▸ Use low bandwidth teaching tools to overcome connectivity challenges	▸ Roll out "recognition of on-the-job learning" systems for repeat students
▸ Design collaborative assessment platforms for group work and soft skills evaluation	

Alumni	
▸ Develop a ledger system for alumni – earning financial credits for university engagement such as teaching, mentoring, offering internships, which could be redeemed against university resources and classes	▸ Do away with the concept of alumni – have life-long students
▸ Create tailored online programs for alumni to reinitiate engagement with universities	▸ Offer long term (15-20 year duration) Education-cum-research programs for students
▸ Engage with alumni to solve industry issues through applied research	

Support process and technology	
▸ Envision a technology strategy to align with university strategy	▸ Fully streamline support functions, enabling higher education – the backbone of a "virtual university"
▸ Baseline existing technology and process repositories and identify public/social infrastructure available freely, to augment it – for example, National Knowledge Network and Digital India	▸ Create an anytime, anywhere university for all stakeholders
▸ Invest in platforms of the future, across students, alumni, faculty and industry	
▸ Offer anytime, anywhere support services to stakeholders	

Crystal ball view: Indian universities in 20 years

Universities of the future will significantly evolve across multiple dimensions, exuding transformation in characteristics of the traditional learning ecosystem		
Dimension	**Universities today**	**Universities of the future**
Learner profile	Early adulthood, post K-12, few postgraduates, post work experience	All ages − many experienced learners, no limit on entry age
Entry criteria	Scores in qualifying exams, minimum age limit	Flexible entry age, assessment of competencies required for courses
Cohort	Few nationalities in a homogeneous age profile	Learners of all ages and nationalities
Course structure	Fixed-term program classroom learning	Flexible program duration − anytime, anywhere learning Classroom program augmented by VR/simulation/on-the-job learning/gamification
Learning objective	Focus on silo-based technical and functional knowledge	Focus on life skills, with choice of technical courses
Faculty	Faculty in the classroom	Synchronous/asynchronous lectures by faculty and AI instructors Peer learning
Exit	After completion of curriculum and assessment, usually after fixed program duration	Life-long enrollments
Enrollments	Few thousands on campus, tens of thousands in distance mode	Few thousands on campus, millions across the virtual model
Geographical coverage	Limited to campus	Across the globe

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FICCI Higher Education

FICCI has been playing a proactive role in the Higher Education sector supported by the Higher Education Committee, comprising key representatives from leading Higher Education Institutions/Universities, Industry and the Government with Prof **Rajan Saxena**, Vice Chancellor, NMIMS University as the Chair and Dr **Indira J Parikh,** Founder, ANTARDISHA as the Co-Chair.

The Committee's focus is on:

▶ Providing a platform for policy advocacy and influencing reforms pertinent to the industry needs

▶ Creating sustainable linkages between Industry and Academia

▶ Facilitating networking and knowledge sharing

▶ Promoting collaborative ventures in academic exchanges, industry oriented research/ consultancy and value added services

Some of the FICCI Higher Education Committee's ongoing initiatives:

▶ FICCI has been actively engaged in the National Thematic Consultative committee meetings for National Education Policy (NEP). FICCI has submitted its recommendations on the same.

▶ FICCI Vision 2030 for Higher Education in India has been very well received by the Government both Centre and States and other stakeholders in the country.

▶ FICCI has been pro-actively participating in the development process by initiating activities like creation of the **National Functional Knowledge Hub (NKFH)** to facilitate Industry–Academia linkages with the aim to improve the quality of graduating students. FICCI has partnered with UK's Royal Academy of Engineering to executive industry-academia engagement in research under the **Newton Bhabha Innovation Fund.**

▶ FICCI plays a critical role in the **Internationalization of Indian Higher Education** by organizing overseas missions and hosting foreign delegations in India. It facilitates campus interactions, seminars, focused one-to-one interactions with Universities, think tanks, research organizations, etc.

▶ The **FICCI Higher Education Summit** is one of the most awaited international events. It brings together key policy makers, educationists and the corporate sector and serves as a networking platform for all stakeholders of Higher Education.

About EY's Education Sector practice
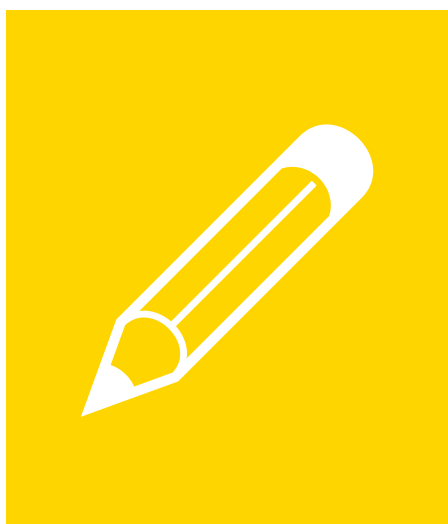
Education is a focus sector for EY. We provide strong capabilities as advisors in this sector through a dedicated team of sector professionals. Our team combines deep insights with strong practical operational experience to provide implementable solutions that lead to tangible and sustained value creation.

EY's Education practice has successfully completed numerous assignments over the last several years, covering all aspects of the education sector in India. The firm's clients include government bodies, reputed Indian and international educational institutions, industry bodies, private equity funds, and corporate houses interested in the education space.

EY's education-centric research and analysis is encapsulated in a range of education thought leadership reports that are widely quoted by sector professionals.

Our services
We provide end-to-end solutions to suit the requirements of clients from all segments of the industry. The following is a snapshot of our services:

Pre-entry	Establishment	Growth	Stability
▸ Market landscaping	▸ MBusiness planning	▸ Growth strategy	▸ Business process improvement
▸ Entry strategy formulation	▸ Franchisee strategy	▸ Organization structuring	▸ Performance management
▸ Feasibility study	▸ Marketing strategy	▸ Internal audit	▸ CSR
▸ Location assessment	▸ Project management	▸ International expansion strategy	▸ Compliance reviews
▸ Regulatory insight	▸ Industry-focused program development	▸ Standard operating procedures	▸ Strategic cost management
▸ Structuring for fund-raising	▸ Approval assistance	▸ Expatriate taxation	
▸ Forms of presence	▸ Inbound investment structuring	▸ Representation before Indian statutory and fiscal authorities	
▸ Tax exemptions	▸ Assistance in entity structuring	▸ Fund raising and M&A advisory	
▸ Commercial diligence	▸ Valuation and business modeling	▸ Transaction support	
▸ JV/strategic partner search		▸ Corporate finance strategy	

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Glossary

3D	Three Dimensional		PMP	Project Management Professional
AI	Artificial Intelligence		SAT	Scholastic Aptitude Test
AICTE	All India Council for Technical Education		SMAC	Social Media, Mobile, Analytics And Cloud Computing
APAC	Asia Pacific		SME	Small and Medium-Sized Enterprises
AR	Augmented Reality		SPOC	Small Private Online Courses
M. Pharm	Master of Pharmacy		SWAYAM	Study Webs of Active Learning for Young Aspiring Minds
B. Tech	Bachelor of Technology		UGC	University Grants Commission
BITS	Birla Institute Of Technology and Science		UIDAI	Unique Identification Authority of India
BPO	Business Process Outsourcing		USA	United State of America
BU	Boston University		VC	Venture Capital
CBCS	Choice-Based Credit System		VR	Virtual Reality
CFA	Chartered Financial Analyst		WDA	Workforce Development Agency
EduTech	Educational Technology		WEF	World Economic Forum
EIT	Education Investment Trust		UPES	University of Energy & Petroleum Studies
EM	Emerging Market			
ERP	Enterprise Resource Planning			
GDP	Gross Domestic Product			
GMAC	Graduate Management Admission Council			
HE	Higher Education			
HEI	Higher Education Institutions			
HR	Human Resources			
IB	International Baccalaureate			
IIM	Indian Institutes of Management			
IIT	Indian Institutes of Technology			
IT	Information Technology			
ITeS	IT-Enabled Services			
LMS	Learning Management System			
MBA	Master of Business Administration			
MCA	Master of Computer Applications			
MHRD	Ministry of Human Resource Development			
MIT	Massachusetts Institute of Technology			
MOOC	Massive Open Online Course			
MS	Master of Science			
NSDC	National Skill Development Corporation			
P2P	Peer-to-Peer			
PE	Private Equity			
PF	Provident Fund			
PG	Post-graduation			

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