



# **Skilling India** **No Time To Lose**

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# Skilling India

## No Time To Lose

*“We have no time to lose, and having no time  
we must scramble for a chance.”*

—Rabindranath Tagore

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Foreword

India’s future holds great hope for its millions. Its working-age population is growing faster than its population of young and old dependents. This demographic dividend comes once in a nation’s life. If the majority of Indian workers in this transition are productively employed in good jobs, and earn and save well, India can see a sustained long-term growth spurt that it badly needs to rise to its potential as an economic powerhouse. India can then become rich before it becomes old. Otherwise, it will forfeit its demographic dividend.

For the majority of Indians to be in good jobs requires them to have the skills that employers and entrepreneurs need. India’s skilling paradox is that the labour market is characterised by dwindling opportunities in agriculture, there is much potential for jobs in manufacturing and services, but there are not enough people with the right skills, even for today’s jobs. While IBM has more employees in India than in the US, ever more Indians are struggling to find work. And while India grapples with the legacy of its existing skills–jobs mismatch, it must pay attention to anticipating the skills of tomorrow, when it sometimes is not even clear what those skills might be.

This NCAER Report on *Skilling India* has the subtitle *No Time to Lose*. Indeed, much time has already been lost. Policymakers face the triple challenge of incentivising the creation of more well-paying jobs, creating efficient pathways to skill acquisition and job matching to ensure workers have the right skills, and protecting low-paid, low-skilled workers with social security benefits. An additional challenge comes from the massive number of workers aged 30–59 who are in the workforce but have to be reskilled or upskilled.

After suggesting simple ways of thinking about the three types of skills that are fundamental—foundational, employability and entrepreneurial—this Report offers a

framework for policymakers and practitioners to use to design, execute and evaluate skilling pathways that can help break the cycle of poor skilling and slow creation of good jobs—the low-skilling trap that India is caught in. The Report argues that the three-part framework of *acquiring, matching, and anticipating skills* provides a way of designing, executing, and evaluating policies and programmes to accelerate skilling India, and to move from its current vicious cycle to a virtuous cycle of better skilling and faster creation of good jobs.

All stakeholders in the skilling space must work together to acquire and impart, to match and adjust, and to anticipate and adapt the skills that India will need in the next three decades to generate good jobs for its rapidly expanding workforce. This imperative calls for distinct roles and responsibilities for employers, for governments, for skill providers and for workers. And it calls for mutually reinforcing policies, actions, incentives and understanding among and between these four key stakeholders to successfully impart, match and anticipate skills for India in the 21st century.

We need a 15-year, 2020–35 perspective plan focused on transferable skills that can meet the demand from industries now and in the future. To prepare such a plan, the government should establish a Commission for 21st Century Skills. This NCAER Report could provide a framework for the terms of reference for such a Commission.

This Report starts with a quotation on its opening page from Rabindranath Tagore’s *Gitanjali*, “We have no time to lose, and having no time we must scramble for a chance.” Though not included on the opening page, Tagore’s next line written in 1912 reads, “We are too poor to be late.” India has achieved much since Tagore wrote those words, yet it cannot afford to be late.

Shekhar Shah  
Director-General

# NCAER Skilling India working papers

1. Where are the Jobs? Skill-based Input-Output Employment Linkages by Sector for India  
Tulika Bhattacharya and Bornali Bhandari
2. Is India’s Education System providing 21st Century Basic and Employability Skills?  
Mousumi Das
3. India’s Employment Challenges and the Demand for Skills  
Pallavi Choudhuri
4. The 3–E Challenge in India: Education, Employability, and Employment  
Bornali Bhandari
5. Providing the Full Range of Employability Skills in India  
Bornali Bhandari
6. The Role of Pedagogy in Developing Life Skills in India  
Renu Gupta
7. How do Technical Education and Vocational Training Impact Labour Productivity in India?  
Seema Sangita
8. An Exploratory, State-wise Education-Employability-Employment Index for India  
Saurabh Bandyopadhyay, Bornali Bhandari, Ajaya K Sahu and Praveen Rawat
9. Viewing Skilling India from the ground up: Project case studies

Available from <http://www.ncaer.org/skillingindia/workingpapers>.

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## Highlights

### India has a skilling paradox

India accounted for 25% of the world's estimated 7.5 million bachelors in science and engineering in 2014. No wonder the world's leading tech companies have their largest operations in India. Yet, as the *Economist* notes, even as "India's labour force will soon overtake China's as the world's largest ... the country is struggling to generate opportunities for a workforce with the wrong skills." The 2015 policy of the Ministry of Skill Development and Entrepreneurship notes, "Our country presently faces a dual challenge of paucity of highly trained workforce, as well as non-employability of large sections of the conventionally educated youth, who possess little or no job skills." This is India's skilling paradox: Dwindling opportunities in agriculture, much potential for jobs in manufacturing and services, but not enough people with the right skills.

### India's 468 million workers have to move from baskets to bytes

The transition of India's labour force from small, unregistered firms in the informal sectors to small, medium and large formal firms has been slow. Rigid labour laws and poor infrastructure impede the pace of transition from informal to formal jobs. So, what's needed?

Conceptually the answer is clear: skill existing informal workers (many of them female) and new workers based on industry requirements and deploy them in a rapidly growing formal sector. Efficiency is higher in the formal sector, costs are lower and profit margins are bigger, all translating into greater job-generating potential. Formalisation increases firms' incentives to invest in upskilling their workers. It also increases the workers' own incentives to remain skilled, besides providing them with better working conditions and health and social security benefits.

#### IBM Now Has More Employees in India Than in the U.S.

IBM has shifted its center of gravity halfway around the world to India.

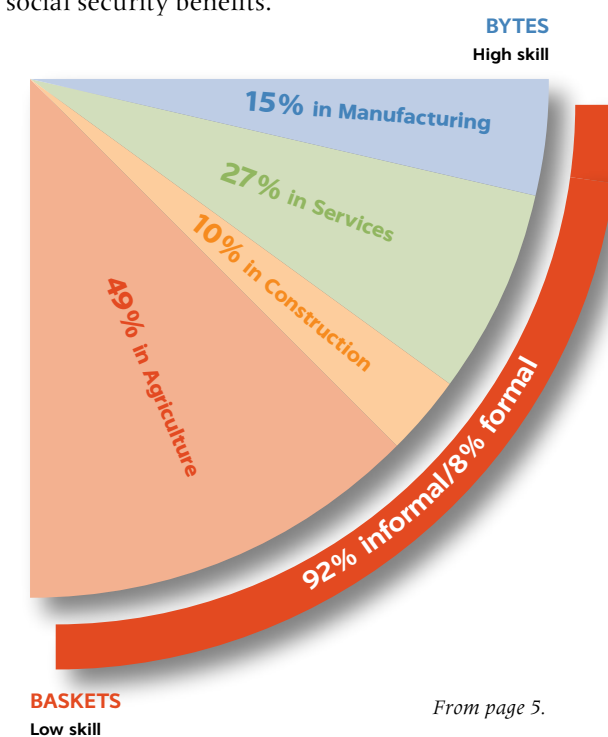
*The New York Times*,  
28 September 2017



#### Ever More Indians Are Struggling to Find Work

The country is missing out on its "demographic dividend"

*The Economist*,  
14 September 2017



From back cover.

From page 5.



# But India is trapped in a vicious cycle of low skills and few good jobs

The combination of inadequately skilled workers, out-of-date labour laws, a rising ratio of wages to the price of capital and persistent informality are feeding on each other—a self-perpetuating vicious cycle that results in fewer good, formal jobs than India is capable of and badly needs. Greater informality drives poor skilling, employers choose machinery over men, and few good jobs are created, driving India’s burgeoning labour force further into informality.



# Moving to a virtuous circle of better skilling and more good jobs is imperative

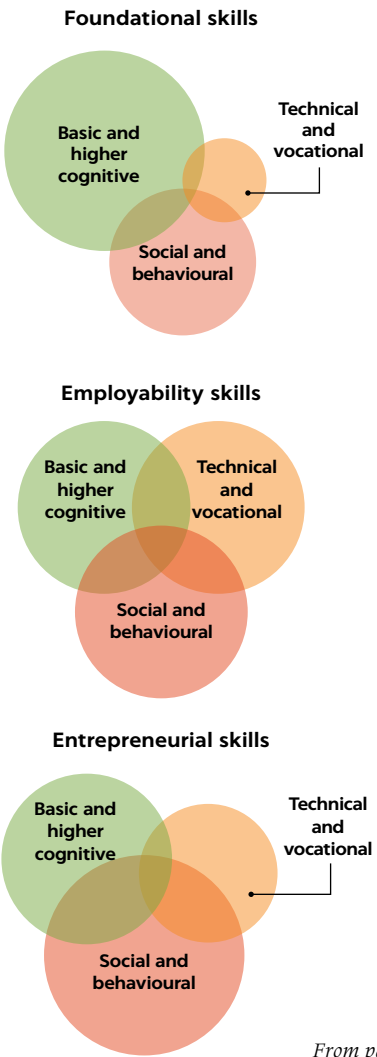
Policymakers need to consider a three-pronged approach. First, completely clear the Central and State underbrush of policy distortions embedded in dysfunctional and out-of-date labour and industrial laws and regulations, many of them hangovers from India’s famous licence raj and from earlier colonial times. Also ensure that laws and regulations no longer impede converting informal to formal jobs. Formalisation will increase firms’ incentives to invest in upskilling their workers. It will also increase the workers’ incentives to remain skilled, besides providing them with better working conditions and health and social security benefits. Second, promote public and private investments in sectors identified as most promising in generating jobs directly within that sector and indirectly across sectors. Third, skill the workforce, covering both existing and new workers, to match employers’ needs and promote formal jobs. After suggesting a simple way for thinking about the types of skills required, this report offers a framework for skilling India—acquiring, matching and anticipating skills—that can help break the cycle of poor skilling and low job creation. There is no time to lose.



From page 21.

# Simplifying skill definitions makes it easier to see what’s needed

Cognitive skills are basic skills of literacy and numeracy, applied knowledge and problem-solving aptitudes and higher cognitive skills such as experimentation, reasoning and creativity. Technical and vocational skills are the physical and mental ability to perform specific tasks using tools and methods in any occupation. Social and behavioural skills include working well with others, communicating well with others, listening well to others and generally being agreeable and outgoing. Everyone has these skills to varying degrees. Combining these types of skills gives *foundational skills*, *employability skills* and *entrepreneurial skills*.



From page 12.

# A three-part framework for thinking about how to make India’s skilling ecosystem work better—acquiring, matching, anticipating skills

*Acquiring, imparting and assessing skills*—requires change in K-12 education, vocational and technical education and on-the-job training. *Matching and adjusting skills*—how best can job seekers with low or high skills find productive work and how can firms find workers with general and specialised skills. *Anticipating and adapting skills*—the continuously evolving landscape of jobs and shorter technology cycles require development of core skills that are transferable across roles. India can successfully create the self-reinforcing virtuous circle of acquiring–matching–anticipating skills as suggested in this Report, and in parallel create the economic and social conditions for rapid, sustained economic growth. If it can do this in the next five years, there is no reason why its aspirations to provide opportunity and well-being to millions of its citizens across the country cannot be realised. Otherwise, with every passing year and each new generation that is not adequately skilled, the backlog of wasted opportunity and unmet skill needs can only become larger, making catch-up increasingly difficult.



Acquiring skills—how best to impart them

Required on the supply side of workers providing skills are essential changes in India’s schooling and skilling system—the world’s largest—in vocational education and in on-the-job training. This also requires recognising and certifying the skills and prior learning of those in the informal workforce. Not only does the overall quality of schooling and training have to rise, but the content has to address the workplaces of today—and tomorrow. General education should impart social and behavioural skills as well as basic and higher cognitive skills, problem solving and systems thinking. Vocational education should develop and revise programmes nimbly to keep up with workplace demands. On-the-job training has to extend beyond large firms and be offered to workers in smaller firms and to informal workers. Indian workers need to shift from lifetime employment to lifetime employability.

How best to turn India’s many disadvantages into advantages? By making sure that all children are literate and numerate. By having the demand for skills from employers drive the supply of skills by workers. By providing the full range of skills for becoming employed. By ensuring that skills are transferable to other jobs and sectors. And by ramping up assessments to know whether and what skills are being successfully imparted.

Matching skills—how best to adjust them

Required on the demand side of employers looking for skills is having job seekers know how they can find productive work with the skills they have or should obtain, and having firms know how they can find workers with the right skills. Educational attainment may be increasing, but high unemployment rates among the educated signal significant problems for their employability. Even if workers read market signals better and understood the skills needed of them better, the problem is that the education

and vocational systems are imparting knowledge through oral and rote learning, but not the broad range of foundational, employability and entrepreneurial skills needed for jobs. Along with job-specific knowledge and skills, firms seek innovation, complex social and emotional, and psychomotor skills that the education system does not easily supply. Educational and skilling institutions need to work more closely with industry, through apprenticeships, training on the job and recognising prior learning.

FIGURE 2.3  
Big numbers for India’s education and skilling ecosystem

2,000,000 Indian institutions imparting skills  
300,000,000 Indians currently getting educated or skilled and will be looking for work

468,000,000 Indians now in jobs may (or may not) be acquiring skills on the job

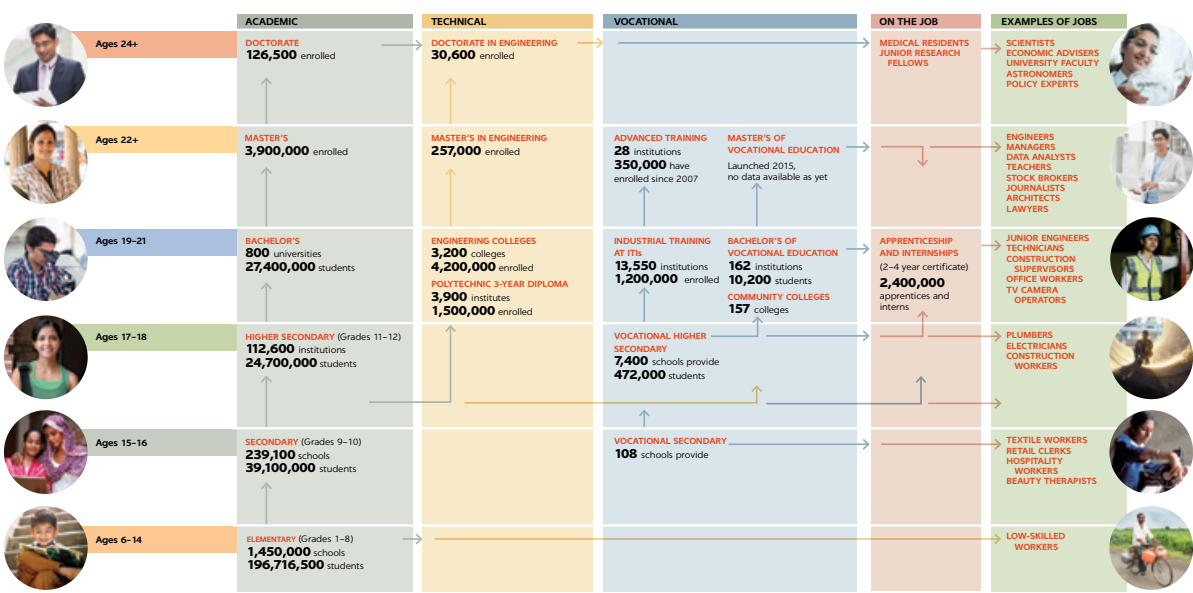


TABLE 3.3 Mismatches between supply and demand

SUPPLY OF SKILLS		DEMAND FOR SKILLS							
Skills	Educational attainment	HIRED WORKERS					ENTREPRENEURS AND SELF-EMPLOYED PERSONNEL		
		Low-skilled casual worker	Medium-skilled operative/trade worker	Medium-high-skilled worker/associate professional	High-skilled worker/specialist trainer/professional	High-skilled manager	Self-employed livelihood/necessity entrepreneur	High-skilled, self-employed professional	CEO/director/opportunity entrepreneur/employer
Routine cognitive skills	Primary and middle school education	●	●	●	●	●	●	●	●
Routine cognitive skills, ICT skills and language skills	Secondary education	●	●	●	●	●	●	●	●
Routine cognitive skills, ICT and language skills, financial literacy	Higher secondary education	●	●	●	●	●	●	●	●
Routine cognitive, nonroutine cognitive skills, core socioemotional skills, ICT skills, language skills, financial literacy and knowledge and ability to apply	College education and above	●	●	●	●	●	●	●	●
Routine cognitive skills, nonroutine cognitive skills, ICT skills, financial literacy and knowledge and ability to apply, sector and job-specific skills	Technical education	●	●	●	●	●	●	●	●
Job-specific skills, one ICT skill, English language skills and some financial literacy	Short-term skilling programmes	●	●	●	●	●	●	●	●
Routine cognitive skills, knowledge and ability to apply and job-specific skills	Long-term skilling programmes	●	●	●	●	●	●	●	●

● Worker cannot supply the skills that the job demands.  
● Worker can perhaps supply the skills that the job demands with varying success ranging from barely to mostly.  
● Worker can fully supply the skills that the job demands.

Note: Red implies that there is demand for this but supply is limited, indicating a mismatch. Green indicates that there is a reasonable degree of match. Yellow indicates that there is only a partial match. Black indicates that workers' skills exceed what the job needs.

Source: NCAER, based on stakeholder consultations and literature reviews.

From page 14.

From page 46.



Anticipating skills—how best to adapt them

Understanding how structural and technological changes in this 21st century are radically altering today’s workplace and the nature of work is imperative. While India must deal with its large and persistent backlog of unskilled informal workers, it must also provide for its future to sustain rapid progress. Firms of different sizes are already placing different skill requirements on individuals—large firms need formal business and accounting skills and high technological skills, and smaller firms need multitasking and adaptability to business practices. The 21st century Indian worker also needs transferable skills. Above all India needs to create an agile workforce that can anticipate and adapt to changes in technology, automation and digitisation.

The Internet has changed how people connect to work, with more workers using cloud computing, video conferencing and other means to work anywhere, anytime.

Technological cycles are shorter than ever, and digital disruption is likely to recur with greater frequency.

21st century jobs will no longer be confined to task-specific roles. Instead, the demand for multidimensional skills will increasingly grow.

Transferable skills relevant to multiple workplaces are the key to promoting workforce agility.

Customer-facing jobs with non-routine interactive tasks that depend on soft skills can be expected to grow. So can jobs depending on higher cognitive skills.

The e-commerce sector could create 14 million jobs in logistics and delivery, and 6 million in customer care, information technology and management.

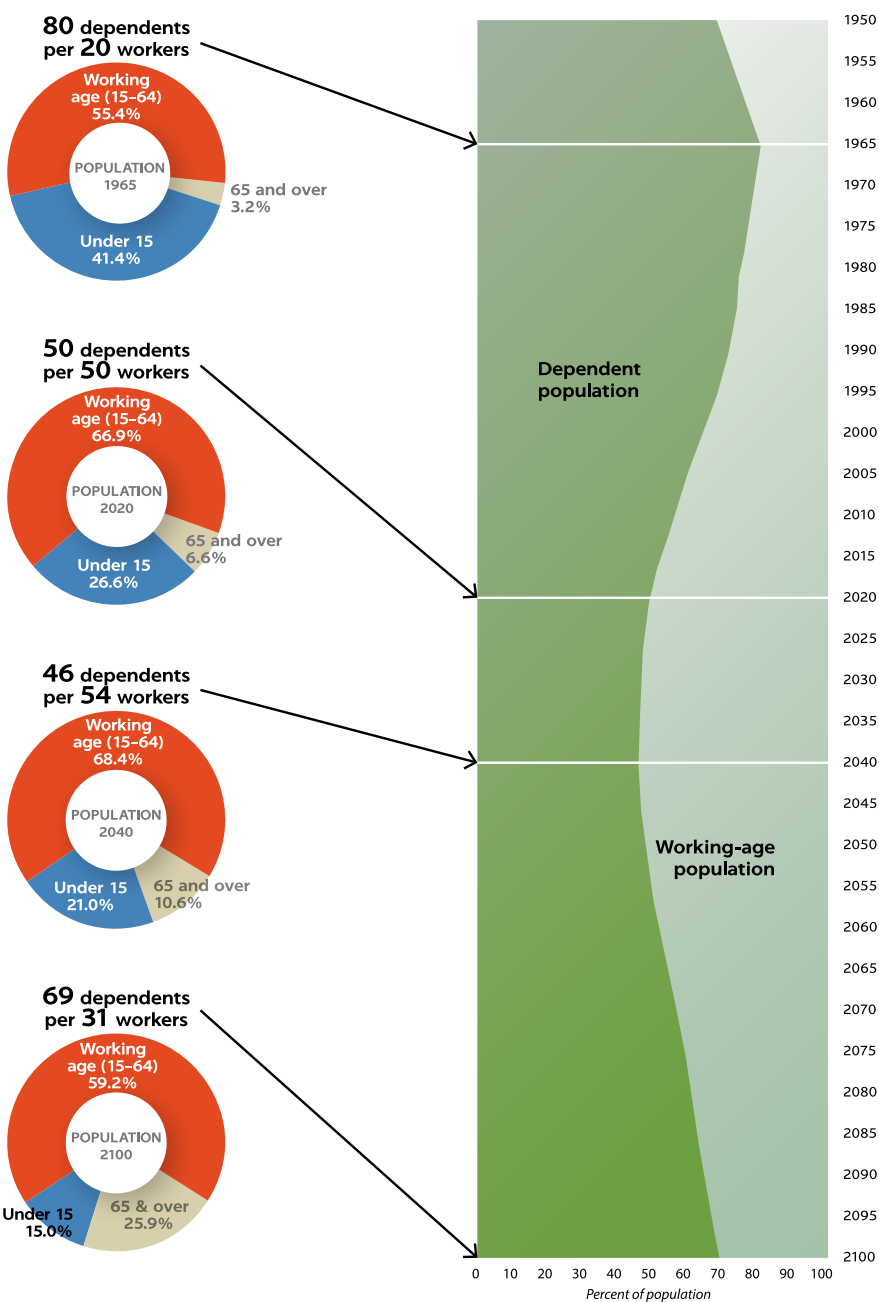
From chapter 4.

India must get rich before it gets old

India’s working-age population is growing faster than its population of young and old dependents. The growing share of the workforce in the population can be a “demographic dividend” that can improve both social and economic outcomes, if the higher numbers of workers are productively employed.

The growing population share of the workforce is a demographic dividend that comes once in a nation’s life. This should raise the rate of economic growth if the higher numbers of workers are productively employed and earn and save well. India then becomes rich before it becomes old; otherwise it will forfeit its demographic dividend.

The Indian policymaker’s first and foremost challenge, given this demographic opportunity, is to spur economic growth that creates good jobs for new entrants to the job market and, at the same time, to ensure that these new workers have the right skills. A second, larger challenge comes from the massive number of workers aged 30–59 who are already in the workforce but have to be reskilled or upskilled.

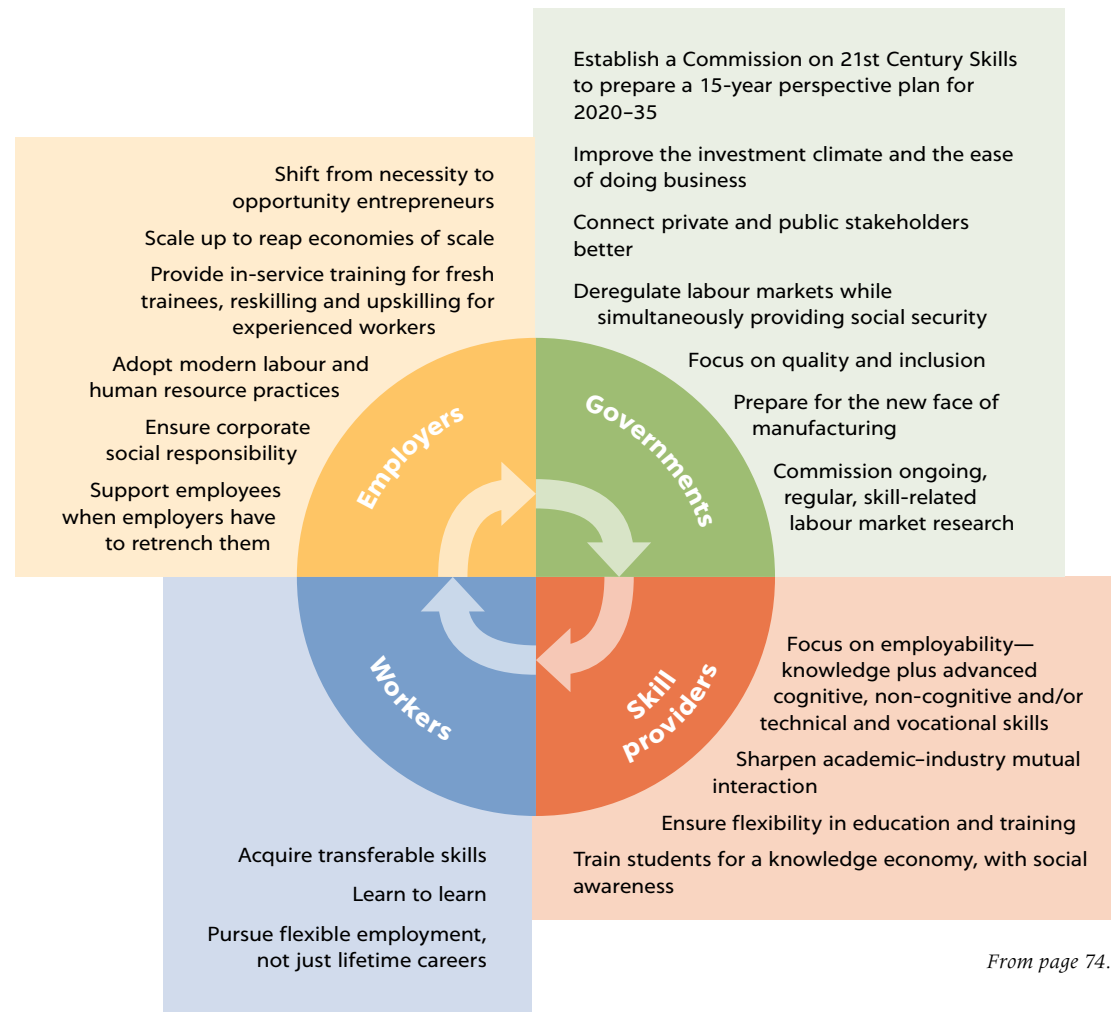


From page 2.

Get all stakeholders to work together...

Given the time it takes to skill both existing and new workers, all stakeholders in the skill-ing space must work together to acquire, match and anticipate skills that India will need in the next two or three decades to generate good jobs for its rapidly expanding workforce. This imperative calls for distinct roles and respon-sibilities for employers, for governments, for training providers and for workers. And it calls for mutually reinforcing policies, actions, incentives and understanding among and

between these four key stakeholders to suc-cessfully impart, match and anticipate skills for India in the 21st century. India needs a 15-year, 2020–35 perspective plan focused on transfera-ble skills that can meet demand from industries now and in the future. To prepare the plan the government should establish a Commission for 21st Century Skills. This NCAER Report could provide a framework for the terms of reference for such a Commission.



...there's no time to lose

India's skilling challenge in numbers

- ◆ Nearly **1.25 million** new workers aged 15–29 are projected to join the workforce every month through 2022.
- ◆ By 2022, India will have about **47 million** more people between the working ages of 19 to 59 than younger or older people. This demographic dividend will peak in about 2040.
- ◆ The roughly **70 million** workers entering the workforce between 2018 and 2022 will need to be skilled for a 21st century economy if India is to keep pace with technological change.
- ◆ Many of the roughly **468 million** now in the workforce could be upskilled and reskilled—not easy because **92%** are in the informal sector.
- ◆ Slightly more than half of India's workers have school attainment below secondary school with no vocational training.
- ◆ Of India's current workforce, **31%** are illiterate, **13%** have a primary education, and **6%** are college graduates.
- ◆ About **2%** of the workforce has formal vocational training, and **9%** have non-formal, vocational training.
- ◆ There were approximately **48 million** workers in construction and **16 million** in textiles and apparel with no vocational training.
- ◆ The unemployment rate for graduates aged 20–24 was **29%**, for those 25–29, **12%**, and for those 30–34, **4%**.
- ◆ Out of the more than **500 thousand** final year bachelors students aged 18–29 who were surveyed, **54%** were found to be unemployable.
- ◆ **2 million** Indian institutions are imparting skills.
- ◆ **300 million** Indians are currently in educational institutions or acquiring vocational skills and will be eventually looking for work.
- ◆ Women's labour force participation was **21%** in urban areas and **36%** in rural.
- ◆ Of rural and urban women aged 15–29, **49%** are neither part of the labour force nor pursuing education, general or vocational.
- ◆ Between 2005 and 2012, **15 million** women dropped out of India's labour force.
- ◆ The share of female managers was **6%** in computer manufacturing and **12%** in computer programming.
- ◆ The rural-urban male migration rates in India have been low at around **4%** in recent decades.
- ◆ **68%** of Indian SME businesses are offline, and another **15%** are digitally connected but not using digital services. Only **2%** marketed products or services online.
- ◆ Technology cycles are shorter than ever, and digital disruption could hit Indian workers hard: globally **75%** of businesses expect that automation will require workers to develop new skills.

Retrospective numbers are from NSSO 68th Round 2014 (with data for 2011–12). Prospective numbers are from Ministry of Skills and Development 2015.





## The urgency of skilling India's workforce

**India's economy is on the move—but its workforce has barely budged**

India has surpassed China as the world's fastest growing large economy. It has also moved toward a knowledge economy, and more broadly from agriculture to manufacturing and services, but for the most part the Indian workforce has not changed. Indeed, policymakers, educators, trainers and firms face daunting challenges in skilling India's workforce to meet the economy's current and changing needs.

- Many of the roughly 468 million now in the workforce need to be upskilled and reskilled—not easy because 92% are in the informal<sup>1</sup> sector, mostly outside the reach of formal skilling.<sup>2</sup>
- Of today's workforce 31% are illiterate, 13% have only a primary education and only 6% are college graduates. Further, only about 2% of the workforce have received formal vocational training while only 9% have nonformal vocational training.<sup>3</sup>
- The roughly 70 million new workers entering the workforce between 2018 and 2022 need to be skilled for a 21st century economy.<sup>4</sup> They may have completed secondary education, but many are not employable because their cognitive and technical skills are not up to par, and their social and behavioural skills are lacking.

Between 2004 and 2011, data from the National Sample Surveys show, the Indian economy created only some 18.6 million jobs, or about 2.7 million jobs a year, far too few for the almost 15 million young adults projected to enter the workforce each year over the next five years.<sup>5</sup> After 2011–12, various estimates suggest weak job growth.<sup>6</sup> India's economic growth over the past decade has for that reason been called “jobless growth.” But India can ill afford to waste this vast human and economic potential. With every passing year and each new generation that is not adequately skilled, the backlog of wasted opportunity and unmet skill needs can only become larger, making catch-up increasingly difficult. Meeting the

challenge is all the more difficult because technology is changing the nature of work everywhere, eroding the low-wage advantage that India could hope to enjoy in meeting domestic and global demand. India's aspirations to become an economic superpower providing opportunity to millions of its citizens cannot be realised at this rate. Indeed, given India's scale, just the frustrated aspirations of its youth can cause social unrest and strife.

**More Indians of working age, with fewer young and old dependent on them—a demographic dividend or a curse?**

India's working-age population is growing faster than its population of young and old dependents. The growing share of the workforce in the population can be a “demographic dividend” that can improve both social and economic outcomes, if the higher numbers of workers are productively employed.

Not only is the ratio of young and old dependents to the working-age population dropping in India, but the trough in the trend is projected to last longer than it did in other countries (figure 1.1). By 2022, India will have about 47 million more people between the working ages of 19 to 59, who are likely to be skilled with no jobs within the country. In addition nearly 1.25 million new workers—aged 15–29—are projected to join the workforce every month through 2022.<sup>7</sup> By the middle of this century, India will have a larger working age population than China. This is a vast potential, and the scale of economic activity that these workers can generate if they are productively employed has been rarely seen in human history.

But if there are too few jobs, or not enough good jobs,<sup>8</sup> the dividend becomes a curse. As the young who form the population bulge today get older in five to six decades, India will then have an aging population that has not accumulated enough wealth and well-being to be able to afford costly old-age care and medical

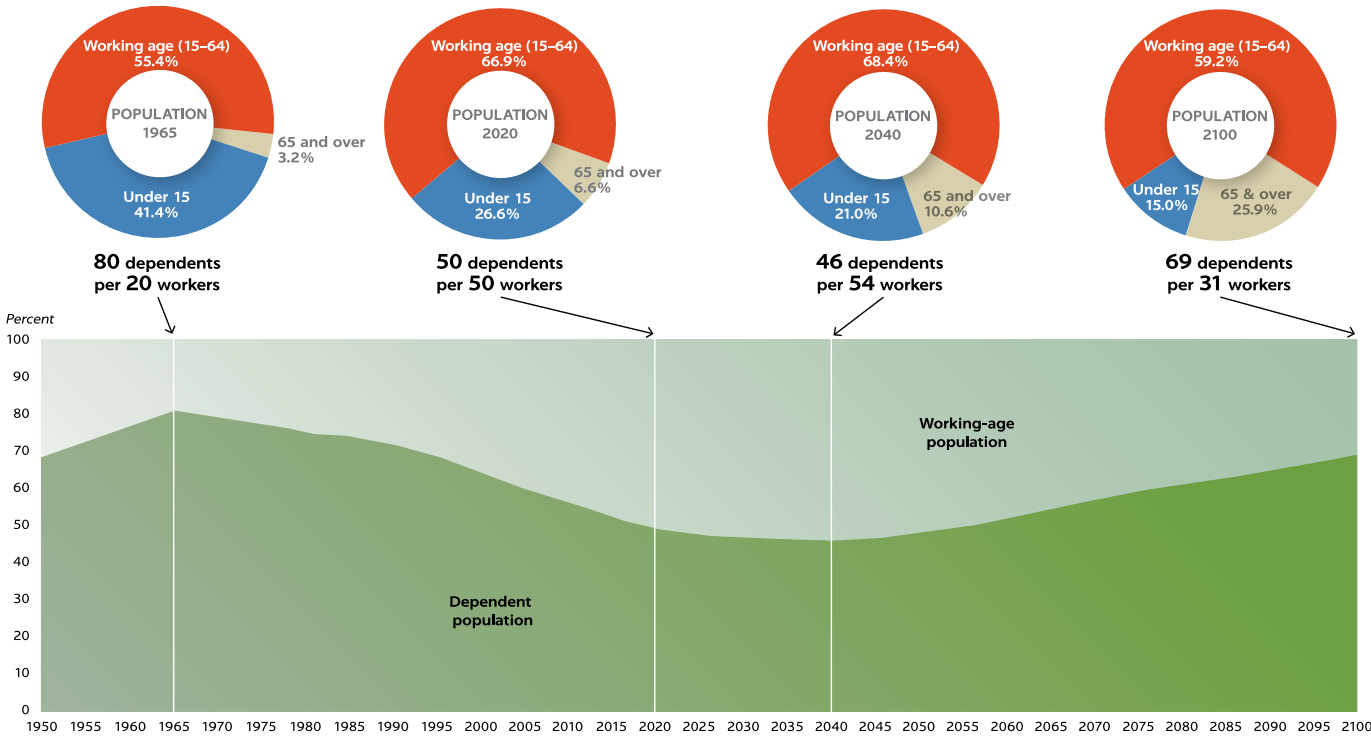


**As India’s birth rate falls, its working-age population grows faster than its population of young and old dependents**

The growing population share of the workforce is a demographic dividend that comes once in a nation’s life. This should raise the rate of economic growth if the higher numbers of workers are productively employed and earn and save well. India then becomes rich before it becomes old; otherwise it will forfeit its demographic dividend.

**FIGURE 1.1 More workers mean fewer dependents**

Share of population



Source: United Nations, Department of Economic and Social Affairs, Population Division, 2017 *Revision of World Population Prospects*, data acquired at website.

Spur economic growth that creates good jobs for new entrants to the job market and ensure that these new workers have the right skills

expenditures. To put it simply, to attain its rightful place and realise its aspirations, India must become rich before it gets old.

The Indian policymaker’s first and foremost challenge, given this demographic opportunity, is to spur economic growth that creates good jobs for new entrants to the job market and, at the same time, to ensure that these new workers have the right skills. A second, larger challenge comes from the massive number of workers aged 30–59 who are already in the workforce but have to be reskilled or upskilled.<sup>9</sup>

**High-growth sectors are not creating jobs in those sectors**

A key challenge is that India’s high growth sectors are not generating direct jobs. Sectors such as business services and information technology-enabled services are contributing substantially to

India’s recent rapid GDP growth. But their share in overall employment is less than 2%. They produce more with less labour (their labour productivity is about 5–10 times higher than in the overall economy), and they are generating jobs mostly for high-skill workers. In general these services are more skill-demanding than manufacturing and have high labour productivity, and therefore services are an unlikely destination for low-skill job seekers.<sup>10</sup>

India has a range of other service and manufacturing industries that can generate a lot of good jobs, both directly and through ripple effects in related industries, but these have not been growing fast enough. Every sector in an economy has consumption and production linkages with other sectors and therefore has the potential to generate jobs not just directly but also indirectly—in other sectors and among firms of different sizes. Even within services some sectors have high job-generating potential

not only for high-skill workers but also for medium-skill workers. For example in services, as NCAER’s research done for this report shows, trade, hotels, restaurants, financing, communication, real estate and business activities are creating substantial numbers of jobs for high- and medium-skill workers both within and outside their sectors.<sup>11</sup> In manufacturing, textiles, wood and wood products and furniture and fixtures have the highest job-generating potential for low and medium-skill workers, both within their own sector and across other sectors of the economy. Manufacturing sectors such as food processing, beverages and tobacco, leather products, nonmetallic mineral products and textiles can create direct and indirect low-, medium- and high-skill jobs. The challenge facing policymakers is to create the investment climate and the supporting infrastructure and regulations that can allow these sectors to grow more rapidly.

India accounted for 25% of the world’s estimated 7.5 million bachelors in science and engineering in 2014.<sup>12</sup> No wonder the world’s leading tech companies have their largest operations in India. Yet, as the *Economist* magazine notes, even as “India’s labour force will soon overtake China’s as the world’s largest...the country is struggling to generate opportunities for a workforce with the wrong skills.”<sup>13</sup> The 2015 Policy of the Ministry of Skill Development and Entrepreneurship notes, “our country presently faces a dual challenge of paucity of highly trained workforce, as well as non-employability of large sections of the conventionally educated youth, who possess little or no job skills.”<sup>14</sup> This is India’s skilling paradox: dwindling opportunities in agriculture and lots of potential for jobs in manufacturing and services, but not enough people with the right skills.

**Why does India have economic growth without jobs?**

India’s unusual pattern of “jobless” economic growth, remarkable in a country destined to be the world’s most populous, is the result of both supply and demand factors. On the supply side there is an inadequate supply of skilled workers. On the demand side three key factors—India’s inflexible and archaic labour laws, the low relative cost of capital compared to labour and the overwhelming level of informality in manufacturing and services—constrain the rapid creation of jobs, particularly of formal

sector, good jobs. Further complicating policy responses to these challenges are geographic differences that make centralised solutions difficult.

*Inadequately skilled workers*

Possibly the most important explanation for low job creation in India is the lack of adequately skilled workers. India is among the top five countries with the highest skill shortages, with nearly two-thirds of firms (with 10 or more employees) surveyed recently by the Organisation for Economic Co-operation and Development (OECD) reporting difficulty finding qualified employees.<sup>15</sup> Another survey had nearly half of all employers reporting unfilled job vacancies due to talent shortages.<sup>16</sup> The scale and impact of formal post-school education and training remains modest, with less than 3% of the workforce undergoing formal skill training, and only about 9% acquiring skills through informal modes (apprenticeships and on-the-job training). A small share of workers get on-the-job training in-house while the vast majority of informal sector workers have no access to formal training. Over the years the government has introduced several schemes to deliver and upgrade skills through a formal technical and vocational education and training system. And efforts have been stepped up through such initiatives as Skill India and Make in India.

*Rigid labour laws*

India’s employment protection legislation is among the world’s most rigid.<sup>17</sup> An example is the prohibition of layoffs under the Industrial Disputes Act, 1947, which requires a company with more than 100 employees to get approval from the appropriate government authority for laying off even a single employee. Small wonder that manufacturing industries in India use more capital-intensive technologies than industries in other countries at comparable levels of development.<sup>18</sup>

Highly capital-intensive production methods may be one response to India’s rigid labour market regulations that make labour expensive (when adjusted for its productivity) and prompt firms to substitute machinery for labour. Another response may be the growing incidence of contracting in the Indian labour market and the consequent decline in labour intensity in organised manufacturing, since contract labour does not show up in the

India is among the top five countries with the highest skill shortages



muster roll meant for a company’s permanent employees. In manufacturing both capital-intensive production methods and contracting can be blamed for slow employment growth in large-scale, labour-intensive manufacturing industries.

Illustrating the prevalence of contracting, the concentration of regularly employed workers is highest (27%) in small firms with 50 or fewer workers, and the concentration of contract workers is highest (21%) in large firms with 1,000 or more workers (figure 1.2). For small and medium firms with 200 or fewer workers, the concentration of regularly employed workers is 55%, but for medium and large firms with more than 200 workers, the concentration of contract workers is 55%. Contracting is thus more prevalent in larger firms reflecting the employers’ response wanting to circumvent rigid labour laws.

Low cost of capital relative to labour

For organised Indian manufacturing the ratio of the real wage to the real rental price of capital has been steadily increasing over the past few decades, more steeply since the late 1990s (figure 1.4).<sup>19</sup> This increase can explain the declining labour intensity in organised manufacturing in India: firms have been substituting machinery for labour due to the lower relative price of capital. The drop in the relative effective cost of capital can be attributed to an increase in real wages and a decline in the rental price of capital (due to the fall in the relative price of capital goods), rather than a fall

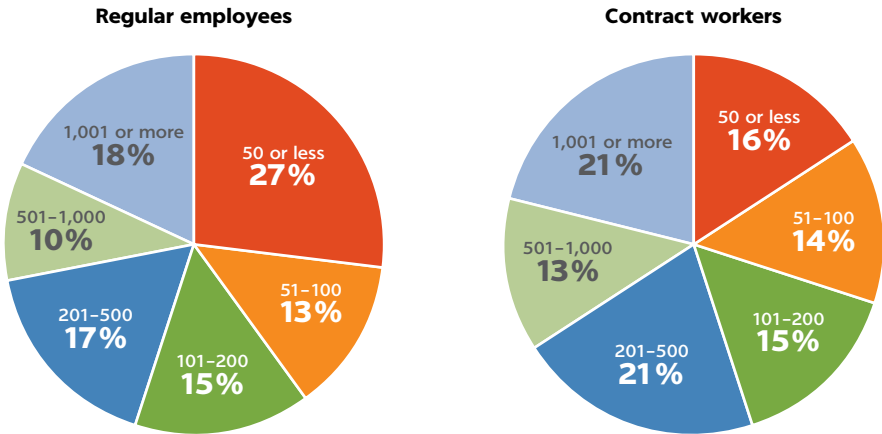
in the real interest rate. The low relative price of capital is exacerbated by improvements in technology and automation, which are displacing labour as firms try to stay competitive.

*Mostly informal jobs even outside agriculture, poor working conditions for women, and a slow shift from informal to formal jobs*

The informal employment share in nonagricultural activities is exceedingly large in India. Furthermore, sectors that have high informality employ a sizable portion of female informal workers with low wages and poor working conditions. The informal employment share in nonagricultural activities is as high as 84%, and the share of female informal employment close to 85%. Among individual nonagricultural activities—such as transportation, construction, trade, manufacturing and services other than trade or transportation—the numbers look similar. For example the informal employment shares in construction and trade are the highest at a little over 97%. In construction the female informal employment share is 99%, and in trade 98%. Similarly in manufacturing 87% of employment is informal, with the female informal employment share at 94%.<sup>20</sup>

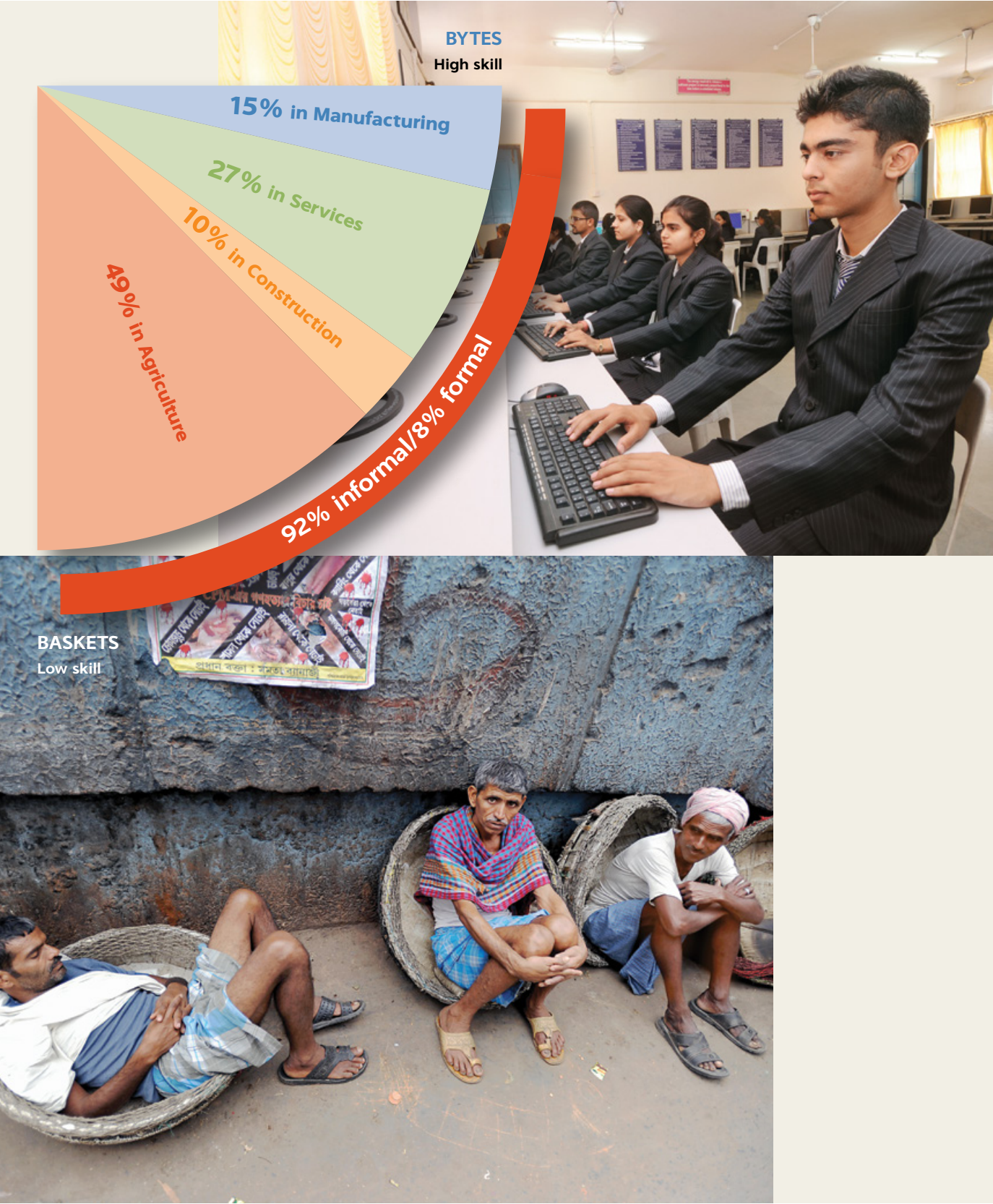
Most new jobs in the economy’s informal sectors have extremely low productivity. And the transition of India’s labour force from small, unregistered firms in the informal sectors to small, medium and large formal firms has been slow (see figure 1.3). Rigid labour laws and poor infrastructure impede the pace of transition from informal to formal jobs. So, what’s needed?

FIGURE 1.2 More regular employees in smaller firms—more contract workers in larger firms



Note: Left side: Employee distribution by factory size of regular employees. Right side: Employee distribution by factory size of contract workers. Data are for 2012–13.  
Source: Economic Outlook, Centre for Monitoring Indian Economy.

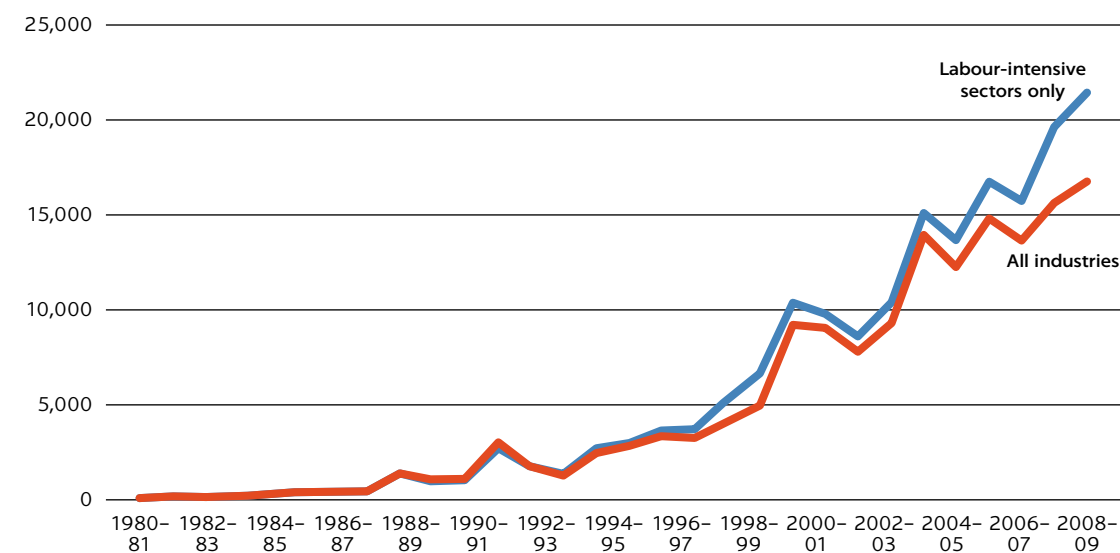
FIGURE 1.3 India’s 468 million jobs: From baskets to bytes





Formalisation increases firms' incentives to invest in upskilling their workers and workers' own incentives to remain skilled

**FIGURE 1.4 Ratio of wages/rental price of capital in organised Indian manufacturing**



Note: The figure plots the ratio of real wages to the rental price of capital, for all industries and only labour-intensive sectors in organised Indian manufacturing.  
Source: Sen and Das 2014.

Conceptually the answer is clear: free up informal workers (many of them female), skill them based on industry requirements and deploy them in a rapidly growing formal sector. Efficiency is higher in the formal sector, costs are lower and profit margins are bigger, all translating into greater job-generating potential. Formalisation increases firms' incentives to invest in upskilling their workers. It also increases the workers' own incentives to remain skilled, besides providing them with better working conditions and health and social security benefits.

Putting this into practise and staying the course is surely one of the most important and difficult policymaking and political economy challenges facing India (see figure 1.3). Again, simply put, in these circumstances policymakers need to consider a three-pronged approach. First, completely clear the central- and state-level underbrush of policy distortions that are embedded in dysfunctional and out-of-date labour and industrial laws and regulations, many of them hangovers from India's famous licence raj and from earlier colonial times. Also ensure that laws and regulations no longer impede converting informal to formal jobs. Second, promote public and private investments in sectors identified as most promising in generating jobs directly within that sector and indirectly across sectors. Third, skill the workforce, covering both existing and new workers, to match employers' needs and promote formal jobs.

#### Geographic differences

Complicating these policy responses is India's geographic and cultural diversity. Different states will realise the demographic dividend at different times, with India's peninsular states peaking sooner than its hinterland states.<sup>21</sup> The proportion of the workforce to be skilled and to be reskilled is also unevenly distributed across peninsular and hinterland states. And the starting points vary across states—in school infrastructure, student-teacher ratios, general and vocational education levels, school dropout rates and workforce participation in formal and informal jobs and in industry and services.

The more advanced peninsular states—such as Andhra Pradesh, Kerala, Maharashtra and Tamil Nadu—need policies for upskilling and reskilling those already in the prime working ages 30–59 and for matching them with the industries that are growing fast and undergoing structural and technological changes. They must also of course cater to new workers entering the workforce. And they need to anticipate the skills needed later in this 21st century.

The less advanced hinterland states—such as Bihar, Chhattisgarh, Jharkhand and Uttar Pradesh—need policies to ensure effective absorption of new entrants (15–29) to the labour force.<sup>22</sup> The key in those states is skilling the new entrants and setting sectoral priorities that ensure young workers' absorption in the workforce. This will not be easy. In Bihar the

share of the school-age population in school is slipping. One report estimates that Bihar alone has around 1.2 million out-of-school 6–13 year-old children, some 20% of the total out-of-school children in India.<sup>23</sup>

Policymakers should thus adopt a decentralised approach for skilling and job creation and for coordinating and monitoring state, district and block initiatives. For this they should annually map skills and sectoral priorities across all Indian states, a task requiring new synergies and cooperative efforts between policymakers and executing agencies at the Centre and their state counterparts.

#### Escaping the vicious cycle

So why has more progress not been made in dealing with India's skills and jobs challenge? The combination of inadequately skilled workers, out-of-date labour laws, the rising ratio of wages to the cost of capital and persistent informality are feeding on each other and resulting in a self-perpetuating vicious cycle whose

result is fewer formal jobs than India is capable of and badly needs (figure 1.5).

This report addresses the key challenge of how India can break out of this vicious cycle and move to a virtuous cycle in which good jobs can lead to better skilled workers who can be employed in more and better jobs.

#### Creating a virtuous cycle of acquiring, matching and anticipating skills

Simply put India can break the cycle of poor skilling and low job creation by ensuring that adequate job growth accompanies economic growth and ensuring that the workforce has the necessary skills to be employable in the jobs thus created. This requires acknowledging the following underlying mismatches and market distortions that constrain creating jobs and skilling the workforce:

- The broken link between industry and the education and training systems.
- Inefficient or missing markets for skills.
- The lack of on-the-job-training, especially in smaller firms but also in many large firms.

**FIGURE 1.5**

**The vicious cycle of low skills and few good jobs—a low skilling trap**



This report addresses the key challenge of how India can break out from a low skilling vicious cycle and move to a virtuous circle in which good jobs can lead to better skilled workers who can be employed in more and better jobs



If in the next five years India can create a self-reinforcing virtuous circle of acquiring-matching-anticipating skills and the conditions for rapid economic growth, there is no reason why India's aspirations to become an economic superpower cannot be realised

- The failure to recognise and certify the prior learning and skills of those in the informal sector.

This report investigates these challenges in greater detail and, in the process, develops a deeper understanding of what's needed to skill India's workforce. The three chapters that follow analyse what's required to skill, upskill and reskill India's workforce in the short, medium and long run. They focus on how skills are being acquired and imparted, how they are being matched and adjusted to jobs and, looking to the future, how they are being anticipated and adapted. Acquiring, matching and anticipating are the three central themes of this skills report, with each chapter recommending a set of policies or actions for policymakers, workers and enterprises to come together effectively to realise India's tremendous jobs and skilling potential.

*Acquiring, imparting and assessing skills*—on the supply side of workers providing skills—requires changing general education, vocational education and on-the-job training (chapter 2). It also requires recognising and certifying the skills and prior learning of those in the informal workforce. Not only does the overall quality of schooling and training have to rise to international standards, but the content has to address the workplaces of today—and tomorrow. General education should impart social and behavioural skills as well as elementary and advanced cognitive skills, problem solving and systems thinking. Vocational education should develop and revise programmes nimbly to keep up with workplace demands. On-the-job training has to be extended beyond large firms and offered to workers in smaller firms and to informal workers. Indian workers need to shift from lifetime employment to lifetime employability.

*Matching and adjusting skills*—on the demand side of employers looking for skills—requires knowing how job seekers with low skills or high skills can find productive work and how firms can find workers with the general and specialised skills they need to prosper and grow (chapter 3). Education and skilling systems should emphasise transferable foundational and life skills, because seasonal industries and ever-changing work require skill sets that will empower workers over the life of their careers and enable them to multitask within industries and to switch across industries. Women need to enter the workplace more widely and move

from low-skill jobs towards high-skill digital and management jobs.

*Anticipating and adapting skills* requires understanding how structural and technological changes in this 21st century are radically altering today's workplace and the nature of work (chapter 4). While India must deal with its backlog of unskilled, informal workers, it must also not forget to provide for its future if rapid progress is to be sustained. Firms of different sizes are already placing different skill requirements on individuals—large firms need formal business and accounting skills and high technological skills, and smaller firms need multitasking and adaptability to business practises. The 21st century Indian worker will need transferable skills. Above all India needs to create an agile workforce that can anticipate and adapt to changes in technology, automation and digitisation.

If in the next five years India can successfully create the self-reinforcing virtuous circle of *acquiring-matching-anticipating* skills as suggested in the report, and in parallel create the economic and social conditions for rapid, sustained economic growth, there is no reason why India's aspirations to become an economic superpower cannot be realised, providing opportunity and well-being to millions of its citizens across the country, men and women, young and old.

#### Notes

1. Informal workers in this report are defined as workers without social security benefits. See also note 20 below.
2. NSSO 68th Round (2014). All data in this report refer to population aged 15 and above for the year 2011–12.
3. NSSO 2014. Data are for 2011–12.
4. This number is estimated based on MSDE 2015.
5. Ministry of Skill Development and Entrepreneurship 2015.
6. Abraham 2017.
7. NSSO 61st and 68th Rounds (2014 and previous rounds) and Ministry of Skill Development and Entrepreneurship 2015.
8. Good jobs are defined here as those with social security benefits.
9. Ministry of Skill Development and Entrepreneurship 2015.
10. Ramaswamy and Agrawal 2012.
11. Bhattacharya and Bhandari 2018.
12. *The Hindu* 2018.

13. *The Economist* 2017.
14. Ministry of Skill Development and Entrepreneurship 2015.
15. OECD 2016.
16. ManpowerGroup n.d.
17. OECD 2007.
18. Hasan, Mitra and Sundaram 2013a, 2013b.
19. Sen and Das 2014.
20. ILO 2012. The data are as of 2009–10. ILO defines informal employment as a job-based concept, which encompasses those persons whose main jobs lack basic social or legal protections or employment benefits and may be found in the formal sector, informal sector or households. Using the NSSO (2014) and NCAER definition of informal employment, the percentage was 98% in 2011–12 in the construction sector.
21. Ministry of Finance 2017.
22. National Institute for Transforming India 2015.
23. Social and Rural Research Institute 2014.

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## 2

### Acquiring skills

#### How best to impart them

The 21st century workplace demands a wide range of cognitive, technical and behavioural skills. But for India's children, adolescents and adults, the education and training systems have for too long failed to deliver, not even recognising the need for many skills. The too-frequent result: school dropouts and unemployable graduates. Vocational and technical education has been below international standards, and imparting vocational skills in secondary schools, though promising, is still in its beginning stages.

For adults already in India's workforce, on-the-job training, including apprenticeships, could improve their productivity. But the vast majority of Indian firms are tiny and need support to see the benefits of improving their workers' skills. Entrepreneurs with planning, finance and inventory management skills are more likely to sustain and expand their enterprises, and risk takers and creative thinkers in new parts of the economy can launch ideas and products. Pilots are under way to build such entrepreneurial skills, but a much broader effort is needed to scale up programmes that work.

How best to turn India's many disadvantages into advantages? By making sure that all children are literate and numerate. By having the demand for skills from employers drive the supply of skills by workers. By providing the full range of skills for becoming employed. By ensuring that skills are transferable to other jobs and sectors. And by ramping up assessments to know whether and what skills are being successfully imparted.

**Simplifying skill definitions makes it easier to see what's needed**

Workplace skills for the 21st century range from the cognitive to the technical and to the social and behavioural. It's tempting to try to

come up with a taxonomy of workplace skills, but such attempts usually do more to confuse than to clarify. For example, thinking of foundational, employability, and entrepreneurial skills can lead to identifying such categories as routine and nonroutine skills, cognitive and noncognitive skills, job and life skills—and in such concoctions as job-relevant routine-cognitive skills and learning-to-learn skills. It's possible to infer what each of these skills involves, but to keep the use of terms simple and consistent, this chapter will stick with basic and higher cognitive skills, technical and vocational skills and social and behavioural skills (see appendix A2.1).

*Cognitive skills* start with literacy and numeracy, continue through applying knowledge and solving problems, and advance to higher cognitive skills such as experimentation, reasoning and creativity. Children have cognitive skills. Secondary leavers have them. Academics with PhDs have them.

*Technical and vocational skills* include the physical and mental ability to perform specific tasks using tools and methods in any occupation. Farmers have them. Architects have them. Computer scientists have them.

*Social and behavioural skills* include working well with others, communicating well to others, listening well to others and generally being agreeable and outgoing. Everyone has these skills to varying degree: children in families and communities, teachers in classrooms, job seekers in interviews and supervisors on factory shop floors.

By sticking to these three broad categories, the chapter clarifies that *foundational skills* are the basic cognitive, technical and social and behavioural skills that children acquire to augment and amplify their full skill sets throughout their lives. It clarifies that *employability skills* are the cognitive, technical and vocational, and social and behavioural skills that make people attractive to employers and get them hired.



Cognitive, technical and vocational, and social and behavioural skills interact with each other in different combinations to provide the foundational, employability, and entrepreneurial skills that a workforce needs

And it clarifies that *entrepreneurial skills* are the cognitive, technical and vocational, and social and behavioural skills that allow entrepreneurs to sustain and expand their enterprises. Cognitive, technical and vocational, and social and behavioural skills interact with each other in different combinations to provide the foundational, employability, and entrepreneurial skills that a workforce needs (figure 2.1).

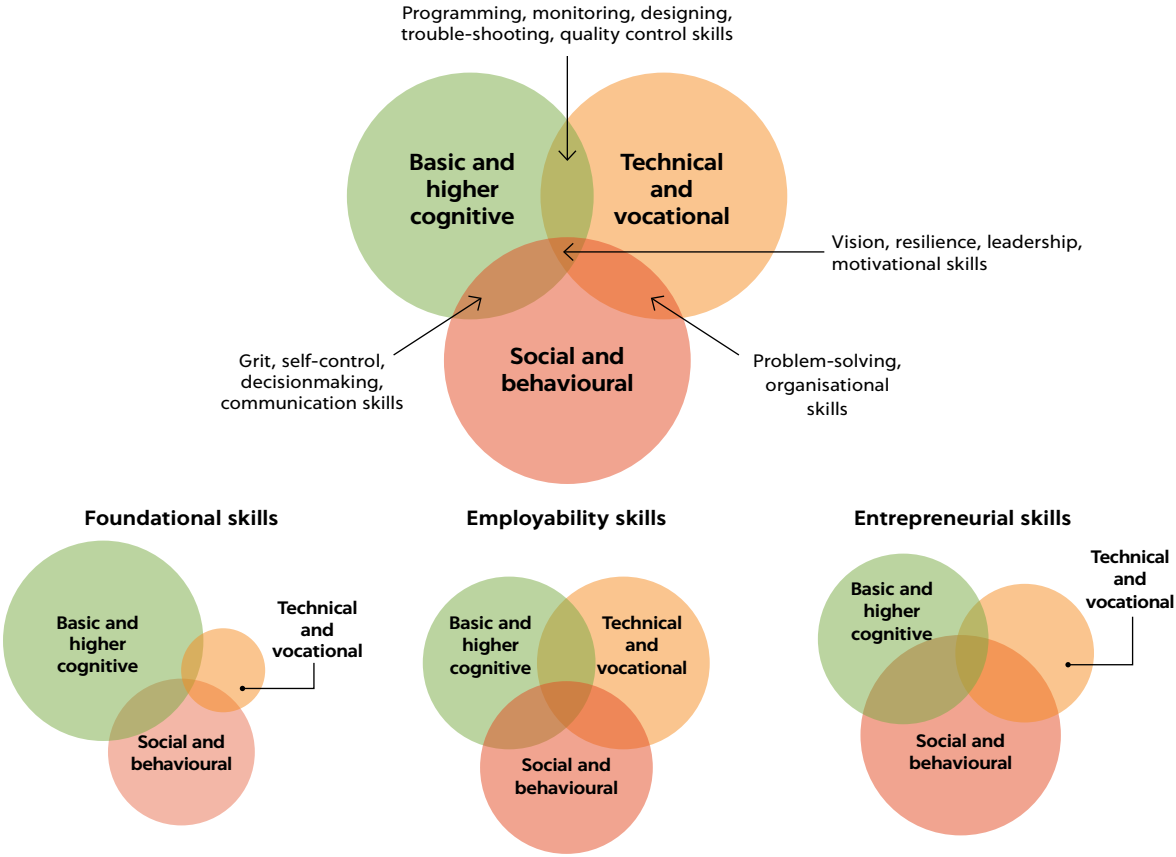
**The world’s largest school system is not producing enough literate and numerate workers**

Indian schools recognise and assess many cognitive skills needed in the 21st century workplace—reading, writing, numeracy, digital literacy—but not technical and vocational or social and behavioural skills. And they supply even the recognised cognitive skills inadequately. India’s workers have much less

education than those in other BRICS countries (figure 2.2), reflected in literacy rates 20 percentage points lower than in the other BRICS countries. The gaps are attributable to poor learning outcomes and high dropout rates—approximately 92% of school-age children are in primary school, but just 63% in secondary and higher secondary school.<sup>1</sup>

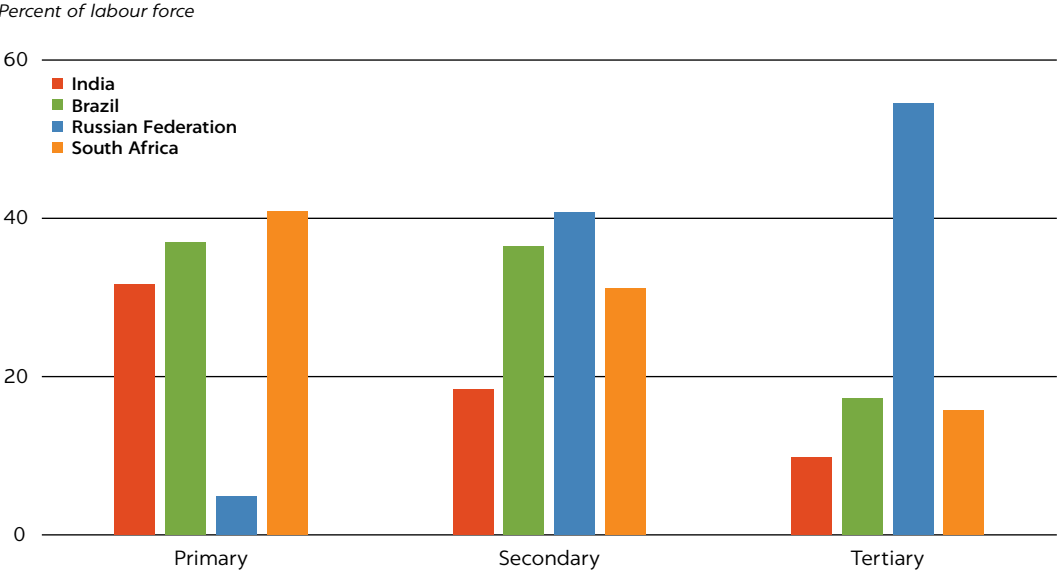
Schooling should have a positive impact on developing both cognitive and noncognitive skills and on later labour outcomes such as wages and productivity.<sup>2</sup> Social and behavioural skills like motivation and positive personality traits are required for improving cognitive scores.<sup>3</sup> The education system should also help children develop these skills through extracurricular activities, but co-scholastic areas—though recognised for building students’ self-confidence, self-control, sportsmanship, solidarity, teamwork, competitiveness and health—are not emphasised in the school curriculum.<sup>4</sup>

**FIGURE 2.1 How skills interact**



Note: See appendix A2.1 for a glossary of skills and examples of cognitive, technical and vocational, and social and behavioural skills.  
Source: NCAER.

**FIGURE 2.2 Lagging behind other BRICS nations, more than 30% of India’s workers have only a primary education and only 18% have a secondary education**



Note: Percentage share of labour force, by highest education level attained in 2010. The BRICS are Brazil, Russia, India, China and South Africa. Data for China are unavailable.  
Source: World Bank, World Development Indicators 2010.

The pre-vocational curricula is only partially followed, with the focus more on discipline and less on situation and personality.<sup>5</sup> And the pre-vocational curricula of India’s Central Board of Secondary Education (CBSE) is focused primarily on teaching “trades” rather than developing good attitudes towards work.

Complicating the problem of inadequate literacy and numeracy are rapid changes in technology.<sup>6</sup> The demand for skills is shifting from people with manual skills to those with higher cognitive skills and analytical and interaction skills. Digital initiatives, such as computer-aided learning, are complementing rather than substituting for current teaching methods in schools, seeking to overcome some of the handicaps of classroom teaching to the curriculum and to tests.<sup>7</sup> The scale of India’s education and skilling ecosystem in academic, vocational and technical education is vast (figure 2.3). The key is to manage it well to generate the equally massive skill acquisition that can meet the market test of employability in a rapidly changing social and technological environment.

**Technical and vocational education are too supply-driven and short term**

India’s technical and vocational education and training (TVET) system includes not only

vocational secondary education but also engineering colleges, polytechnics, industrial training institutes (ITIs) and apprenticeships (see figure 2.3).

The TVET system in India is still evolving and is inadequate to cater to the growing needs of industry.<sup>8</sup> The key ministries involved in the TVET system are the Ministry of Skill Development and Entrepreneurship, the Ministry of Human Resource Development (principally the Department of School Education and Literacy for TVET programmes in senior secondary schools and the Department of Higher Education for technical education), the Ministry of Micro, Small and Medium Enterprises, the Ministry of Rural Development and the Ministry of Housing and Urban Poverty Alleviation. At the state level the main providers are the Directorate of Technical Education, the private sector and nongovernmental organisations (NGOs). Despite the many agencies involved, only 2.2% of all persons aged 15–59 received formal vocational training and 8.6% received nonformal vocational training.<sup>9</sup>

Recent developments in vocational training include:

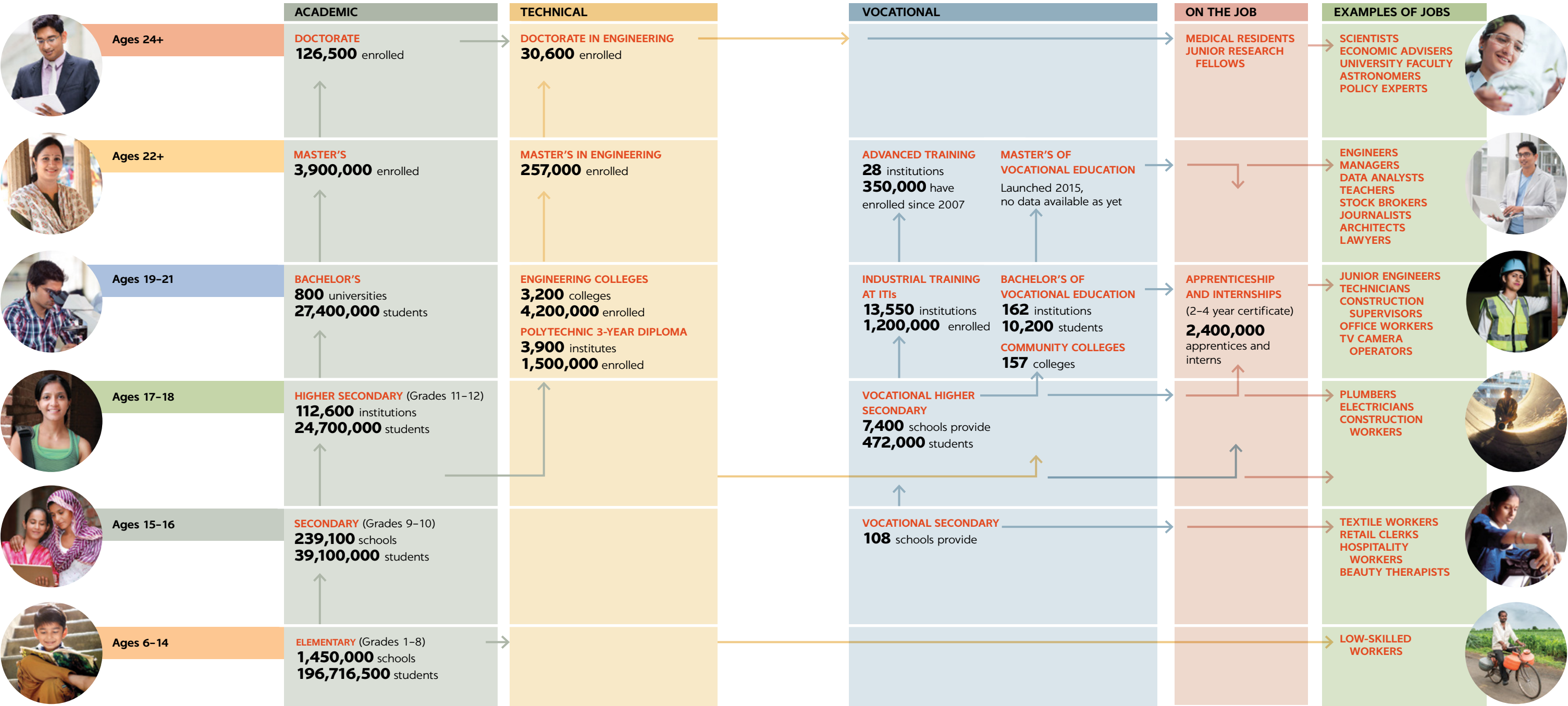
- Creating the new Ministry of Skill Development and Entrepreneurship (MSDE), which is devoted to the needs of vocational education and training. Agencies previously spread over various ministries have

The TVET system in India is still evolving and inadequate to cater to the growing needs of industry

FIGURE 2.3  
Big numbers for India’s education and skilling ecosystem

2,000,000 Indian institutions imparting skills  
300,000,000 Indians currently getting educated or skilled and will be looking for work

468,000,000 Indians now in jobs may (or may not) be acquiring skills on the job



Source: NCAER compilation from District Information System for Education (DISE) Flash Statistics, All-India Survey on Higher Education, AICTE and Ministry of Skills Development and Entrepreneurship Annual Report. All data are for 2015-16 except data for ITI enrollees, which are for 2016-17. Enrolment in Bachelor's programmes was higher than in higher secondary since the former may include school leavers from previous years who did not go on to college directly after school.

Note: Apprenticeships are also open to vocational secondary and higher secondary graduates and graduates of polytechnics, engineering colleges and industrial training institutes.



Poor perceptions of the relevance, quality, job placement impact, and links with higher education have discouraged enrolments in vocational education in schools

been brought under one aegis, including the Directorate General of Training (previously under the Ministry of Labour and Employment), which ran the oldest TVET program in the country. New agencies like the National Skill Development Corporation (NSDC), National Skill Development Agency (NSDA), National Skill Development Fund (NSDF) and Sector Skill Councils (SSCs) were created.

- The NSDC is the key agency of the government TVET. It is a public-private partnership between the government and the private sector aimed at promoting skill development. The Sharda Prasad Committee Report released in 2016 has recommended a comprehensive review of the Memorandum of Association of the NSDC.<sup>10</sup>
- Adapting the German model of vocational skilling, SSCs have been established in India, with 40 SSCs approved.<sup>11</sup> The SSCs are autonomous not-for-profit organisations guided by industry leaders in their respective sectors. They bridge the gap between what the industry wants and the skilling curriculum. Their key roles involve developing curriculum and courseware (of which very little existed before), developing qualification packs for each job role in their sector, training trainees and trainers, affiliating vocational training partners, developing assessment guides and strategies, recommending infrastructure and assessing and certifying trainers. The Prasad Committee has suggested that SSCs should be based on the National Industry Classification 2008, and therefore limited to the 21 SSCs pertaining to items in the classification (pared down from the current 40).<sup>12</sup> Further, that the creation of SSCs should be transferred from the NSDC to the NSDA. And that SSCs should be re-created with sector employers as members, rather than remain industry associations that are making standards and testing and certifying them at the same time, since this could create conflicts of interest.
- The National Skills Quality Framework (NSQF), developed in 2013, is a competency-based framework that organises qualifications by levels from one to ten relating to knowledge, skills and aptitude. The levels are defined as learning outcomes that the learner must possess regardless of whether they are obtained through formal, nonformal or informal learning. Many SSCs have

developed qualification packs up to level 6 out of 10 levels. Many VET courses offered by myriad ministries are being synched with the NSQF qualification packs, standardising VET around the country, but the NSQF level descriptors lack clarity and objectivity.

- A plethora of TVET schemes, both short-term and medium-term at various levels of education starting from 9th class to undergraduate, are provided by both public and private providers, with 17 Central Ministries offering skilling programmes other than MSDE.

Technical education is primarily provided in postsecondary courses and includes practical training for technicians who will be hired as supervisors. It spans engineering, technology, management, architecture, town planning, pharmacy, hotel management, catering technology and applied arts and crafts. Technical educational institutes in India can be categorised as Central Government-funded, State Government-funded and self-funded. The institutes include the Indian Institutes of Technology, Indian Institutes of Management, Indian Institute of Science, Bangalore, Indian Institutes of Science and Research, National Institutes of Technology, Indian Institutes of Information Technology, National Institute of Technical Teachers Training and Research, among others. In 2011–12 only 2.4% of the Indian population had technical degrees or diplomas or certificates, 1.1% in rural areas and 5.5% in urban.

Formal vocational education begins as early as grade 9 for sector-specific and occupation-specific skills with hands-on training. Vocational training may also be informally attained through family or other means. Technical education can provide sector-specific skills below or above the graduate level in a range of fields.

Poor perceptions of the relevance, quality, job placement impact, and links with higher education have discouraged enrolments in vocational education in schools, and the curriculum is far below international standards. Other obstacles include difficult school schedules, inadequate facilities for practical training, students' poor foundational skills from primary school and students' having to choose the vocational stream in Class 9, which is perhaps too early for India, leading students and parents to choose the "safer bet" of general education.<sup>13</sup>

Industrial training institutes are India's foremost vocational training platform outside schools. More than 13,550 ITIs teach 126 trades to about 1.2 million trainees each year, while seat capacity is 2.9 million. They are run by both government and private parties.

The ITIs provide long-term vocational training in both engineering and non-engineering trades, but their instructors, curriculum and infrastructure have been less than satisfactory. A study in Karnataka comparing ITI, secondary and higher secondary graduates found that after three years all three categories showed poor labour market outcomes, with 60% unemployed. Students who followed the traditional general education-oriented school system were likely to go farther than the ITI graduates, whose education options were limited.<sup>14</sup> And the firms hiring ITI graduates found their training inadequate. In October 2017, about 400 ITIs were de-affiliated.<sup>15</sup> And a Parliamentary panel found that ITIs were certified despite poor infrastructure, and it reprimanded the certifying agency.<sup>16</sup> Over the last few years the unemployability of graduates has led several ITIs and other TVET institutions to sign agreements with large industrial houses (box 2.1). These collaborations aim at a curriculum

better aligned with industry needs and the training of trainers.<sup>17</sup>

Short-term skilling programmes of a few months like the Pradhan Mantri Kaushal Vikas Yojana (PMKVY) offer occupational and job-specific vocational skills, focusing on information and communications technology, literacy and spoken English, and such noncognitive skills as anger management. But their quality remains uncertain, and dropout rates from the programmes and turnover rates from job placements are generally high. Short vocational training programmes of 150–300 hours duration neither make the youth easily employable nor meet the needs of industry. Having about 10,000 short-term training standards for programmes of a few months is too many. The focus should instead be on strengthening reading, writing and arithmetic skills and providing no more than 450 vocational training courses with a minimum duration of one year. Short-term training should be limited to recognising and certifying prior learning.

One-year vocational skilling programmes may prove more effective but are still in their early stages. The programmes offered by the Tata Institute of Social Sciences, and the Deen Dayal Upadhyaya–Grameen Kaushalya Yojana

Short vocational training programmes neither make the youth easily employable nor meet the needs of industry

#### BOX 2.1 "Learn and Earn" at Boeing and Saint Gobain

In 2016 two multinationals launched vocational training projects to skill their workforces.

Boeing, as part of an effort to develop suppliers for its global supply chain, combines vocational training with on-the-job training for frontline factory workers at its industrial partners. The first 30 students, trained for aerospace interconnect solutions, were hired by Rossell Techsys, the technology and engineering wing of Rossell India Limited. The second group went to Tata Advanced Materials Limited, which focuses on advanced composites for high-tech and industrial sectors, including spacecraft and aircraft.

Saint Gobain India, part of the French multinational Saint Gobain, offers a programme in modern manufacturing skills in the glass making industry. In these programmes, modelled after German vocational education, trainees are associated with a factory right from the

beginning. Training consists of a day of classes followed by five days on the shop floor, where trainees operate along with their coaches. The training is for three years, after which trainees are awarded a diploma in the field they studied. Students receive a stipend, with part sent to their families to persuade them to send the students for training rather than into unskilled work.

Both initiatives were collaborations with the Indo-Swiss Nettur Technical Training Foundation (NTTF), which worked with the NSDC on Learn and Earn. The programme, aimed at underprivileged youth from economically backward rural and industrially underdeveloped regions, was developed under the National Employability Enhancement Mission. Learn and Earn Training runs for two years, and the NTTF adds a third year to offer the diploma. The partnering industry bears the entire cost of the programme.

Source: Boeing (2016) and Dubey (2016).

Curricula and teaching practices of vocational training require a relook to prepare candidates with industry-relevant skills

(DDU-GKY) programmes offered by the Ministry of Rural Development, tend to be more sustainable, but are also in their early stages.

Private providers also offer vocational training based on industry needs. For example, SkillSonics offers fee-based training modules to both large and small companies. Dual-track Swiss apprenticeship modules—practical training combined with classroom training—run 2 to 3 years for multiskilled production technicians, or 6 to 12 months for specialised production technicians, equipping workers to perform tasks with international skill sets. SkillSonics also offers both shorter and longer courses of 4 to 52 weeks for NSDC and SSC candidates.

Government–industry partnerships have been launched under the National Skill Development Mission, and the MSDE was established, not only for training unemployable youth, but also for upskilling workers. NSDC provides industry-specific job role training. But it may not be sufficient to bridge the many skill gaps facing small and medium-size enterprises (SMEs). Training for micro, small and medium enterprises also needs to account for the multiskilling and multitasking demands on workers.

Curricula and teaching practices of vocational training both at the technical institutes and industrial training institutes and secondary schools require a relook to prepare candidates with industry-relevant skills. Supply-driven TVET has performed poorly in this respect, and to match trainee career aspirations requires greater engagement from industry practitioners and relevant stakeholders to develop and continually update the curricula in response to local realities, and to train trainers—including teacher-industry interface, trainee-industry interface for developing practical job-relevant technical skills, and soft (noncognitive) skill development for job interviews.<sup>18</sup>

The MSDE is planning to recruit retirees from industry and the army as trainers. But initiatives need to go beyond such moves, and existing trainers need to be continually upskilled in new technologies being adopted across industries, in addition to updating infrastructure and technologies at ITIs. Training practices could adopt a European dual-training approach, combining classroom theoretical training with simultaneous applications on the factory shop floor. Such models require extensive industry–academia collaborations and

need to be based on assessments of the demand for such skills.

The Indo-German Chamber of Commerce (IGCC) in Pune launched VETnet<sup>19</sup> in 2014 under its DUALpro programme to help industry meet needs for quality VET services and well-trained potential employees.<sup>20</sup> VETnet established a VET Council and specialised working groups in 2014, after which the IGCC conducted a pilot course in metal working in 2015 in collaboration with the Don Bosco Private Industrial Training Institute in Pune and several companies.<sup>21</sup> The training yielded positive learning outcomes for the trainees, prompting the IGCC to extend the course and develop a one-year course for industry mechanics. Trainees split their work week between developing technical skills based on classroom training and shop floor experience across different departments of the respective company, along with guidance on social, behavioural and problem-solving skills.

#### Apprenticeships for learning-by-doing and learning-while-earning

One of the key reasons Germany has the highest youth employment rate among European countries is that students have to compulsorily enrol for three years in part-time vocational education if they are not enrolled in school.<sup>22</sup> India's training institutes are gradually adapting the dual training model in collaboration with industry. For example, the ITI in Pusa, New Delhi has dual TVET programmes in collaboration with Maruti Suzuki and Siemens. The learning-by-doing and learning-while-earning models make apprenticeships attractive as trainees gain not only theoretical knowledge but also practical on-the-job training on a factory floor, along with exposure to a real work environment, not just a simulated workshop in a training institute. Degrees and apprenticeships tend to complement each other—with the former enabling signalling of knowledge gained at a formal educational institution, and the latter signalling a candidate's job readiness.<sup>23</sup>

Launched in 2016, the National Apprenticeship Promotion Scheme (NAPS) offers incentives to employers by sharing 25% of the cost of stipends paid to the apprentices and by reimbursing the cost of training at basic training providers. Its objective is to increase the number of apprenticeships to 50 million a year by 2020.<sup>24</sup>

#### Industry clusters for supplying skills to meet local demand conditions

While MSDE skill development initiatives follow the unified guidelines under the NSQF, any such training should factor in skill needs, capabilities and attitudes based on local socio-cultural settings and local labour market conditions.<sup>25</sup> The training also needs to be tuned to local industry-specific and firm-specific requirements and address the skills gap within the socioeconomic context in which workers operate.<sup>26</sup> Industry clusters tend to share several commonalities of sector concentration and socioeconomic and demographic characteristics, and this builds the case for cluster-based skill initiatives in collaboration with knowledge partners and training hubs.

In August 2016 the MSDE partnered with the German Corporation for International Cooperation GmbH (GIZ) to implement elements of German dual training in automobile, electronics and construction clusters in India. The project was planned to run for three years to improve vocational training in India's industrial clusters—including the automobile component cluster in Aurangabad, Maharashtra, the electronics cluster in Bangalore, Karnataka, and the construction cluster in Bhiwadi, Rajasthan. Implementation of cluster-based VET programmes involves coordinating with multiple stakeholders at central, state and local level, including the NSDC, the NSDA, SSCs, State Skill Development Missions, as well as regional and local business membership organisations. The project also aims to incorporate gender-sensitive approaches for a more inclusive skilling framework, considering the needs of both men and women.<sup>27</sup>

More home-grown initiatives such as the IL&FS Cluster Development Initiative Ltd. (IL&FS Clusters) work with the manufacturing sector, particularly SMEs, in enabling their access to quality industrial infrastructure through the cluster format. The Tripura Bamboo Cluster is a public–private partnership in which villagers have formed incense stick, handicraft and furniture and plantation clusters.

#### Imparting skills on the job to make skilling more demand-driven

On-the-job training to plug skill gaps and improve employability can involve typically

short-term training in noncognitive skills, training in cognitive skills such as functional language and communication skills, and longer term training in technical skills and domain knowledge or apprenticeship training. Typically, the large firms provide such training.

In well-functioning labour markets, firms are unlikely to invest in training for generic skills, because a trained worker is more likely to leave.<sup>28</sup> So a firm is likely to invest only in firm-specific (technical or nontechnical) skills that will improve worker productivity largely in the current job. However, firms in India such as Infosys, through its Campus Connect Programme, also impart generic skills for freshly recruited engineering graduates, who are more likely to have technical skills but fall short of communication skills and other soft skills. Further, the work experience in itself is of value. It imbues social and behavioural skills (such as teamwork, initiative, attitude towards work and working under pressure), and enhances industry knowledge and commercial awareness.

#### Large companies—training on the job

Of Indian companies in the organised sector, 16% were providing on-the-job training in 2007, but that rose to 36% in 2014, given the shortages of skilled workers.<sup>29</sup> Investment in training on the job is clearly more prevalent among large firms, which can bear the cost. In 2014, 60% of large firms were willing to train their full-time permanent employees (box 2.2), but only 25% of small companies and 39% of medium companies.

With technologies disrupting the workspace, IT service companies such as Wipro, Infosys and Tata Consultancy Services have programmes to reskill and upskill their workers. For example, Wipro started Newton's Cradle to reskill its employees.<sup>30</sup> In the programme, employees with more than five years' experience are retrained and redeployed in higher value projects. The National Association of Software and Services Companies (NASSCOM), the industry association, is working with its members to launch a comprehensive digital skilling platform, with the goal of reskilling 1.5–2 million workers in the IT–BPO sector over the next 4–5 years.<sup>31</sup>

#### Smaller companies—not training on the job

With 95% of firms employing fewer than five workers, and another 3% employing

With 95% of firms employing fewer than five workers, diseconomies of scale discourage on-the-job training



**BOX 2.2 Demand-driven interventions for on-the-job training in large firms**

- Bosch India started a “Learn by doing” apprenticeship programme for full-time engineering graduates—a 12-month course of on-the-job and classroom training in technical skills and non-cognitive skills such as decisionmaking.
- Infosys soft-skills training, running 3–4 months, is intended for fresh graduates recruited from campus placements and involves language, business and communication skills.
- GE Global Research has a multiyear Edison Engineering Development Programme that exposes university graduates with a master’s degree to real-world practical applications in addition to advanced engineering courses and project assignments.

Source: Company websites.

Small firms are more willing to invest in training if the government covers some of the cost

6–9 workers, diseconomies of scale discourage on-the-job training at such firms. So does contract work, especially when contracts are short or irregular. Compared with larger firms, smaller ones are even less likely to invest in generic skills because a trained worker is more likely to leave a smaller firm with fewer growth prospects, and even firm-specific training is deterred when similar technologies are used across an industry.<sup>32</sup> The result is underinvestment in training existing workers. Small firms are, however, more willing to invest in training if the government covers some of the cost.<sup>33</sup>

Although SMEs see little advantage in hiring apprentices, a 2014 International Labour Organization (ILO) case study found positive returns on investment for SMEs the first year after a completed apprenticeship, with benefits accruing in most cases during the apprenticeship itself. The NAPS, mentioned earlier, was launched precisely to incentivise industry, including SMEs, to hire apprentices and provide on-the-job training.

**Turning the vicious cycle virtuous: acquiring skills and generating good jobs**

Chapter 1 showed how the combination of inadequately educated and skilled workers, out-of-date labour laws, the rising ratio of wages to the cost of capital and persistent informality are feeding on each other and resulting in a self-reinforcing vicious cycle of not enough good jobs, far less than India is capable of and badly needs. This chapter has explored the problems in acquiring, imparting and assessing skills that result in the poor supply of skills by

workers and fuel this vicious cycle. Better public policies and programmes can break this in a number of ways (figures 2.4 and 2.5).

*Make sure all children are literate and numerate*

What can be done to increase literacy and numeracy? First, volunteer teachers and remedial teaching can fix some problems in the system. However, remedial teaching does what should happen in the formal school system—individual attention and instructional material that is suited to the ability of the learner. Remedial teaching has its own problem—volunteers may teach as they were taught. For instance, remedial courses in English at university still teach formal rather than functional grammar in the belief that this will improve students’ language proficiency.

Second, use technology.<sup>34</sup> But schools and teachers seem to have a limited view of what technology offers, merely displaying supplementary lessons or PowerPoint presentations, and universities preparing videos of professors lecturing. The range of options for using technology for education is wide. At one end of the spectrum are small learning objects and simulations. For instance, the Tata Institute of Fundamental Research creates simulations for science and mathematics that allow students to manipulate variables to understand the underlying concepts and relationships. At the other end of the spectrum is learner-driven education though technology that is proposed in minimally invasive education and self-organised learning environments,<sup>35</sup> though it still needs to be driven by a curriculum. Between the two extremes, simple technology using

**FIGURE 2.4 India’s vicious cycle of low skills and few good jobs—a low skilling trap**



**FIGURE 2.5 Moving to a virtuous circle of higher skills and many good jobs—escaping the low skilling trap**





High-performing school systems provide instructional leadership and enable teachers to learn from each other

smartphones offers access to multiple sources of information on the Internet so that teachers and students are not dependent on the textbook. Students can also use technology to create documents that combine text, graphics and video and use it to analyse data.

Third, address teacher professionalism. The education systems of the top-performing countries in OECD’s Programme for International Student Assessment get the right people to become teachers.<sup>36</sup> They also develop them into effective instructors through teacher education programmes that provide support for effective teaching. High-performing school systems, such as Singapore’s and Japan’s, use four broad approaches to support trainee teachers. They build practical skills during initial training by moving the lecture into the teacher’s classroom. They place coaches in schools to help the novice teacher. They get the right teachers to become principals. And they provide instructional leadership and enable teachers to learn from each other.

Recent curricula frameworks incorporate life skills by stressing the importance of inquiry and collaborative work in all school subjects.<sup>37</sup> There is a similar emphasis in the National Curriculum Framework in India, but its translation into textbooks remains weak, with learning objectives that are misaligned with the framework. This poses further challenges to the effectiveness of teachers who are judged by how well they follow the curriculum.

Since it is the teacher who handles classroom instruction, adequate teacher preparation is critical.<sup>38</sup> This preparation cannot be handled through short training sessions for in-service teachers that do not allow time for reflection, mentoring or practice.

*Make changes in curricula and teaching practices based on evidence about what is working*

Rashtriya Avishkar Abhiyan was launched in 2015 to motivate kids aged 6–18 to study science, mathematics and technology. The curriculum is the starting point for devising or structuring pedagogical strategies, but there is little emphasis on teaching practices in India. Revised curricula have not improved learning outcomes much,<sup>39</sup> even though interactive teaching methods are known to have a positive impact on learning outcomes.<sup>40</sup> Even with innovative pedagogical methods, the impact on learning outcomes is not significant due to factors such as teacher and student absenteeism

and children attending the same grades with different levels of learning.<sup>41</sup> More than infrastructure, the focus needs to be on a more dynamic curriculum and teaching practices.

The Shaala Siddhi or School Evaluation Dashboard put out by the National University of Education Planning and Administration helps each school provide consolidated self-evaluation reports on key performance domains and core standards, including action for improvement. It can be used for viewing and analysing school evaluation reports and data, which can further be consolidated at the block, district and state level to extend appropriate support to schools. It also allows schools to monitor their own progress and improvement.<sup>42</sup>

*Ramp up assessments to know whether and what skills are imparted with what success*

Understanding India’s skilling ecosystem clearly requires new forms of analytical work, research and assessments driven by the demands of India’s workplaces and new dashboards. Schemes need to be assessed for their contribution to acquiring (this chapter), matching (chapter 3) and anticipating (chapter 4) skills to better understand how they can work together to break out of the gridlock embedded in the vicious cycle of low skilling and poor jobs.

Though not definitive, table 2.1 is a first pass at assessing the many skilling schemes in India for their performance on design, implementation and impact on the three themes of acquiring, matching and anticipating skills. The establishment of a National Skills Research Division in MSDE to serve as a think tank to provide evidence based policy inputs to government and to collaborate with independent research organisations such as NCAER is highly welcome.

Programme assessments can be robust only if they themselves are based on sound student and worker assessments. Traditional student assessments have focused on certification outcomes, such as board exams for individuals and literacy and employment rates for institutions, but with little attention to employability and the portability of skills (and as will be discussed in chapter 4, on being prepared for the future of work). And they have usually focused only on cognitive skills, whether subject mastery in school (again by rote) or technical understanding in the workplace.

Continuous and Comprehensive Evaluation (CCE) was introduced by the CBSE to assess all

TABLE 2.1 Rating India’s largest skilling schemes (see also Annex 2.2)

SCHEME (ANNUAL SPENDING 2017-18, UNLESS OTHERWISE NOTED)		PERFORMANCE ON					
		ACQUIRING	MATCHING	ANTICIPATING			
General education							
1. <b>Mid-Day Meal Scheme</b> Improving nutrition among primary school children to enhance enrolment, attendance, cognitive achievement and retention. (Rs 10,000 crore; \$1.5 billion)	DESIGN	✓	—	—			
	IMPLEMENTATION	✓	—	—			
	IMPACT	✓	—	—			
2. <b>Rashtriya Madhyamik Shiksha Abhiyan</b> Universal secondary education with goal of universal retention by 2020. Subschemas improve access for disabled students, construct girls' hostels in educationally backward blocks for retaining girls in secondary education and build information and communications technology skills. (Rs 3,914 crore; \$602 million)	DESIGN	✓	—	—			
	IMPLEMENTATION	✓	—	—			
	IMPACT	✗	—	—			
3. <b>Rashtriya Uchchar Shiksha Abhiyan</b> Improving the quality of teaching-learning processes to produce employable and competitive graduates, post-graduates and PhDs. This scheme involves central government funding for state higher educational institutions. (Rs 1,300 crore; \$200 million)	DESIGN	✓	—	—			
	IMPLEMENTATION	✓	—	—			
	IMPACT	✗	—	—			
4. <b>Saakshar Bharat</b> Improving adult education: skill development; equivalency to formal education and functional literacy and numeracy for nonliterates. Promoting a learning society through continuing education. Between August 2010 and March 2017, 66.9 million adults passed exams given by the National Institute of Open Schooling and National Literacy Mission Authority; the effective passing rate was 75.1%. (Rs 320 crore; \$49 million)	DESIGN	✓	—	—			
	IMPLEMENTATION	✓	—	—			
	IMPACT	✓	—	—			
5. <b>Sarva Shiksha Abhiyaan</b> Universal enrolment and retention in primary education up to class 8. The scheme includes reaching out to “hardest to reach” girls for upper primary level education; community mobilisation and gender sensitisation; and setting up upper primary level residential schools for girls in the Scheduled Caste (SC), Scheduled Tribe (ST), Other Backward Classes (OBC) and minority communities. (Rs 23,500 crore; \$3.6 billion)	DESIGN	✓	—	—			
	IMPLEMENTATION	✓	—	—			
	IMPACT	✓	—	—			
Technical and vocational education							
6. <b>Sub-mission on Polytechnics</b> Creating technically skilled manpower. Students after class 10 are eligible to apply. Polytechnics offer three-year diploma courses in civil, electrical and mechanical engineering; electronics; computer science; medical lab technology; hospital engineering; architectural assistantship; leather technology; sugar technology; printing technology; garment technology; beauty culture; textile design and other areas. India had 3,867 polytechnics in 2017-18. (Rs 50 crore; \$7.7 million)	DESIGN	✓	✓	—			
	IMPLEMENTATION	✓	✓	—			
	IMPACT	✓	✗	—			
✓	GOOD	✗	NEEDS IMPROVEMENT	?	UNKNOWN OR TOO NEW	—	NOT APPLICABLE



SCHEME (ANNUAL SPENDING 2017-18, UNLESS OTHERWISE NOTED)		PERFORMANCE ON		
		ACQUIRING	MATCHING	ANTICIPATING
7. <b>Apprenticeship training</b> Enhancing technical skills for job absorption. The National Apprenticeship Training Scheme (ATS) covers graduate, technician and technical (vocational) apprentices. The Apprenticeship Training Scheme covers trade and optional trade apprentices. The National Apprenticeship Promotion Scheme, introduced in 2016 under the above ATS promotes apprenticeship. The National Employability through Apprenticeship Program, a public-private partnership, helps unemployed youth build skills through learning and learning by doing while earning. (Rs 556 crore; \$86 million)	DESIGN	✓	✗	—
	IMPLEMENTATION	✓	✗	—
	IMPACT	✓	?	—
8. <b>Deen Dayal Upadhaya Grameen Kaushalya Yojana (DDU-GKY)</b> Skilling rural youth between the ages of 15 and 35 from poor families. DDU-GKY is part of the National Rural Livelihoods Mission, tasked with diversifying the incomes of rural poor families and catering to the career aspirations of rural youth. The programme trained 162,586 students and placed 84,900 in 2016-17. Some 654 centres offer skills in 329 trades. (Rs 871 crore; \$134 million)	DESIGN	✓	✓	—
	IMPLEMENTATION	✓	✓	—
	IMPACT	✓	?	—
9. <b>Craftsman Training Scheme implemented through Industrial Training Institutes (ITIs)</b> ITIs have grown from 59 in 1956 to 13,550 up to December 2016 (2,150 in government and 11,200 private). Candidates at least 14 years old may be enrolled. ITI courses also run in 500 polytechnics. The number of people enrolled was 1.2 million in 2016-17. (Rs 68.4 crore; \$10.5 million, 2015-16)	DESIGN	✓	✓	—
	IMPLEMENTATION	✓	✗	—
	IMPACT	✓	✗	—
10. <b>National Urban Livelihoods Mission</b> Developing skills and providing credit facilities for the urban poor. Skills training covers market-based jobs and self-employment. The scheme strives to facilitate easy access to credit in district headquarter towns and all other cities with a population of 100,000. The scheme aims at universal coverage. (Rs 349 crore; \$54 million)	DESIGN	✓	✓	—
	IMPLEMENTATION	✓	✓	—
	IMPACT	?	?	—
11. <b>Bachelor of Vocation degree in universities</b> Enhancing employability of students via vocational courses in universities. The courses have been mapped with National Skills Quality Framework levels 5 to 7. There are 162 B.Voc. colleges/universities. (Rs 10 crore; \$2 million, 2016-17)	DESIGN	✓	✓	✓
	IMPLEMENTATION	✓	✓	?
	IMPACT	?	?	?
12. <b>Community colleges</b> Providing low cost and high quality education that integrates skills in higher education. The distribution of modules and credits between general and vocational education is 40:60. In 2015-16, 89 trades were identified. There are 157 community colleges. (Rs 25 crore; \$3.8 million)	DESIGN	✓	✓	✓
	IMPLEMENTATION	✓	✓	?
	IMPACT	?	?	?
✓ GOOD	✗ NEEDS IMPROVEMENT	?	UNKNOWN OR TOO NEW	— NOT APPLICABLE

SCHEME (ANNUAL SPENDING 2017-18, UNLESS OTHERWISE NOTED)		PERFORMANCE ON		
		ACQUIRING	MATCHING	ANTICIPATING
13. <b>Jan Shikshan Sansthan (JSS)</b> Provide vocational training, literacy and life skills to nonliterate, neo-literate and school dropouts in skills with a market in their region. There were 221 JSS in India as of 2009-10. (Rs 40 crore; \$6 million)	DESIGN	✓	?	—
	IMPLEMENTATION	✗	?	—
	IMPACT	?	?	—
14. <b>Pradhan Mantri Kaushal Vikas Yojana (PMKVY): Recognition of prior learning</b> Assessing and certifying informally trained vocational workers through recognition of prior learning. This scheme started in 2016-17. <b>Pradhan Mantri Kaushal Vikas Yojana (PMKVY): Short-term training</b> Short-term training in industry-relevant skills for school or college dropouts or unemployed youth that will help them secure a better livelihood. Student enrolment was 34,757 in 2016-17. (Rs 1776 crore; \$273 million)	DESIGN	✓	✓	—
	IMPLEMENTATION	✓	✓	—
	IMPACT	?	?	—
16. <b>Vocationalisation of secondary and higher secondary education</b> The scheme has created 21,000 sections in 9,619 schools with a capacity of about 10 lakh students at the 10+2 level as of March 2016. The vocational education corresponds to National Skills Quality Framework levels 1 to 4. (No separate budget)	DESIGN	✓	✓	—
	IMPLEMENTATION	✗	✗	—
	IMPACT	?	?	—
✓ GOOD	✗ NEEDS IMPROVEMENT	?	UNKNOWN OR TOO NEW	— NOT APPLICABLE

Note: See appendix A2.2 for fuller descriptions and comments. The three schemes, Sarva Shiksha Abhiyaan, Rashtriya Madhyamik Shiksha Abhiyaan and Teacher Education have been combined to form one scheme Samagra Shiksha Abhiyaan, effective May 2018.

aspects of a student’s development on a continuous basis throughout the year. The assessment covered both scholastic subjects and co-scholastic areas such as performance in sports, art, music, dance, drama and other cultural activities and social qualities. CCE gave more weight (40%) than in the past to formative evaluation (class tests, homework, quizzes, projects and assignments directed throughout the year) than summative evaluation (60%, examination/test conducted at the end of a term or year) of student learning. It also determined that students should not face board exams before class 8. However, the CCE came to an end in 2016-17 with compulsory board examinations for Class 10 from 2018, carrying 80% of the weightage. The impact of CCE on learning outcomes remains open to debate.

The government needs to extend the National Assessment Survey for Classes 1 to 8 to Classes 1 to 12 to test for learning outcomes. Further, it needs to test for functional skills, such as telling time, adding weights, or counting money, that a young person might have even if they can’t do

the same calculation in an academic form. This is similar to what the Annual Status of Education Report (ASER) 2017 report has done.<sup>43</sup>

The quality of skill acquisition in India’s post-secondary higher education is now being assessed by the India Skills Reports (box 2.3). The employability of final year students in various educational programmes between the ages of 18 to 29 remains below 50%, though there has been some improvement.

#### Adopt international learning standards

The Programme for International Student Assessment (PISA) is an international survey held every three years to test the performance of 15-year old students in science, mathematics, reading, collaborative problem solving and financial literacy. According to the only PISA survey conducted in India in two states in 2009, the Indian states of Tamil Nadu and Himachal Pradesh ranked 72 out of the 74 countries or regions that participated, lower than Kyrgyzstan. These states with presumably

According to the only PISA survey conducted in India in two states in 2009, the Indian states of Tamil Nadu and Himachal Pradesh ranked 72 out of the 74 countries or regions that participated

Entrepreneurship interweaves multiskilling and higher cognitive skills, such as creativity and critical thinking, with technical skills and job-specific skills, including sectoral knowledge

**BOX 2.3 The Wheebox Employability Skills Test: India Skills Report 2017 and 2018**

The Wheebox Employability Skills Test (WEST) included all 29 states and 7 union territories and 3,000 educational campuses across India and assessed about 560,000 candidates on parameters like domain knowledge, computer skills, numerical and logical aptitude, critical thinking, and such behavioural traits as learning agility, adaptability, interpersonal skills, emotional intelligence, conflict resolution and self-determination.

The employability of final year students (between the ages of 18 and 29) was tested using WEST, including those getting degrees in engineering, MBAs, BAs, BComs, BScs, MScs, BPharmas and including students at Industrial Training Institutes and Polytechnics. All those who scored more than 60% on WEST were considered employable. Candidates overall showed an improvement in employability from 33% in

2016 to 40% in 2017, but the employability of engineers, MBAs, BScs and MScs fell slightly. Engineering students were found most employable at 50%.

The best performers in English as a second language were West Bengal and Maharashtra; in numeracy, West Bengal and Delhi; in critical thinking, Delhi and West Bengal; and in computer skills, Rajasthan and Delhi.

The India Hiring Intent Survey 2017 shows that skills required by employers include domain expertise, integrity and values, learning agility, cultural fit, communication, numerical and logical agility, result orientation, adaptability and interpersonal skills.

The *India Skills Report 2018* shows an improvement in overall employability from 40% in 2017 to 46% in 2018.

Source: Peoplestrong et al. 2017, 2018.

the best education outcomes in India were low achievers when assessing problem solving skills of 15-year-old students. China (Shanghai) and Singapore were the best performers.

The Indian government has decided to participate in the OECD PISA Test in 2021. In preparation, students from *Kendriya Vidyalayas* and *Navodaya Vidyalayas* will start participating in the annual PISA tests from 2018 onwards.

**Focus and consolidate technical and vocational education**

As the Prasad Committee has recommended, there is a strong need to limit short-term skilling programmes to recognition of prior learning and to focus on longer-term programmes. Vocational education should be offered after students have finished 10 years of school with strong foundational skills in reading, writing and numeracy. The SSCs need to be revamped. The NSQF needs to be strengthened and the ITIs and polytechnics should be upgraded. Demand-side vocational training models like Dual VET need to be encouraged. The apprentice system needs to be strengthened and linked with the NSQF system.

**Reach special groups**

*Skilling entrepreneurs*

Entrepreneurs take risks in uncertain environments, and the vast majority in India are necessity entrepreneurs, operating as own-account workers or micro-entrepreneurs. Opportunity entrepreneurs, by contrast, make up just over 1% of the workforce.<sup>44</sup>

Both types of entrepreneurs need accounting and financial management skills, marketing skills and inventory management skills. Lacking numeracy, financial literacy and digital literacy can impede cash flow, inventory management and access to formal sources of credit. Lacking adequate capital for future investment reduces the long-term viability of the enterprise. Entrepreneurship interweaves multiskilling and higher cognitive skills, such as creativity and critical thinking, with technical skills and job-specific skills, including sectoral knowledge.<sup>45</sup>

Several institutions offer entrepreneurial skills and incubation support (box 2.4).

Micro-enterprises also need linkages with markets and livelihood activities. Mentoring support over the life cycle of the business, especially to vulnerable low-income groups, is

**BOX 2.4 Boosting entrepreneurial skills**

The central government established the Ministry of Skill Development and Entrepreneurship (MSDE) to boost entrepreneurial skills, including through the Indian Institute of Entrepreneurship, focusing on training, research and consultancy services for SMEs. It also launched the National Institute for Entrepreneurship and Small Business Development to promote entrepreneurship training.

- StartUp India Learning Program (StartUp India) is a free government-supported online learning programme, following up on Startup India, promoting bank financing for startup ventures. Developed by Invest India in collaboration with UpGrad, it offers structured learning modules for aspiring and new entrepreneurs.
- *Deen Dayal Upadhyay Swaniyojan Yojana*, the rural avatar of StartUp India launched in 2016, promotes entrepreneurship especially among self-help groups and women. It provides skills for self-employment and livelihood generation, with the potential for credit access through government-backed loans.
- The *Pradhan Mantri Kaushal Vikas Yojana (PMKVY-II)* requires training providers to include financial literacy and digital literacy in their curricula, along with core competencies for job roles across sectors prescribed by India's National Skills Qualification Framework. The goal is to ensure self-employment for those unable to secure wage employment.
- In schools of management and technology, business plan competitions as part of regular

coursework can help the practical application of classroom learning and also serve as launch pads for startups. Such opportunities are primarily restricted to top tier schools, such as the Indian Institutes of Management and the Indian Institutes of Technology, and need to be broader based.

- The NASSCOM “10,000 startups” initiative launched in 2013 has the goal of aiding the growth of 10,000 startups by 2023 through funding, acceleration, mentoring and enterprise connect.
- The MSDE has launched the Skills Strengthening for Industrial Value Enhancement (STRIVE) scheme with assistance from the World Bank. MSDE has also launched the Skills Acquisition and Knowledge Awareness for Livelihood Promotion (SANKALP) scheme with World Bank support. Both schemes are aimed at institutional reforms and improving the quality and market relevance of skill development training programmes. They both support the National Skills Development Mission of the Government of India.
- Friedrich-Naumann-Stiftung für die Freiheit, Germany, in coordination with the Tamil Nadu Small and Tiny Industry Association, launched innovation vouchers in Tamil Nadu in 2012. The voucher programme encouraged local entrepreneurs to come forward with their ideas and business plans, an improvement over providing incubation support based on areas pre-determined by the funder.

Source: Literature reviews and agency websites.

also necessary. Women are encouraged to form cooperatives as support networks and platforms for developing life skills.

Far more is needed to train and support the vast number of self-employed, taking into account their level of schooling.<sup>46</sup>

The Pradhan Mantri Kaushal Vikas Yojana (PMKVY-II) programme has made it mandatory for skill training providers to impart additional hours of training in financial literacy and digital literacy, apart from training in core

competencies. The goal is to ensure self-employment for those who are unable to secure wage employment. Such necessity-driven entrepreneurs need to be further connected to labour networks for access to markets. Lifecycle support through co-operatives and access to supply chain networks, as done by the Self-Employed Women's Association of India (SEWA Bharat) for women from marginalised backgrounds, can create pathways for entrepreneurship under master networks. Peer-effects

Far more is needed to train and support the vast number of self-employed, taking into account their level of schooling



Recognition of prior learning can provide pathways for skill certification and further skill upgrading for informal workers without formal vocational training

and training in business skills enhance the ability to launch businesses and/or expand existing micro-enterprises and hire workers.<sup>47</sup> For existing livelihood entrepreneurs, formal recognition and certification of skills can provide pathways for skill upgradation based on industry needs, along with the potential for connecting such entrepreneurs to digital platforms or industry value chains, tapping into previously inaccessible markets.

### *Skilling informal workers*

Recognition of prior learning can provide pathways for skill certification and further skill upgrading for informal workers without formal vocational training. Skill certification can signal higher productivity to potential and existing employers and can thus pave the way for social recognition, job mobility and better wage and compensation benefits. Once identified, upskilling these workers with digital skills and basic financial literacy will increase access to networks and markets and enhance livelihood opportunities. Recognition of prior learning for wage workers can be implemented at factory sites, employer premises and industrial clusters. However, a vast majority of informal workers are operating as self-employed necessity-driven micro-entrepreneurs. These self-employed workers can be certified via traditional clusters (such as, for example, handloom clusters in the Northeast), networks of master artisans, by UWIN (Worker Index Number) cards, or by Aadhaar biometric identification. The Ministry of Labour announced in January 2018 that it would issue UWIN cards to some 470 million informal workers to bring them under the social security net. It proposes to complete this exercise before the end of FY2018–19. The UWIN card is to be seeded with the Aadhaar number of the informal worker.

### *Skilling workers for lifelong learning*

There's more to learning than memorising facts or figures, or preparing for an examination, too often central to formal institutional learning in India. Cognitive learning, such as learning to learn, includes acquiring knowledge, skills, attitudes and aptitudes that prepare individuals for quick effective learning, with the eventual goal of becoming independent learners for lifelong learning. That requires developing such skills as logical reasoning and

decision-making—being willing to experiment, to be open to growth opportunities and to acquire new capabilities. Learning to learn thus enhances adaptability, supporting job security in labour markets that are much more flexible.

Initiatives such as open access massive open online courses (MOOCs), or app-based learning modules such as those provided by Pratham and through the EkStep Foundation, provide access for upgrading skills. The government, on its part, can offer grants/tax rebates to incentivise uptake of formal skill upgrading courses for lifelong learning, such that the workforce remains agile and adaptive to new trends in the economy.

Online learning courses are popular among working professionals and students. Almost 98% of students reported receiving benefits in the pursuit of their educational courses. According to a recent KPMG report, online education in India is expected to grow eight-fold by 2021, to USD 2 billion from 247 million in 2016. The paid user base is expected to grow at a compound annual rate of 43%, from 1.6 million users in 2016 to 9.5 million in 2021. Demand is very high for supplementing primary and secondary education, test preparation for engineering and government service courses, reskilling and online certifications, higher education, and language and casual learning.<sup>48</sup> The Khan Academy is a popular online source offering practice exercises, instructional videos and personalised dashboards on subjects like math, science, computer programming and history. It also has tie-ups with institutions like NASA, the California Academy of Sciences and MIT.<sup>49</sup> SWAYAM is a free online electronic education platform sponsored by the Government of India.

The EkStep Foundation's platform, developed by Nandan and Rohini Nilekani and their team, provides learning and content frameworks and tools, and increases access to learning opportunities by enabling and facilitating interaction between content creators, learning facilitators and learners across contexts and content types. EkStep is thus both an open learning platform and a utility focusing on improving basic literacy and numeracy, but is also scalable through partner networking and co-creation of other learning content.

Notable government initiatives include: the National Repository of Open Educational Resources, with a collection of 20,000 resources

in 29 languages on both school and teacher education; e-Pathshala developed by NCERT for dissemination of educational resources; and Saransh, an online platform for improving interaction between schools and parents.

### **Ensure that skills are portable across other jobs and sectors**

This chapter began by defining foundational, employability and entrepreneurial skills. Many of these skills, particularly the foundational and the employability ones, can be job specific or skills that stay with the worker and are therefore portable. Portable skills that workers can carry with them to any job require innovative, good-quality primary and secondary education and training, complemented with relevant vocational training and skills, along with ensuring that students complete their courses. Portable skills such as critical thinking and problem solving are directly linked to deep knowledge of the content and require innovative teaching approaches. Some of the good practices on imparting portable skills or core work skills involve interactive teaching practices where instructors facilitate enquiry, critical thinking and creativity instead of teaching

to text; learner-centred teaching approaches; emphasis on learning by doing; and experiential based learning, working in teams and mentoring programmes that link students and trainees to professionals.<sup>50</sup>

The German Federal Institute for Vocational Education and Training, for instance, develops labour market research to identify core transferable and vocational skills.<sup>51</sup> Trends over the last decade point towards placing more emphasis on multidisciplinary core skills that are portable, such as ICT skills, communication and language skills, financial literacy skills, critical thinking and reasoning, learning to learn and teamwork.

Of graduates from government-sponsored ITIs or the ATS, 34% claimed that no jobs were available in their area of training.<sup>52</sup> So, task-specific vocational skills and portable skills that can be applied across different work situations need to be given even more importance.

This report has developed the triad of acquiring-matching-anticipating skills that if implemented well can help turn the vicious cycle of low skilling and not enough jobs to a virtuous circle of good skilling and good jobs. Skills that are portable across sectors and jobs are a vital element of this transition from the vicious to the virtuous.

Portable skills such as critical thinking and problem solving are directly linked to deep knowledge of content

APPENDIX A2.1 A glossary of skills

**Active learning**—understanding the implications of new information for both current and future problem-solving and decision-making.

**Advanced digital skills**—advanced technical skills like programming, quality control analysis and technology design. It may further include advanced computer programming, applications development, big data analytics, ability to work on algorithms and neural networks.

**Applied mathematics**—using mathematics to solve problems at the workplace.

**Attitude to work**—in the Indian context includes working eight hours a day, being punctual, and so on. It may also involve other skills like listening and speaking in a socially sensitive manner in the context of work.

**Basic digital skills**—mobile literacy, basic computer literacy, responding to email/text messaging.

**Cognitive flexibility**—the ability to switch between mental processes in order to adapt behaviour in response to changing environment.

**Communication**—providing information to supervisors, co-workers and subordinates by telephone, in written form, e-mail or in person.

**Complex communication skills**—oral and written skills to transmit complicated ideas.

**Complex problem solving**—identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.

**Complex technical problem solving**—abstract reasoning, analytical skills, critical thinking to provide insightful job-relevant solutions.

**Creativity**—developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.

**Critical thinking**—using logic and reasoning to identify the strengths and weaknesses of

alternative solutions, conclusions or approaches to problems.

**Emotional intelligence**—the measure of an individual’s abilities to recognise and manage their emotions and the emotions of other people, both individually and in groups. It includes:

- *Self-awareness*—being aware of and understanding emotions as they occur and as they evolve. It is wrong to think of emotions as either positive or negative. Instead, think of them as appropriate or inappropriate.
- *Self-management*—the emotions you are feeling at any given time or in any given circumstance and how well you manage them.
- *Self-motivation*—our personal drive to improve and achieve, commitment to our goals, initiative, or readiness to act on opportunities and optimism and resilience.
- *Empathy*—an awareness of the needs and feelings of others both individually and in groups and being able to see things from the point of view of others.
- *Social/interpersonal*—developed capacities to work with people, includes coordination, instructing, negotiation, persuasion, service orientation and social perceptiveness.

**Financial literacy**—the ability to understand how money works in day-to-day functions and how someone manages it, invests it and offers it to others. More specifically, it refers to skills and knowledge that allow an individual to make informed and effective decisions with all of their financial resources.

**Financial management**—financial accounting, investment management and corporate finance.

**Functional digital skills**—planning events, developing budgets, or managing projects using digital technology/computers, digital marketing on websites and the ability to use social media for information dissemination.

**Leadership skills**—an amalgam of thinking strategically, planning and delivery skills, people management skills, change management and innovation, communication and persuasion and influencing skills.

**Listening/active listening**—paying full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate and not interrupting at inappropriate times.

**Mathematical reasoning**—the ability to choose the right mathematical methods or formulas to solve a problem.

**Numeracy**—a necessary skill for all occupations, is basic mathematical literacy and indicates a basic ability to work with numbers.

**Problem-solving skills**—solve novel, ill-defined problems in complex, real-world settings.

**Psychomotor skills**—areas that require strength and dexterity and involve manual skills.

**Reading comprehension**—understanding written sentences and paragraphs in work-related documents.

**Social sensitivity**—sensitivity towards gender, caste and religious concerns.

**Speaking**—talking to others to convey information effectively, using the appropriate language at the workplace.

**System skills**—capacities to understand, monitor and improve socio-technical systems, include judgment and decisionmaking, systems analysis and systems evaluation.

**Technical skills**—developed capacities used to design, set-up, operate and correct malfunctions involving application of machines or technological systems, such as equipment maintenance, equipment selection, installation, operation and control, operation monitoring, operations analysis, programming, quality control analysis, repairing, technology design and troubleshooting.

**Writing**—communicating effectively in writing as appropriate for the needs of the audience.

Skills illustrated

BASIC COGNITIVE	HIGHER COGNITIVE	SOCIO-EMOTIONAL SKILLS	TECHNICAL AND VOCATIONAL SKILLS
<ul style="list-style-type: none"><li>• Reading literacy</li><li>• Writing</li><li>• Numeracy/ mathematics</li><li>• Communication</li><li>• Language skills</li><li>• ICT literacy to skills</li><li>• Financial literacy</li><li>• Self-learning to active (independent) learning</li><li>• Active listening</li><li>• Science</li><li>• Problem solving</li></ul>	<ul style="list-style-type: none"><li>• Learning strategies</li><li>• Critical thinking</li><li>• Complex problem solving</li><li>• Complex communication</li><li>• Creativity</li><li>• Independent research</li></ul> <p><b>Systems skills</b></p> <ul style="list-style-type: none"><li>• Judgement and decision-making</li><li>• Systems analysis</li><li>• Systems evaluation</li></ul> <p><b>Resource management skills</b></p> <ul style="list-style-type: none"><li>• Financial resources</li><li>• Management resources</li><li>• Personnel resources</li><li>• Time management</li></ul>	<ul style="list-style-type: none"><li>• Conscientiousness (including attitude towards work)</li><li>• Social sensitivity</li><li>• Openness to experiences</li><li>• Extraversion</li><li>• Agreeableness</li><li>• Neuroticism/ emotional stability</li><li>• Instructing</li><li>• Negotiation</li><li>• Persuasion</li><li>• Decision-making</li><li>• Coordination</li><li>• Emotional intelligence</li><li>• Social perceptiveness</li><li>• Service orientation</li></ul>	<p><b>Technical skills</b></p> <ul style="list-style-type: none"><li>• Equipment maintenance</li><li>• Equipment selection</li><li>• Installation</li><li>• Operation and control</li><li>• Operation monitoring</li><li>• Operations analysis</li><li>• Programming</li><li>• Quality control analysis</li><li>• Repairing</li><li>• Technology design</li><li>• Troubleshooting</li></ul> <p><b>Vocational trades</b></p>

Source: O\*Net, <https://www.onetonline.org/>



**APPENDIX A2.2 Explanations for ratings in table 2.1**

Based on interviews with industry representatives and training providers and reviews of existing assessments. Responsible ministry in parentheses.

**Mid-Day Meal Scheme (MHRD).** There is evidence that the Scheme does have a positive impact on overall cognitive ability of primary school children. Further, foundational cognitive ability also affects future learning outcomes. Even with implementation challenges, the Scheme is having an impact.

**Rashtriya Madhyamik Shiksha Abhiyan (MHRD).** The evidence is limited but this scheme has the same challenges as Sarva Shiksha Abhiyan with focus on general knowledge and acquiring of a limited set of skills, if any. The recent *ASER 2017: Beyond Basics* report points to a significant gap in skills in youth aged 14–18 years.

**Rashtriya Uchchatar Shiksha Abhiyan (MHRD).** The India Skills Reports indicate improvement in employability over the years for people with higher education including general and technical. Employability has touched a new high of 45.6% in 2018.<sup>53</sup>

**Saakshar Bharat (MHRD).** While programme outcomes show improvement, the scheme is only resulting in the acquisition of foundational literacy and numeracy skills.

**Sarva Shiksha Abhiyaan (MHRD).** Of the 16 foundational cognitive and noncognitive skills, the scheme impacts six—reading, writing, numeracy, language, ICT literacy, science and general knowledge. And even though there has been improvement in 2016, the quality remains poor, with emphasis on rote rather than functional skills. Large firms will not hire middle school graduates, and demand from medium and small firms only partly matches supply.

**Sub-mission on Polytechnics (MSDE).** Employability of polytechnics graduates is also low but quality has improved between 2017 and 2018 as per the India Skills Report 2018. However, employability remains below 50%. Their quality of education is variable and they are regarded by students as a stepping stone to engineering colleges as there is a quota for them.

**Apprenticeship training (MSDE).** There is ongoing assessment of the National Apprenticeship Training Scheme. A National Institute of Labour Economics Research and Development report shows that in the National Apprenticeship Training Scheme in the Western India region, apprentices gain from the training, but due to low pay have little incentive to take it up. It is viewed as a last resort and not very aspirational. The programme is underutilised. The NAPS and National Employability through Apprenticeship Programme are too new to be evaluated, having been introduced in the last two years. The India Skills Report 2018 finds that only 54% of students were aware of the NAPS, while 93% were interested in an apprentice opportunity.

**Deen Dayal Upadhaya–Grameen Kaushalya Yojana (MoRD).** This is a well-structured programme to match rural youth to employment by skilling them. However, NCAER interviews with MoRD officials had suggested that turnover rates are very high. Nonetheless the programme is evolving to focus on one-year training instead of short-term ones. This is too new to assess impact. In 2013, it was mandated that 25% of the NRLM funds would be allocated to the DDU–GKY.

**Craftsman Training Scheme implemented via Industrial Training Institutes (MSDE).** This programme is one of the oldest programmes for vocational education and training in India. While the ITIs have suffered from extensive quality issues, the programme is undergoing changes in design and implementation to improve quality. The India Skills Report 2018 shows that the employability of ITI graduates, already quite low, worsened between 2017 and 2018. The day-to-day operations of the ITIs are done by the state governments. But central funds are distributed to ITIs through other central schemes, including the World Bank assisted Vocational Training Improvement Programme (VTIP), “Upgradation of 1,396 Government ITIs through PPPs,” “Upgradation of Existing Government ITIs into Model ITIs,” “Enhancing Skill Development Infrastructure in NE States and Sikkim,” and “Skill Development in 47 Districts Affected by Left Wing Extremism.”

**National Urban Livelihoods Mission (MoHUA).** Underachievement of targets and implementation are tough to analyse, but there might be design flaws where skills informally acquired are not being recognised by the programme.

**Bachelors of Vocational Education in colleges and universities (MHRD).** The intent of this scheme, which started in 2014, was to acquire and match skills better and provide increased flexibility. Media reports indicate underuse.

**Community colleges (MHRD).** The intent is to acquire and match skills, but the programme is too new to assess impact.

**Jan Shikshan Sansthan (MHRD).** Jan Shikshan Sansthans are established to provide vocational training to non-literate, neo-literate, as well as school drop outs by identifying skills that should be locally in demand. But evaluation of the Scheme suggests the need for better targeting, since enrollees may have much higher school education in some areas. JSSs suffer from poor curriculum materials, inadequate teaching material, long duration of training, inadequate facilities, irregular attendance and indifferent attitude of resource persons, inadequate and poor condition of tools and equipment and poor follow-up.

**Pradhan Mantri Kaushal Vikas Yojana Short-term Training and Recognition of Prior Learning (MSDE).** The intent is to acquire and match skills or recognise prior skills, but this is too new a programme to assess impact.

**Vocationalisation of Secondary and Higher Secondary Education (MHRD).** There is not enough data on the outcome or impact of this scheme. The CBSE has withdrawn compulsory vocational education in secondary education because of implementation challenges. With vocational education gained in schools, students are more likely to find a match in the job market. The National Sample Survey Office (NSSO) 2011–12 data show that workers with secondary or higher secondary education and formal vocational education receive higher average wages than workers with only secondary or higher secondary education. So, the matching of skills between employees and employers is likely to be better in this programme.

**Notes**

**MHRD**—Ministry of Human Resource Development

**MSDE**—Ministry of Skill Development and Entrepreneurship

**MoRD**—Ministry of Rural Development

**MoHUA**—Ministry of Housing and Urban Affairs

## Notes

1. This is for 2015–16.

Adjusted Net Enrolment Ratio measures number of pupils of primary school age group (6+ to 10+ years) enrolled either in primary or upper primary grades expressed as a percentage of the corresponding population.

Adjusted Net Enrolment Ratio measures pupils that are of the official secondary age group who are in secondary and in higher secondary level (NUEPA, 2016 and 2017).

2. Heckman, Stixrud and Urzua 2006.
3. Brunello and Schlotter 2011.
4. EI and Wipro 2011.
5. Pilz et al. 2016.
6. Levy and Murnane 2005.
7. Linden 2008.
8. Agrawal 2014.
9. NSSO 2014.
10. Prasad et al. 2016.
11. MSDE Annual Report 2016–17.
12. Prasad et al. 2016.
13. OECD 2010.
14. World Bank 2008.
15. Hindu 2017.
16. Chatterji 2018.
17. Joshi, Pandey and Sahoo 2014 and Tara, Kumar and Pilz 2016.
18. Mehrotra 2016; Tara, Kumar and Pilz 2016.
19. The VETnet promotes the German dual system of TVET in nine countries, including India. The programme is sponsored by the German Federal Ministry of Research and Education (BMBF) and is coordinated by the Association of German Chambers of Industry and Commerce (DIHK) and the nine participating German chambers abroad (AHKs).
20. DUALpro: The VET service brand of the Indo German Chamber of Commerce <http://indien.ahk.de/training/vocational-education-training/>.
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## Matching skills

### How best to adjust them

In the face of technological change, the labour skills required in all parts of the economy are changing at all levels of employment, and the educational system and vocational training system are not matching those requirements. Adjusting to match requirements and workers requires providing workers not only with job-specific technical skills but also with flexible cognitive skills such as creative thinking and social and behavioural skills such as work effort and discipline.

Agriculture employs about half of India's 468 million workers, industry about a quarter and services about a quarter (table 3.1). India's economic transformation from agriculture to services that drives employment and economic growth has so far missed out on the manufacturing stage seen in most countries. Manufacturing typically provides the high productivity boost that lifts incomes, increases the demand for durable and consumer products, creates jobs and propels a virtuous circle of higher incomes, rising demand for manufactured goods, even higher productivity, even lower prices, and thus rising disposable incomes.

All sectors generate jobs directly in their sector but also indirect jobs in the rest of the economy through inputs they buy and outputs they sell. So, India's manufacturing sectors indirectly generate jobs in other sectors, and NCAER research<sup>1</sup> for this report finds that in 2011–12 wood and wood products generated another 54.5 million jobs indirectly, in addition to the 6.1 million. Other leading indirect job generators making up the top five include food, beverages and tobacco (33.3 million indirect jobs), leather and leather products (28.0 million), textiles (26.2 million), and pulp, paper, printing and publishing (14.7 million). The indirect job generation in service subsectors is similar: hotels and restaurants (33.8 million indirect jobs), community, social and personal services (15.9 million), wholesale and retail trade plus vehicle repair (14.9 million), transport

(7.8 million) and financing, real estate and business (4.6 million). Policymakers clearly need to keep indirect jobs in mind, not just direct jobs.

The Indian workforce is largely low-skilled. Slightly more than half of India's workers have school attainment below middle school with no vocational training (figure 3.1). This share rises above 60% for agriculture, construction, food, beverages and tobacco, and other nonmetallic mineral products. In textiles, wood and wood products, furniture and fixtures, metals, other manufacturing and service sector of hotels and restaurants, more than 20% of workers have only middle education with no vocational training. Agriculture too absorbs mostly low-skilled workers (with some in disguised unemployment).

Service sectors mainly create jobs for workers with educational attainments above 12th grade, such as communication (51% of total workers within that sector), financing, real estate and business activities (58%), and other services (39%). So do such manufacturing sectors as transport equipment (48%), machinery (46%), petroleum products (35%), pulp, paper, printing and publishing (34%) and chemicals (32%).

Among the 12 Indian sectors generating the most jobs, with the exception of the community, social and personal services and financing, real estate and business activities, all other sectors employ the most workers with less than a middle-school education.

Sectors such as pulp, paper, printing and publishing, rubber and plastics, transport, metals, and hotels and restaurants generate employment for a spectrum of educational levels in India; in contrast, construction mainly generates employment for people whose school attainment is below middle school.<sup>2</sup>

Only very small shares of workers in India have technical or vocational education. Transport and textiles employ more workers with

**MATCH  
&  
ADJUST**

**ACQUIRE  
&  
IMPART**

**ANTICIPATE  
&  
ADAPT**



Policymakers face the triple challenge of incentivising the creation of more well-paying jobs, creating efficient pathways to skill acquisition and job matching, and protecting low-paid, low-skilled workers with social security benefits

TABLE 3.1 Where are the 468 million jobs?

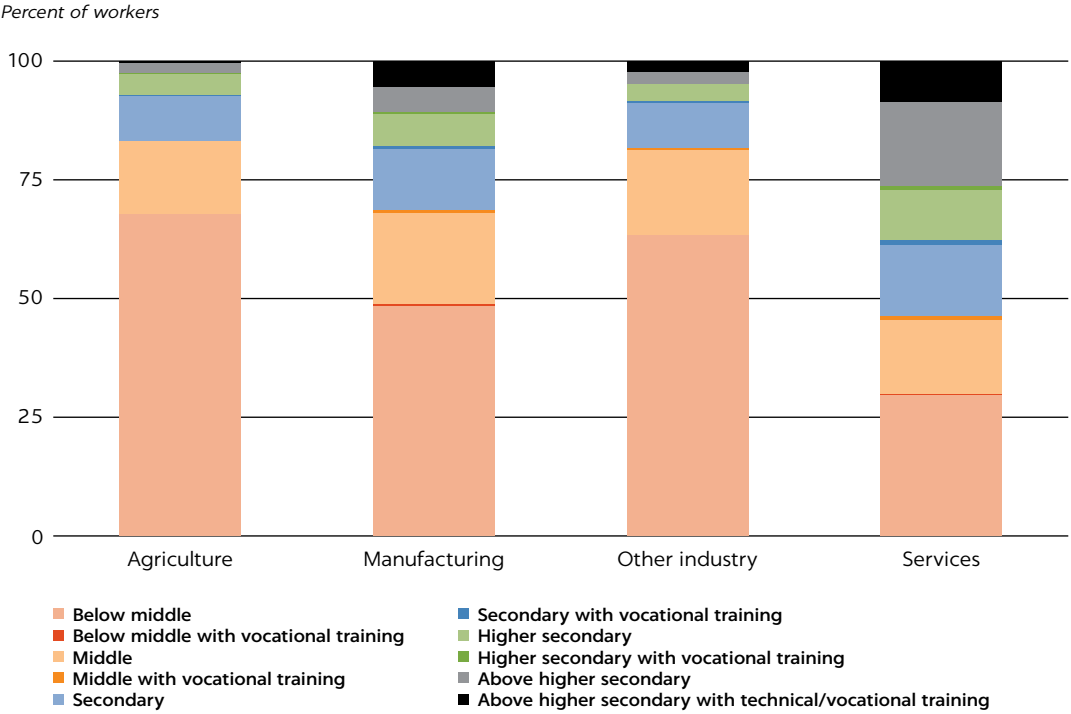
SECTOR	SUBSECTOR	MILLIONS OF JOBS	EMPLOYMENT SHARE (%)
Agriculture		228.5	48.8
Industry		112.8	24.1
	Mining & quarrying	2.5	0.5
	Manufacturing		
	Total	58.9	12.6
	Food, beverages & tobacco	11.0	2.4
	Textiles & apparel	18.3	3.9
	Wood & wood products, furniture & fixtures	6.1	1.3
	Pulp, paper, printing & publishing	1.6	0.3
	Leather products	1.2	0.3
	Rubber & plastics	1.1	0.2
	Petroleum products	0.1	0.0
	Chemicals	1.9	0.4
	Other nonmetallic mineral products	4.9	1.0
	Metals	4.4	0.9
	Machinery	2.4	0.5
	Transport equipment	1.5	0.3
	Other manufacturing	4.2	0.9
	Electricity, gas & water supply	1.6	0.3
	Construction	49.8	10.6
	Services		
	Total	126.5	27.0
	Wholesale & retail trade; repair of motor vehicles and motorcycles	43.7	9.3
	Hotel & restaurants	7.6	1.6
	Transport, storage & communication		
	Total	20.7	4.4
	Transport & storage	18.5	4.0
	Communication	2.2	0.5
	Financial services, real estate & business activities	12.3	2.6
	Community, social & personal services, other services	42.0	9.0
Total workforce		467.7	100

Note: The economic sectors are compatible with the World Input-Output Database. With minor discrepancies in a few sectors, they are compatible with the sectors in the National Accounts Statistics of India. Workers include principal and subsidiary workers. Source: NCAER computations from the 2014 National Sample Survey Office, with data for 2011–12.

below secondary schooling and vocational training. Services, by contrast, employ workers with above Class 12 and vocational and technical education—especially communication, financing, real estate and business activities and community, social and personal services. The share of workers with higher secondary attainment compared with other categories is curiously low.

Capital-intensive sectors—such as mining, electricity, machinery and petroleum tend to pay a positive wage premium.<sup>3</sup> So do skill-intensive sectors, such as computer work and financial intermediation. But less capital-intensive and skill-intensive sectors—such as foodstuffs, tobacco, textiles, agriculture and hotels—have below-average pay. Overall, the sectors that are hiring the most workers are

FIGURE 3.1 Most workers have little education



Source: NCAER computations using National Sample Survey Office data (2011–12) and the employment-unemployment survey (National Sample Survey Office 2013).

low skill-intensive sectors, and they are paying below-average wages.

Since the share of well-paying, skill-intensive industries in the workforce remains low, policymakers face the triple challenge of incentivising the creation of more well-paying jobs, the creating efficient pathways to skill acquisition and job matching, and protecting low-paid, low-skilled workers with social security benefits.

The supply of skills doesn't match the demand

India's economic structure clearly is not in sync with its labour markets, leading to misallocations of labour resources. The demand for skills is not matching the supply of skills. What sectors, and at what level, are creating the demand for which type of skilled and unskilled workers? How can workers acquire skills more effectively and at lower cost to meet this demand, propelling firms and workers towards higher productivity and faster economic and job growth?

On the demand side, employers require workers with many combinations of cognitive,

noncognitive, and job- and sector-specific skills depending on the occupation and level of responsibility (table 3.2). Seen against the poor skilling levels of most Indian workers in the sectors generating the most jobs, the large size of India's skilling demand-supply mismatch becomes obvious.





Technology and skilled labour complement each other, but technology can replace lower-skilled labour. It is especially likely to displace routine cognitive skills in clerical work, accounting and shop floor assembly—repetitive activities that follow clear guidelines.<sup>4</sup> Jobs that require higher-order cognitive skills such as creativity and complex problem solving are likely to thrive with new technology.<sup>5</sup> Self-motivated employees who upgrade their skills are in demand.<sup>6</sup> Paradoxically, however, many jobs requiring little education—such as driving, child care and unskilled health care—have resisted automation.

So, automation is not necessarily stealing jobs, but it can transform jobs. Infosys, the global software technology giant, released 8,000–9,000 employees from their current assignments during 2016 by automating their low-end jobs, but it then trained them in more

Automation is not necessarily stealing jobs, but it can transform jobs

TABLE 3.2 Demand for skills across occupational roles

		HIRED WORKERS			
SKILLS		Low-skilled casual worker	Medium-skilled operative/trade worker	Medium-high-skilled worker/ associate professional	High-skilled worker/specialist/ trainer/professional
		Semi-skilled construction worker/helper	Welding technician, assistant beauty therapist, power loom operator	Automotive service technician, shuttleless weaving machine operator, junior accountant	Economist, engineer, scientist, lawyer, surgeon, consultant, chartered accountant
Equivalent NSQF levels developed by NSDC		1 or 2	3 or 4	5 or 6	7 and above
COGNITIVE SKILLS	Routine cognitive	Read & write short sentences & numerical figures, understand drawings, basic math, communicate with team, supervisor	Read & write long sentences, numerical figures, understand drawings, perform basic math calculations, communicate with clients/supervisor	Reading comprehension (e.g. manuals/drawings/ graphs), write short paragraphs, perform basic calculations, communicate with clients	Reading comprehension (concepts in books, articles, technical manuals), writing (policy notes, reports, articles), mathematical reasoning (for scientific assessment)
	Nonroutine cognitive	Active learning based on assigned duties (trade skills)	Active learning latest welding techniques (welding technician), latest wellness products and safety measures (beauty therapist)	Active learning (latest on-demand trade skills), escalate anomalies/defects to supervisor for prompt redressal, problem solving in different contexts	Cognitive flexibility (adapt to unforeseen market trends), learning to learn, complex communication (gathering/ processing/presenting concepts at scientific conference), complex (technical) problem solving & critical thinking, creativity (product, design, and process innovation)
	Language	Local language skills for semi-skilled migrant workers, daily wage earners	Local & regional language skills for client servicing, conveying messages	Bilingual/multilingual requirements as per work place duties for effective communication	Bilingual/multilingual skills for independent learning, communicating, adapting
	Information & communications technology (ICT)	Read/type on mobile	Read/type on computer / mobile, use e-wallet on phone	Basic computing skills (research assistant, junior accountant), perform computerised diagnostics (automotive service technician), use e-wallets.	Advanced ICT/programming skills in R/Stata/SAS (data scientist), Tally (Senior Accountant), Python (senior consultant working on artificial intelligence/neural networks)
	Financial literacy	Basic financial literacy (operating savings bank account, basic knowledge of financial products)	Basic financial literacy (operating bank account, knowledge of financial products, calculate interest from savings)	Financial literacy (knowledge of financial products, manage own finances, calculate interest rates); basic financial management (junior accountant)	Advanced financial literacy (managing own finances/ retirement planning); advanced financial management (financial economist, chartered accountant, investment consultant)
	Knowledge & ability to apply it	Basic building & mechanical knowledge (semi-skilled construction worker), ability to assist supervisor (helper)	Knowledge of welding techniques (welding technician); basics of beauty therapy, medical safety, hygiene, beauty products (beauty therapist)	Knowledge of engines, transmission, braking, steering (automotive service technician), knowledge of fibre/ yarn, functioning of mill (shuttle-less loom weaver)	Medical knowledge (surgeon), scientific knowledge (scientist), knowledge of GAAP (generally accepted accounting principles)—(chartered accountant)

Cognitive skills       
Sector or job-specific technical skills      
Noncognitive skills    

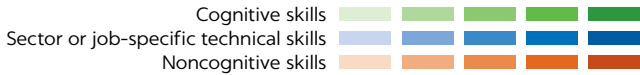
NSQF = National Skills Qualification Framework. NSDC = National Skills Development Corporation.  
Note: The colour gradations reflect different levels of complexity across three broad categories of skills, with darker shades indicating higher levels of complexity.  
Source: NCAER conceptualisation.

		ENTREPRENEURS/SELF-EMPLOYED PERSONNEL		
High-skilled manager		Self-employed livelihood/ necessity entrepreneur	High-skilled, self-employed professional	CEO/director/opportunity entrepreneur/employer
Operations manager, HR manager, finance manager, research manager, team manager		Hawker, one-person shop, handicraft/handloom weaver, cab driver	Lawyer, doctor, consultant, stock broker, chartered accountant, freelance artist, content developer	CEO, MD, director-general, secretary to government, board member, employer
8 and above		1 through 6	7 and above	8 and above
Reading comprehension (reports/compliance manuals), writing (reports), mathematical reasoning (evaluating team submission)		Read, write short sentences, perform basic calculations, communicate with clients	Reading comprehension (books, articles), writing (reports, prescription) mathematical reasoning (stock trader, programmer)	Reading comprehension (books, articles, policy papers), writing (reports, articles), mathematical reasoning (for critical assessment of projects, products, markets)
Cognitive flexibility (steer team to adapt to unforeseen trends), active learning, complex interpersonal communication with team members/clients, complex (technical) problem solving & critical thinking, resource management		Active learning (trade skills), problem solving (while sourcing products, interacting with clients), creativity	Cognitive flexibility (for adapting to sectoral trends), active (independent) learning of trade skills, complex communication (gathering/processing/conveying information), complex technical problem solving & critical thinking (finding solution to ailments/trouble-shooting), creativity (e.g. content development)	Cognitive flexibility (adapting across business cycles/market trends), learning to learn, complex communication (processing/presenting information, interpersonal communication), complex technical problem solving (abstract reasoning, critical thinking for company level problems), creativity, resource management
Bilingual/multilingual skills for communicating with team members/clients from different regions/ countries		Skills in local & official (English, Hindi) languages for communicating with clients across platforms	Skills in local & official languages for communicating with clients/ stakeholders across platforms	Skills in local & official languages for outreach across multiple stakeholders across geographical boundaries
Advanced ICT skills in Stata/ SAS (research manager), Tally (accounts manager), Neuroph/ Python (tech manager) for supervising team progress		ICT skills for sourcing product orders (garments) via e-commerce platforms (e.g. IndiaMart), operate e-wallets for payments	Advanced ICT skills in R/Python (independent AI consultant), source clients via e-commerce platforms (e.g. UrbanClap), operate e-wallets for payments	Advanced ICT skills across respective tech-platforms based on company structure/sector (IT/BPO, manufacturing, research, consulting, hospitality)
Advanced financial literacy (HR manager, research manager; advanced financial management (finance manager/accounts manager)		Financial literacy to manage earnings/ cash-flow/credit repayment (handloom weaver) basic financial management (one-person retail shop owner)	Advanced financial literacy to manage earnings/profit (doctor/ lawyer) financial management (chartered accountant) investment management (stock broker)	Advanced financial management to understand earnings/cash-flow analysis/financial ratios/corporate restructuring
Sector (e.g. breakfast food), product knowledge (cereals, probiotic yoghurt), managerial ability (manage product development team)		Sector knowledge (handloom), product knowledge (handloom sarees), market knowledge (latest trends)	Sector (ailments—doctor, legal knowledge—lawyer), product knowledge (medicines, laws), occupational knowledge (ethical practices)	Sector (consumer goods/agricultural machinery), products (food, ag. tools), market knowledge (regional, national, international), managerial ability (manage firm, subsidiaries, clients—e.g. CEO of FarMart, Amul, Dabur)



TABLE 3.2 Demand for skills across occupational roles (continued)

		HIRED WORKERS			
SKILLS		Low-skilled casual worker	Medium-skilled operative/trade worker	Medium-high-skilled worker/ associate professional	High-skilled worker/specialist/ trainer/professional
SECTOR OR JOB-SPECIFIC, TECHNICAL SKILLS	Cognitive, noncognitive & psychomotor	Follow instructions, assist supervisor in designated tasks based on sector-specific job duties.	Operating welding equipment, assist welding engineer (welding technician), perform depilation, manicure, pedicure (beauty therapist)	Identify and repair mechanical problems (automotive service technician), run loom efficiently, motor skills, visual skills (shuttleless loom weaver)	Manual dexterity, visuo-spatial awareness, surgery skills (surgeon), research & technical skills, post-doctoral competency (scientist)
	Core noncognitive	Interpersonal skill (team effort), attitude to work (discipline, follow instructions), social sensitivity	Interpersonal skill (work with team), attitude to work (discipline, commitment to work), social sensitivity	Interpersonal skill (compassionate responsiveness), attitude to work (time management, promptness), social sensitivity	Interpersonal skill (congeniality thoughtfulness), attitude to work (self-discipline, promptness, determination), social sensitivity (gender/racial)
NON-COGNITIVE SKILLS	Other noncognitive			Basic problem solving—assuaging difficulties faced by customers/ clients/other team members	Judgement and decision-making (project feasibility), problem solving (negotiating terms and conditions), emotional intelligence (coping with work related stress)



NSQF = National Skills Qualification Framework. NSDC = National Skills Development Corporation.

Note: The colour gradations reflect different levels of complexity across three broad categories of skills, with darker shades indicating higher levels of complexity.

Source: NCAER conceptualisation.

The growing disconnect between industry and education has led to acute shortages of skilled workers across all sectors

advanced skills and assigned them to new Infosys projects.<sup>7</sup> In contrast, the half of the Indian workforce with less than middle school attainment and no vocational skills likely lacks the skills that even a casual worker should possess.

A slight change in technology has the potential to disrupt livelihoods of a vulnerable section of population with no other skillsets. This was the case with incense stick production in Tripura, a case study examined for this NCAER report. The rapid transition from handmade to semi-mechanised products meant that Tripura lost its lead position in handmade incense sticks, with the demand for Tripura’s sticks falling to one-fifth of its capacity, driven down by imports from China and Vietnam.<sup>8</sup>

Technology cycles are shorter than ever, and robots and digital disruption could hit Indian workers hard: globally 75% of businesses expect that automation will require workers to develop new skills. Today’s workers and new labour market entrants must thus prepare for jobs that do not yet exist. For example, “sewbots” using robotics and Artificial Intelligence (AI)

may replace textile workers in India.<sup>9</sup> The textile sector directly employed 15.6 million (15+ age group) workers and indirectly 26.2 million workers in 2009–10. And almost half of textile workers have less than middle school attainment and little or no vocational training.

On the supply side, while educational attainment of the general population is increasing, high unemployment rates among the educated signal significant challenges to employability of the better educated. This problem is more acute for females. The education and vocational systems are imparting knowledge through oral and rote learning methods but not the broad range of foundational and advanced, general and specialised skills needed for jobs (table 3.3).

Along with sector-specific and job-specific knowledge and skills, employers seek innovation skills and complex psychomotor skills. But the education system is not delivering them. The growing disconnect between industry and education has led to acute shortages of skilled workers across all sectors.

ENTREPRENEURS/SELF-EMPLOYED PERSONNEL			
High-skilled manager	Self-employed livelihood/ necessity entrepreneur	High-skilled, self-employed professional	CEO/director/opportunity entrepreneur/employer
Supervise research team (research manager), manage accounts department in company (accounts manager), manage project related technical team (project manager)	Multi-tasking, weave garments (handloom weaver), manage shop (kirana store vendor)	Multi-tasking, application of trade skills such as (a) accountancy (chartered accountant), (b) medicines (general physician)	Multi-tasking, launching of company/ programme, mergers/acquisitions; product diversification, implementing lean management techniques
Interpersonal skill (managing team, sociability), attitude to work (determination, respect for others), social sensitivity (gender/racial/cultural sensitivity)	Interpersonal skill (respectful, helpful), attitude to work (time management, promptness), social sensitivity (gender/ caste/racial differences)	Interpersonal skill (social responses), attitude to work (self-motivated, time management), social sensitivity	Self-confidence, Interpersonal skill (responsiveness towards various stakeholders), attitude to work (stress management), social sensitivity (gender/racial/cultural sensitivity)
Judgment & decision making (e.g. communication strategy), leadership & coordination with team members, problem solving and negotiating with, clients, emotional intelligence (coping with stress/emotion)	Problem solving (e.g. working through delivery mechanisms for buyers), basic decision making (product offerings)	Judgement & decision-making (sourcing new contract), negotiating payments, coordinating with clients, troubleshooting client dissatisfaction, emotional intelligence (self-awareness, coping)	Judgement & decision-making (e.g. expanding market share), negotiating deals, leadership, coordination, problem solving, emotional intelligence (emotional stability, empathy, coping)

An army of educated unemployed—and acute shortages of skilled workers

The central mismatch of the Indian economy: an army of educated unemployed (and many unemployable) persons and an acute shortage of skilled people. Educated youth unemployment brings the challenges of employability into sharp relief—and the transition from school to work even more. The unemployment rate for graduates aged 20–24 was 29% in 2011–12, for those 25–29, 12%, and for those 30–34, 4%.<sup>10</sup> Even labour force participants with technical education above the graduate level show double-digit unemployment for the same age groups, respectively 28%, 13% and 5%. As mentioned in box 2.3, the India Skills Reports continue to find a high degree of unemployability for final year students in colleges and universities across India.<sup>11</sup> Why are so many people with degrees not in jobs? They may be repeatedly trying to get a government job (box 3.1), and filling the time in between by enrolling for free vocational training

offered by private providers with government subsidies.

Youth unemployment rates in were high even for people with vocational education. The unemployment rate of labour force participants with formal vocational education was 11% for those 15–19, 21% for those 20–24, 8% for those 25–29 and 5% for those 30–34.<sup>12</sup> The cause likely lies not in the degrees and certificates but in the workers’ skills, which both the TVET and general education systems fail to deliver.

Women’s labour force participation rate (LFPR) was barely 21% in urban areas and 36% in rural areas in 2011–12. It was especially low for women with middle, secondary, and higher secondary education. Himachal Pradesh, Sikkim, Chhattisgarh and Meghalaya have the highest women’s LFPR, and Bihar has the lowest. Of both rural and urban women aged 15–29, 49% are neither part of the labour force nor pursuing education, general or vocational.

Women’s unemployment rates are higher than men’s and, like men’s, tend to rise with higher education. Even so, graduate women’s

Of both rural and urban women aged 15–29, 49% are neither part of the labour force nor pursuing education, general or vocational

TABLE 3.3 Mismatches between supply and demand

SUPPLY OF SKILLS		DEMAND FOR SKILLS		
		HIRED WORKERS		
Skills	Educational attainment	Low-skilled casual worker	Medium-skilled operative/trade worker	Medium-high-skilled worker/ associate professional
Routine cognitive skills	Primary and middle school education	●	●	●
Routine cognitive skills, ICT skills and language skills	Secondary education	●	●	●
Routine cognitive skills, ICT and language skills, financial literacy	Higher secondary education	●	●	●
Routine cognitive, nonroutine cognitive skills, core socioemotional skills, ICT skills, language skills, financial literacy and knowledge and ability to apply	College education and above	●	●	●
Routine cognitive skills, nonroutine cognitive skills, ICT skills, financial literacy and knowledge and ability to apply, sector and job-specific skills	Technical education	●	●	●
Job-specific skills, one ICT skill, English language skills and some financial literacy	Short-term skilling programmes	●	●	●
Routine cognitive skills, knowledge and ability to apply and job-specific skills	Long-term skilling programmes	●	●	●

- Worker cannot supply the skills that the job demands.
- Worker can perhaps supply the skills that the job demands with varying success ranging from barely to mostly.
- Worker can fully supply the skills that the job demands.

Note: Red implies that there is demand for this but supply is limited, indicating a mismatch. Green indicates that there is a reasonable degree of match. Yellow indicates that there is only a partial match. Black indicates that workers’ skills exceed what the job needs.

Source: NCAER, based on stakeholder consultations and literature reviews.

unemployment rates fell between 2004–05 and 2011–12. The relationship between labour force participation and educational attainment appears to be U-shaped for urban women aged 25–54: it is high among illiterate women, lowest for women with some schooling or high school and highest among university graduates (at 25%).<sup>13</sup> While the aggregate number shows that the urban female unemployment rate is higher than the rural one, urban female unemployment rates are higher until secondary school, but after that, rural female unemployment rates are higher than urban.

Fixing the mismatches requires more than vocational skill training

The vocational skills taught through various programmes meet current technological needs, rarely future ones. PMKVY—India’s flagship skilling programme of the MSDE—focuses on short-term skilling, with uncertain quality, at best teaching a worker just enough vocational skills to find a job immediately. The content and design of most skilling programmes is below international standards, leaving graduates vulnerable to technological shocks. Even if placement rates are high, dropout rates can

DEMAND FOR SKILLS				
HIRED WORKERS		ENTREPRENEURS AND SELF-EMPLOYED PERSONNEL		
High-skilled worker/ specialist trainer/ professional	High-skilled manager	Self-employed livelihood/necessity entrepreneur	High-skilled, self-employed professional	CEO/director/ opportunity entrepreneur/ employer
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●

The hope is that vocational training in task-based skills can provide a temporary solution for industry’s acute skill shortages, but fixing skill supply-demand mismatches will require more than such vocational training

also be high, unless employers implement the programmes directly. The NSDC, in response to the growing skill mismatch, formulated a framework for job-specific training for a variety of industries based on a state-level skill gap analysis. The training is conducted by NSDC-certified training providers across India.<sup>14</sup> The hope is that vocational training in such task-based industry-specific job-related skills can provide a temporary solution for the industry’s acute skill shortages. But turnover can be extremely high, with only 32% of NSDC-certified workers still employed 1–2 years after training.<sup>15</sup>

Short-term skilling programmes also misplace their emphasis on school dropouts. Only 3% of males aged 15–29 are neither pursuing education or training nor participating in the labour force (table 3.4). But 50% of women are in this category and the share increases with age. In the 25–29 age group, 62% of rural women and 71% of urban women fall in this category. With 50% of the current workforce having attainments below middle school, focusing a vocational skills programme exclusively on school dropouts will largely miss that group. More relevant are recognising prior learning, training on-the-job, schooling adults,



Education and training systems with stronger industry-academia connections can nurture both higher-order cognitive skills such as creativity, critical thinking and lifelong learning and socio-emotional skills such as teamwork

BOX 3.1 In search of the public-sector job

The educated youth in India spend years at-tempting to get a public-sector job by taking exams for any public-sector opening. The most common job aspiration for young Indians is a government job, and millions attempt to get one each year. Many of them spend several years unemployed or underemployed, sup-ported by their families, enrolling in subsidised training that pays them a stipend, and part-time jobs, while making multiple attempts at passing exams to get a government job.

The large fraction (2%, or some 1.9 million youth in 2011–12) of all males in their 20s who have education above middle school but with-out a bachelor’s degree and who are unem-ployed is noteworthy. Also striking is how this

fraction falls for those 30–32 (the age limit for entering many government jobs). The average successful applicant spends around four years preparing for and taking these exams. Since the ratio of applicants to positions exceeds 100:1, hundreds of thousands (if not millions) of youth in their 20s are taking these exams.

A plausible reason is that many youth pre-fer to take entrance exams for government jobs rather than getting skilled in a chosen profession and entering a competitive and uncertain labour market. This may be perfectly rational because the returns to winning the “government job lot-tery” are so large—with above-market wages, pensions and benefits, lifetime job security, and the potential to make money on the side.

Source: Adapted from Muralidharan 2015.

and bridge or remedial learning for cognitive and noncognitive skills.

Workers with higher education find it eas-ier to adapt to changing labour markets than those with less education.<sup>16</sup> One way to avoid the skill obsolescence brought by a major tech-nological shock<sup>17</sup> is to provide core competency skills that foster in higher-order cognitive skills such as self-learning, lifelong learning, and learning to learn, thereby increasing adapt-ability. A leading German training provider,

bfw-Unternehmen für Bildung, offered a blend-ed learning module for upskilling nurses in Dubai—beyond the core courses were class-room seminars, extensive periods of self-learn-ing and practical internships at an industrial unit.<sup>18</sup>

Education and training systems with strong-er industry-academia connections can nurture higher-order cognitive skills such as creativity, critical thinking and lifelong learning and fos-ter socio-emotional interactive skills.

TABLE 3.4 Education and employment of Indian youth

	% OF MALE POPULATION AGES 15–29	% OF FEMALE POPULATION AGES 15–29	% OF TOTAL POPULATION AGES 15–29
Labour force	63.6	24.4	44.6
Workforce (principal + subsidiary workers)	59.8	22.8	41.9
Only employed	57.5	22.0	40.3
Employed plus currently pursuing either general or vocational education	2.3	0.8	1.5
Only currently pursuing either general or vocational education	33.7	25.6	29.8
Unemployed and currently pursuing neither general nor technical education	3.6	1.5	2.6
Unemployed and currently pursuing general or technical education	0.1	0.1	0.1
Neither pursuing general or technical education nor in labour force	2.9	50.1	25.8

Source: NCAER computations from 2014 National Sample Survey Office, with data for 2011–12. This refers to age group 15–29.

Connecting women to work

Between 2004–05 and 2011–12, 15 million women dropped out of India’s labour force.<sup>19</sup> Meanwhile, the percentage of working-age women enrolled in education fell from 12% to 7% (though their number grew by 16 million). As younger women (aged 15–19) pulled out of the labour force to attend educational institu-tions, fewer women aged 20–24 entered it. The loss is greater in rural than in urban areas.

The drop in women’s labour force partici-pation could indicate inadequate opportuni-ties for appropriate jobs,<sup>20</sup> greater involvement of women in unpaid household care work and children’s education, or considerations of caste and culture or wealth and income.<sup>21</sup>

The labour force participation rate among women declines with increasing education through the higher secondary or vocational diploma, turning around after college gradu-ation.<sup>22</sup> But higher labour force participation among university graduates does not always translate to higher workforce participation, and a higher proportion of females with a graduate degree and above were unemployed than their male counterparts in 2011–12. One reason for this is a perceived competence gap. Anoth-er is the occupational segregation of men and women.

While quality education (beyond secondary level) is vital for improving job outcomes and labour market participation, access to quality employment remains a critical impediment.<sup>23</sup> The proportion of women is low in secure high-productivity and high-income jobs. Most women are engaged in the agricultural and allied sectors, and in labour-intensive unorgan-ised manufacturing, where gender wage gaps are wide. As jobs become less labour intensive, men tend to occupy them—as in manufactur-ing machines and equipment.

The share of female managers in 2011–12 was 6% in computer manufacturing and 12% in computer programming.<sup>24</sup> Even in the sec-tors where women dominate, the propor-tions of women owners and women managers remain low (table 3.5). And women directors and managers are concentrated in activities where job roles are perceived to be primarily low-skilled.

Entrepreneurship among women is also restricted. Only 14% of establishments are owned by women, and those 8 million estab-lishments employ 13.5 million people, showing

how small the average woman-owned business is.<sup>25</sup> Of these entrepreneurs 66% operate in nonagricultural sectors, with manufacturing taking up 30% and retail trade 18%.

Increasing opportunities for part-time work would bring more women into the labour force. Digitised service aggregators, such as Urban Clap and e-commerce websites such as Flipkart and IndiaMART, offer women more avenues for part-time work and flexible schedules. Of women willing to work but not in the labour force, 78% are available for part-time or occa-sional work.

Skill training for women should prepare them for working in male-dominated indus-tries, rather than focus only on such industries as beauty and wellness, food and beverages, and textiles and apparels. The United Nations Development Programme’s (UNDP) Disha ini-tiative provides women with such training, entrepreneurial skill development and employ-ment.<sup>26</sup> After young women in Haryana were given short vocational courses in plastic engi-neering, they started work in industrial hubs across the state. Another group was offered for-mal training in both technical and noncogni-tive skills to work in the steel industry, largely dominated by men.

Policymakers should develop ways to offer life skills to women working in the informal sector and women who have dropped out of the labour force. Self-help groups have had an impact on rural women. One programme linked to the National Bank for Agriculture and Rural Development empowered families socially and economically. Participants learned basic concepts of financial management, and leadership rotations developed managerial skills such as decisionmaking, problem solving and self-motivation.<sup>27</sup> The UNICEF programme Kanyashree Prakalpa (girl child welfare)—designed to eliminate child marriage through targeted cash transfers—promotes girls’ edu-cational attainment and improves their socio-economic independence.<sup>28</sup>

Mentoring and counselling can be key, as in the SEWA Youth Connect, which pairs Delhi University students as mentors with SEWA young adults aged 15–25 to motivate them to continue education and enhance their self-re-liance and independence, including through soft skills for job interviews. Career coun-selling centres run by SEWA in Delhi were set up under Disha to provide information to women on employment opportunities, foster

Skill training for women should prepare them for working in male-dominated industries

Indian rural-to-urban migration is surprisingly low, especially given the substantial rural-urban wage differential

TABLE 3.5 Male–female distribution of managers by sector

MALE MANAGERS			FEMALE MANAGERS		
RANK	SECTOR	SHARE IN TOTAL	SECTOR	SHARE IN TOTAL	GENDER RATIO*
1	Retail trade	35.9	Retail trade	33.7	12.0
2	Food and beverage service	7.8	Manufacture of wearing apparel	10.6	30.8
3	Land transport and transport via pipelines	6.1	Food and beverage service	8.2	13.4
4	Wholesale trade	5.2	Manufacture of textiles	7.2	37.9
5	Construction of buildings	4.1	Manufacture of food products	5.8	18.4
6	Food	3.7	Manufacture of tobacco	4.6	78.7
7	Manufacture of wearing apparel	3.5	Other personal service activities	3.6	23.5
8	Wholesale and retail trade and repair of motor vehicles and motorcycles	2.6	Accommodation	3.5	38.8
9	Financial service	2.2	Manufacture of wood and products of wood	3.3	23.5
10	Manufacture of fabricated metal products	1.8	Financial service	2.8	15.5
Top ten sectors		72.9	Top ten sectors	83.1	

\*Gender ratio in sectors having a high concentration of women managers.  
Note: Only manufacturing and services have been considered for calculating sectoral concentration.  
Source: NCAER computations from the 2014 National Sample Survey Office, with data for 2011–12.

self-confidence and impart digital skills for greater connectivity. In another initiative linked to Disha, young women were introduced to a female role model, Skill Sakhi (skill friend), to bridge the information gap on employment opportunities and improve socio-emotional skills.<sup>29</sup>

Connecting women to work can be enhanced physically and electronically to raise their workforce participation. Reducing the distance to work, providing better transportation and infrastructure, and enhancing workplace security and sanitation remain key concerns.<sup>30</sup> Digitised service aggregators such as UrbanClap and e-commerce websites such as Flipkart and IndiaMART allow women who want to work part-time and prefer flexible schedules to enter the workforce as entrepreneurs, working independently or as contractors. Acquiring digital skills is vital to reap the benefits of the digital dividend offered by such virtual marketplaces.

Increasing the mobility of labour

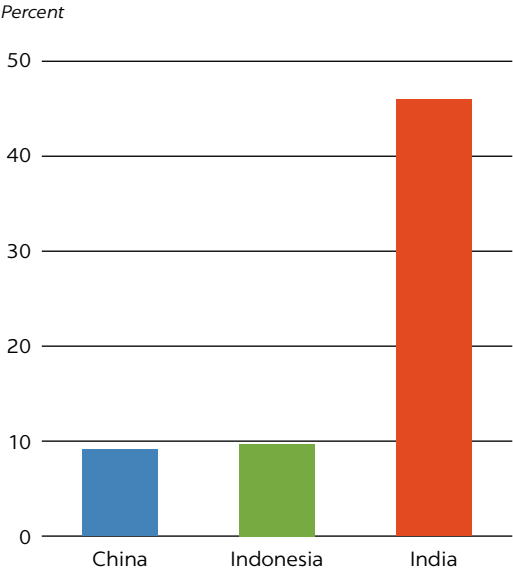
Labour mobility ensures that the economy’s human capital is efficiently distributed across its geography and sectors. Thus, while a

healthy level of labour mobility is a precondition for a well-functioning labour market, low labour mobility may indicate misallocations of resources. Indian rural-to-urban migration is surprisingly low, especially given the substantial rural-urban wage differential, much higher in India than in China and Indonesia (figure 3.2).<sup>31</sup>

Notwithstanding the stark wage differential, the rural-urban male migration rates in India have been low at around 4% in the recent decades, significantly lower than Brazil, with a male migration rate of 14%.<sup>32</sup> The absence of formal insurance markets together with well-functioning informal caste-based insurance networks may explain India’s exceptionally low migration rates.<sup>33</sup> Moving from rural to urban areas severs the caste-based network of the migrating rural household. India’s caste-based networks are exceptionally effective at consumption smoothing because of their large size and scope. So, the gains from migration—in income—are outweighed by the cost of the loss in consumption smoothing through caste-based networks.

To address this spatial skill mismatch—labour abundant in rural areas, jobs available in urban areas—the government has started a

FIGURE 3.2 Rural-urban wage gaps



Source: Munshi and Rosenzweig 2016.

skills programme for rural youth: Deen Dayal Upadhyay-Grameen Kaushalya Yojana (see appendix A2.2). Although it functions better than many other skilling programmes, the scheme is characterised by high turnovers.

As India develops further, the share of agricultural output as a percentage of GDP will continue to shrink (as in other developing economies) with a corresponding decline in the share of workforce in the agriculture sector. While the proportion of the labour force involved in agriculture and allied activities is currently still substantial relative to the size of the sector, a massive amount of labour will be released or not efficiently absorbed by the agriculture sector. Low labour mobility can thus seriously exacerbate misallocation of labour.

Temporary or seasonal migration can impede skill development and employability. While seasonal migration in India has been increasing over time, the principal limitation of the temporary migration is that it will not fill the large number of jobs which require firm-specific or task-specific learning and where firms will want to set permanent wage contracts.<sup>34</sup> And seasonal migration discourages employers from investing in upgrading skills given the temporary association with the worker.

The recent Economic Survey of the Government of India (2016–17) projects an optimistic trend of increasing interstate and interdistrict migration rates, which should improve the

allocation of labour and the acquisition and matching of skills.

Unleashing opportunity entrepreneurs

Entrepreneurship in India, as in other developing countries, combines two disparate groups: necessity entrepreneurs (own-account workers) and opportunity entrepreneurs. Necessity entrepreneurs work for themselves because they face entry barriers to the formal labour market. They are often low on productivity and in accounting, managerial and marketing skills, and they tend to leave entrepreneurship for formal employment when the opportunity arises.<sup>35</sup> Entrepreneurs from scheduled castes and scheduled tribes are more likely to be smaller own-account enterprises and located in rural areas. Among scheduled caste–scheduled tribe enterprises a greater proportion are owned by women.<sup>36</sup>

Skill development and enhanced access to markets and credit are crucial for necessity entrepreneurs. A majority of own-account workers have mostly acquired skills through informal learning, operating as independent workers in the informal sector and involved in the entire production process. Often such informal entrepreneurs acquire a wide range of specialist skills outside the formal system, who are not only skilled in their own trade, but also have complex skills such as price setting and marketing.<sup>37</sup> Formally recognising and validating the skills of such workers under Recognition of Prior Learning (RPL) and upgrading and aligning their skills to the NSQF is important for them, as is connecting them to markets. Programmes targeted at them to give digital and financial literacy skills could go a long way in converting the necessity entrepreneurs into opportunity ones.

Opportunity entrepreneurs tend to be drivers of innovation, keen to exploit new business opportunities and more likely to expand business and hire people. They are, however, few in number, with only 1.5% of the workforce serving as employers in 2011–12.<sup>38</sup>

Entrepreneurs need system skills and resource management skills. They also need advanced noncognitive skills such as instructing and negotiating. India’s higher education system does not equip students with these skills.<sup>39</sup> But many entrepreneurs use these skills tacitly without being aware of them.<sup>40</sup>

Programmes targeted at necessity entrepreneurs to give them digital and financial literacy skills could go a long way in converting them into opportunity entrepreneurs



The potential is enormous for connecting micro-entrepreneurs that have certified skills to service aggregators for increased access to markets

Institutional training and entrepreneurial support are needed to encourage creation of more opportunity entrepreneurs. Leading business schools support entrepreneurial activities and offer entrepreneurial courses.<sup>41</sup> Besides entrepreneurial courses integrated in the curriculum, innovation centres such as the Indian Institute of Management's (IIM) Calcutta Innovation Park,<sup>42</sup> the Centre for Innovation, Incubation and Entrepreneurship at IIM-Ahmedabad and the NS Raghavan Centre for Entrepreneurial Learning at IIM-Bangalore provide an experiential learning-by-doing platform through mentorship, incubation support, connections with funding, industry networks and alumni entrepreneurs, campus training and a fellowship programme. But the lack of sufficient trainers and limitations with pedagogy are impediments in developing an entrepreneurial spirit.<sup>43</sup>

The National Institute for Entrepreneurship and Small Business Development under the MSDE was launched by the central government to promote entrepreneurship training. MSDE also boosts entrepreneurial skills through Indian Institute of Entrepreneurship, focusing on training, research and consultancy services for SMEs and on cluster development.<sup>44</sup>

The Entrepreneurship Development Institute of India provides entrepreneurship training and education both for first-generation entrepreneurs and for those transitioning from SMEs into growth-oriented enterprises. The curriculum is designed so that students can develop their enterprise step by step while taking entrepreneurial courses at the institution.

Local physical infrastructure, geographic clusters of like-minded companies, and supporting industrial structures for forward and backward linkages contribute to higher entry rates of firms.<sup>45</sup> An enabling environment for start-ups includes eased business regulatory bottlenecks, and the government having taken steps in that direction. Some of these policies include Department of Industrial Policy and Promotion's state-level Business Reforms Action Plan intervention and the Ministry of Micro, Small & Medium Enterprises' (MoMSME) launch of the Udyog Aadhaar scheme for streamlining registration for MSMEs. In addition, the Micro Units Development & Refinance Agency (MUDRA) Bank provides credit to young, educated and skilled workers and entrepreneurs.<sup>46</sup> The Insolvency and Bankruptcy Code 2016 allows start-ups and small firms to exit within three months, in case of failure.

GIZ, in co-ordination with MoMSME experimented with innovation vouchers in the state of Tamil Nadu in 2012. The voucher programme encouraged local entrepreneurs to come forward with their ideas and business plan, instead of providing incubation support based on pre-determined areas. The entrepreneurs were linked up with knowledge providers to develop their business models.

Top business schools (such as IIMs) and leading tech companies (such as Infosys) have innovation centres, offering mentorship and incubation support, funding connections, connecting with industry networks, along with campus training for startup entrepreneurship development.

The government's free Startup India Learning Program follows up on its Startup India initiative. Developed by Invest India with UpGrad, the programme offers structured learning modules to aid aspiring entrepreneurs and those two to three years into their start-up venture. The platform also provides mentoring and incubation support to learn from experienced entrepreneurs about protecting intellectual property rights and approaching investors.

The birth of service aggregators such as Ola, the cab aggregator, UrbanClap, the service aggregator and IndiaMART, the e-commerce platform have given wing to entrepreneurial spirits across India. The potential is enormous for connecting micro-entrepreneurs with certified skills to service aggregators for increased access to markets.

#### Formalising informal workers by recognising prior learning

India's labour force is still almost entirely informal. Of the workforce 15 years and above, 92% did not have access to any social security or healthcare benefits. A large proportion of new jobs remain informal. In manufacturing, while the informal sector has been key to generating employment opportunities, its average wages are dramatically lower than the formal manufacturing sector's. The formal manufacturing sector hires only 20% of India's manufacturing workers (in 1% of the manufacturing establishments) even though it contributes more than 80% of manufacturing output.

Providing incentives for greater registration of firms, improving regulatory transparency, and easing regulatory burdens (including

labour laws) for better compliance may help expand the size of the formal sector. This could accelerate the creation of formal jobs and allow the formalisation of informal labour. However, informal labour is not confined to the unorganised sector: informal labour is increasingly hired even in the formal sector, a phenomenon termed "flexibilisation," raising concerns about the quality of employment.<sup>47</sup> The government launched three social security schemes targeted at the informal sector—two insurance schemes (Pradhan Mantri Jeevan Jyoti Bima Yojana and Pradhan Mantri Suraksha Bima Yojana) and one pension scheme (Atal Pension Yojana).

Informal wage workers exist in both the organised and unorganised sectors, and wage inequality between the formal and informal workers is wide in both sectors. Formalising the skills of informal workers by recognising skills they have gained outside regular education and training institutions would benefit both the workers and their employers. One path to formalisation is RPL, which assesses and certifies those skills.

Some workers without formal education or training have acquired knowledge through "non-formal" sources, which are structured but outside educational institutions, such as community and hereditary sources. But most learned primarily from "informal" sources, such as daily activities or work experience. Many of these workers hail from less developed regions and have been systematically left behind due to inadequate education facilities, while others opted out of formal schooling in order to eke out a living. Formally evaluating previously unrecognised skills, acquired outside formal educational and vocational training, can lead to skill certification and further skill improvement. Skill certification can signal higher productivity to potential and existing employers—and pave the way for social recognition, job mobility and better wages and benefits.

Employers benefit from a having a certified skilled worker because certified skills can improve firm competitiveness and productivity. They also benefit from providing on-the-job training once they learn workers' skill gaps through assessment and certification of existing skills. And they benefit from the certification of that further training if assessed through RPL.

RPL assessments can reduce regional mismatches of supply and demand for labour by steering workers into new employment through the visibility and accreditation of their

skills, including possible entry into the formal sector. The MSDE certified nearly 110,780 through the RPL programme after training 180,690 workers in 2015–16. For 2016–20, it has set a target of some 573,550 trainees for the RPL programme. In 2016–17, they had enrolled just under 52,880 students.<sup>48</sup>

A majority of workers in manufacturing of food products, wood products, textiles and apparel, construction and retail trade have no vocational training.<sup>49</sup> There were approximately 39 million workers in construction and 16 million workers in textiles and apparel with no vocational skills in 2011–12.<sup>50</sup> Including all sectors, about 33% are illiterate, and another 45% have a lower-than-secondary level of education.

RPL is also vital in the health sector. Up to 75% of primary care visits in rural India are carried out by informal providers and self-declared doctors, reflecting the dearth of trained health professionals in such areas. Identifying and training such workers can increase correct case management and improved health care provision.<sup>51</sup>

The disparate geographic distribution, occupational groups, and skills of informal workers suggest two different groupings for RPL. First come wage workers at factory sites, employer premises and industrial clusters, including the construction sector, apparel factories and textile mills employing large number of workers. Second are self-employed workers, micro-entrepreneurs and livelihood entrepreneurs. They are widely spread and hard to trace, making RPL difficult. Some, however, may be traced to traditional clusters (such as handloom clusters in the Northeast) and master artisan networks, and others can be traced by UWIN cards issued by state governments or Aadhaar number. When they are found, RPL may be implemented in collaboration with NSDA-recognised training partners.

While the formal assessment of acquired skills helps employers ensure the quality of their products, they often lack incentives to invest in RPL. Most construction work, for instance, is subcontracted to small contractors with little long-term incentive for skilling their workers. The workforce's migratory nature adds to the problem, including in the textile sector, where the difficulty of tracing workers prevents employers from reskilling or upskilling. Also, most of these workers are daily wage earners inclined to switch jobs for higher wages without any notice, also preventing firm-level investment in training.

Recognition of prior learning assessments can reduce regional mismatches of supply and demand for labour by steering workers into new employment through the visibility and accreditation of their skills

As India grapples with the legacy problems of its existing skills–jobs mismatch, it must also pay attention to anticipating the skills of tomorrow where it is not even clear what those skills might be

### BOX 3.2 The knowledge economy and skills

In a knowledge economy, knowledge propels competitive growth—it is acquired, created, disseminated and used to enhance economic development. The transition from a traditional economy to a knowledge economy thus requires long-term investments in education, innovation and information and communications technology (ICT). It also requires an economic and institutional regime that mobilises and allocates resources efficiently.

Knowledge economies constantly modernise their education system. Traditional economies, too, have relied on education to advance innovation and technology, but a knowledge

Source: Adapted from UNESCO (2010).

economy’s complex and rapid interplay among education, knowledge, technology and skills requires far-reaching adjustments to teaching and learning.

These adjustments are essential to improving the skills, quality and flexibility of labour and management. They require not only traditional “hard” skills and ICT competencies, but also a new set of “soft skills,” such as the spirit of enquiry, adaptability, problem-solving, communication, self-learning, knowledge discovery, cultural sensitivity, social empathy and motivation for work. A country’s teaching and learning environments must nurture these skills.

Under PMKVY 2 (Pradhan Mantri Kaushal Vikas Yojna), the MSDE in association with the NSDC has launched an outcome-based RPL for pre-assessing the industry-specific skills of workers and recommending training based on the assessments.<sup>52</sup> The skill profile of the worker to be mapped into the requisite qualification packs based on National Occupational Standards formulated by the appropriate SSCs.

Also under PMKVY–II, RPL has been launched in industry sites and industrial clusters for several sectors. LabourNet Services India, a partner of NSDC, also launched RPL for tailors working in the apparel sector in collaboration with Raymond, a leader in the men’s apparel segment. IL&FS Clusters—a joint initiative of IL&FS Education & NSDC—has conducted the RPL programme for multiple sectors including, Agriculture, Apparel, Leather, Tourism & Hospitality, and street vendors. PMKVY–II has also launched RPL for micro-entrepreneurs, such as street vendors near Rashtrapati Bhavan, and now should scale up the programme.

#### India’s new knowledge economy requires new skills

India’s economy is transforming into a knowledge economy, with computers performing routine tasks while collaborative work takes on greater importance, along with sifting vast amounts of information to separate signal from

noise (box 3.2). Employers want to hire people who can identify and solve problems—and work in teams. These needs are at odds with the way India’s educational system teaches a body of immutable facts.

As India grapples with the legacy problems of its existing skills–jobs mismatch, it must also pay attention to anticipating the skills of tomorrow where it is not even clear what those skills might be.

#### Notes

1. Bhattacharya and Bhandari 2018.
2. Kochhar et al. 2006.
3. Azam 2012.
4. Autor 2015, Autor, Katz and Kearney 2006, Goos, Manning and Salomons 2014.
5. Autor 2015.
6. Maclean and Pavlova 2013.
7. Das 2017.
8. Bhandari 2018.
9. Stacey and Nicolaou 2017.
10. NCAER computations from NSSO 68th Round (2014).
11. The Wheebox Employability Skills Test (WEST) included all 29 states and 7 union territories and 3,000 educational campuses across India and assessed about 5.6 lakh candidates on parameters like domain knowledge, computer skills, numerical and logical aptitude, critical thinking, behavioural traits including learning agility,

adaptability, interpersonal skills, emotional intelligence, conflict resolution and self-determination. Employability of final year students (between the ages 18–29) was tested using the WEST including those getting degrees in engineering, MBAs, Bachelors of Arts (BAs), Bachelors of Commerce (BComs), Bachelors of Science (BScs), Masters of Science (MScs), Bachelors of Pharmacy (BPharmas) and including students at Industrial Training Institutes and polytechnics. All those who scored more than 60% were considered employable. Candidates showed an improvement in employability from 33.1% in 2016 to 40% in 2017 (Wheebox et al. 2017). Latest available statistics from 2018, shows an even further improvement in employability, at 45% (PeopleStrong et al. 2018).

12. NCAER computations from the NSSO, 68th Round (2014). Data are for 2011–12.
13. Klasen and Pieters 2015.
14. The NSQF (National Skill Qualification Framework) is a competency-based framework anchored at the National Skill Development Agency (NSDA), which charts out career progression of a worker in specific job roles in respective sectors, mapping task-based job roles over ten levels.
15. World Bank 2015.
16. Cortes et al. 2014.
17. De Grip 2006.
18. iMove 2015.
19. NCAER computations from the NSSO 68th Round and previous rounds (NSSO 2014).
20. Chatterjee, Murgai and Rama 2015, Desai 2017.
21. Eswaran, Ramaswami and Wadhwa 2013, Desai and Mehta 2017.
22. Desai et al. 2010. A similar trend was observed for urban women aged 25–54 by Klaasen and Peiters (2015).
23. Verick 2014.
24. NCAER computations from NSSO 68th Round (2014).
25. Sixth economic census, carried out between January 2013 and April 2014.
26. UNDP 2016.
27. Sinha, Parida and Baruah 2012, Field et al. 2016. Peer effect is likely to enhance the likelihood of running a viable business for women subject to social and cultural restrictions.
28. UNICEF Kanyashree Prakalpa Annual Report 2015–16 and NCAER research team discussions with UNICEF.
29. The Skill Sakhi initiative is incubated by Pratham Foundation under Disha. <https://undp-india.exposure.co/disha-in-action>.
30. Desai 2017, Nathan, Saripalle and Gurunathan 2016.
31. Munshi and Rosenzweig 2016.
32. Munshi and Rosenzweig 2016.
33. Munshi and Rosenzweig 2016. Insurance networks are organised around caste in India. The empirical evidence indicates that there exists a trade-off between the insurance provided by rural caste-based networks and the income gain from migration. Those households that benefit less (more) from the rural network are more (less) likely to have migrant members.
34. Morten 2013.
35. Daymard 2015, Mondragón-Vélez and Peña 2008.
36. Deshpande and Sharma 2013.
37. Pilz, Uma and Venkatram 2015.
38. Estimated based on NSSO 68th round data (2014). Data are for 2011–12.
39. Blom and Saeki 2011, PeopleStrong et al. 2018.
40. Pilz, Uma and Venkatram 2015, Pilz and Wilmshöfer 2015.
41. Basu 2014.
42. <https://www.iimcal.ac.in/faculty/centers-of-excellence/centre-for-entrepreneurship-innovation/iim-calcutta-innovation-park>.
43. Shankar 2012.
44. IIE has been particularly instrumental in implementing the Scheme of Fund for Regeneration of Traditional Industries (SFURTI).
45. Ghani, Kerr, and O’Connell 2011.
46. MUDRA is the regulatory body for Micro-Finance Institutions (MFIs).
47. Saha, Sen and Maiti 2013; WTO 2009.
48. Ministry of Skill Development and Entrepreneurship 2016–17.
49. All estimates are based on the portion of workforce (based on usual principal status) with no college degree and no formal vocational education. NSSO 68th round (2014). Data are for 2011–12.
50. If one looks at both principal plus subsidiary workers, the total workers in construction up to higher secondary education and with no formal vocational skills increases to 48 million. The corresponding number for textiles and apparel remains at 16 million.
51. Das et al. 2016.
52. [http://pmkvyofficial.org/App\\_Documents/News/RPLGuideline-Final21stSep-withAddendum2.0.pdf](http://pmkvyofficial.org/App_Documents/News/RPLGuideline-Final21stSep-withAddendum2.0.pdf).

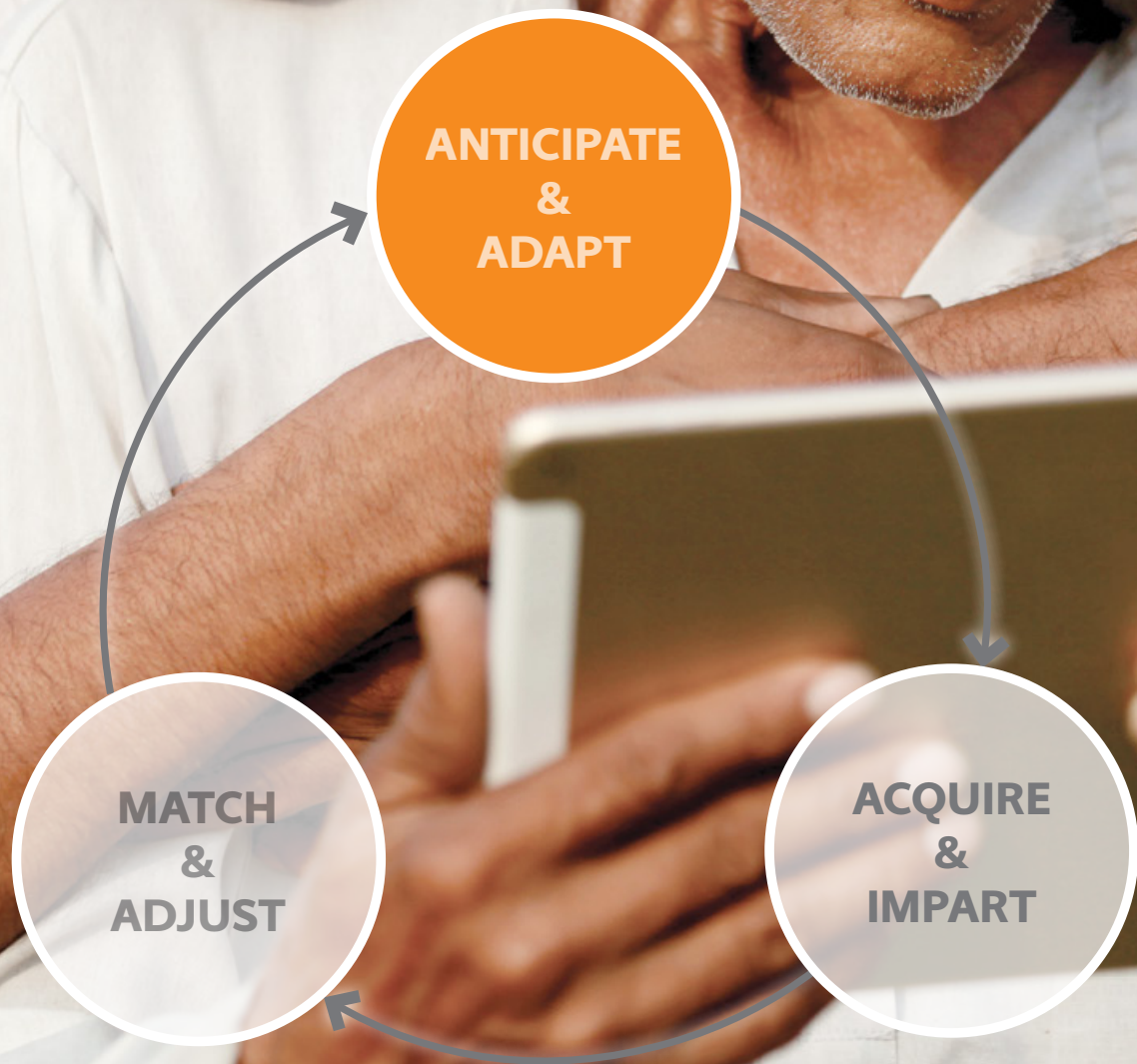
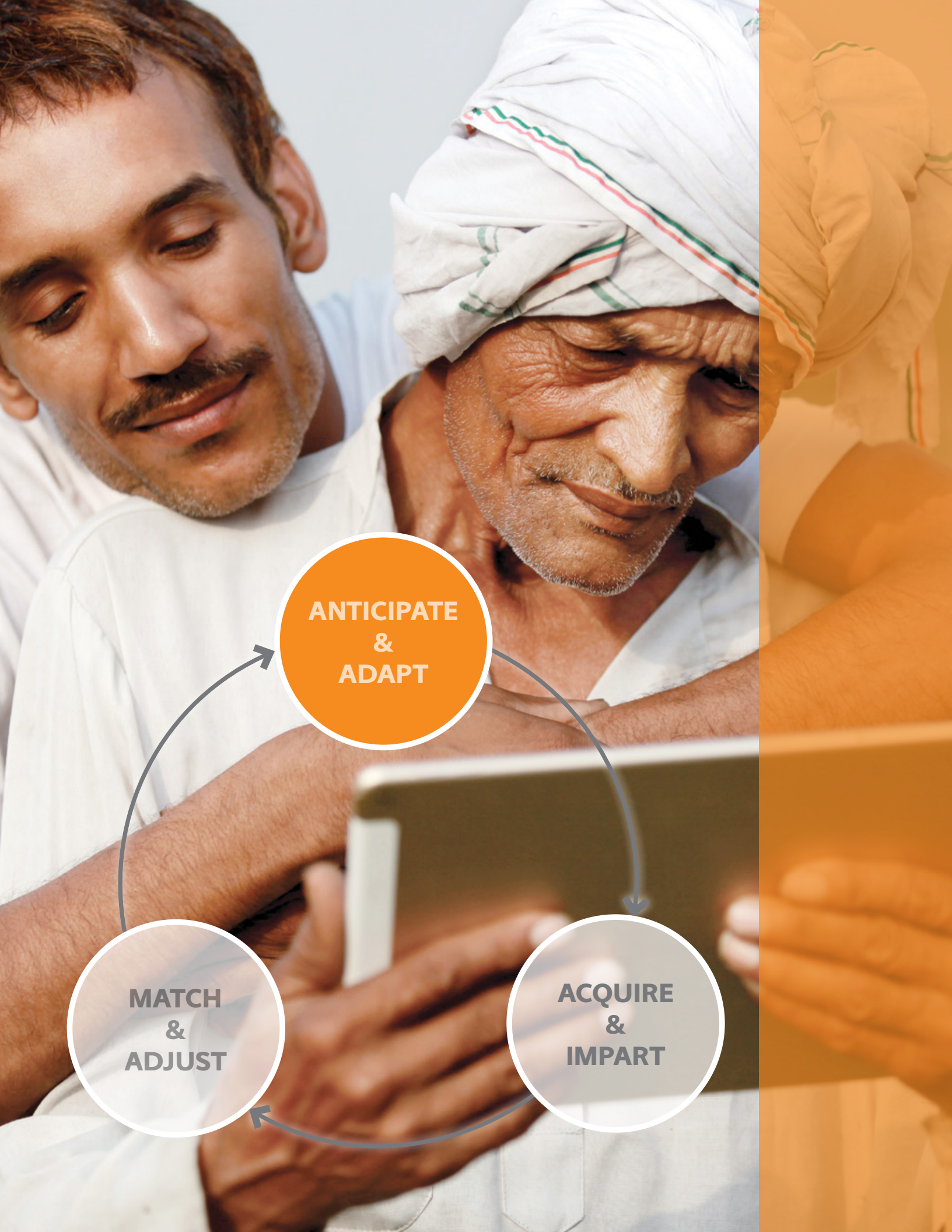


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## 4

### Anticipating skills

#### How best to adapt them

Imagine a ship sailing in uncharted waters. Given the risks and uncertainties, all hands need to work in concert: the officers steering on the bridge, the navigators using sonar, the crew stoking the engines, the rest of the crew performing other essential tasks—all ready to quickly change course as new conditions become known. Anticipating the future of skills is much the same: all hands need to work in concert. The Central and State Governments will create the environment and set the incentives to foster flexibility in the labour market and responsiveness in allocating resources to the most promising and most productive sectors. Firms will be the antennae navigating risky and uncertain global and domestic markets, investing in skilling, upskilling and reskilling. Firms and training providers will come together in an integrated skilling ecosystem to impart the higher-order cognitive, technical and behavioural skills employees need for the 21st century workplace. With all that in place, trainers and workers will have clear incentives to invest in their own human capital so that they keep India's skilling ship on a steady course. How might this happen? Perhaps through a new Commission for 21st Century Skills, pulling together all stakeholders.

India's economy is slowly shifting from agriculture to manufacturing and services and from labour-intensive to capital-intensive production modes. Even though services are booming, only unorganised manufacturing and construction are absorbing much labour released from agriculture. Meanwhile technological changes are boosting the capital intensity of manufacturing sectors, threatening their future demands for labour. Industrial Revolution 4.0—with its burgeoning applications of such disruptive technologies as robotics, cloud computing, artificial intelligence and the Internet of things—will be game changers for business growth over the next several decades,

revolutionising the world of work, the workplace and the workforce.

#### Exchanging life-time employment for life-time employability

Workforce skills must adapt. Workers must exchange lifetime employment, which is fast disappearing, for lifetime employability. Skilling the Indian workforce in this fluid, rapidly changing environment means training workers and employers to recognise and enhance transferable skills that can let workers move from job to job, firm to firm and industry to industry over the course of their careers. Bolstering innovative entrepreneurs and upskilling women, who are greatly underrepresented in the workforce, will both encourage the entry of workers and create new jobs.

Digitising India's economy and formalising its informal economy will change the skills demanded of the labour force for many years. Anticipating precise numerical or sectoral demands, given accelerating technology cycles, is impossible and likely to be misleading. Since the demand for skills is volatile and uncertain, policy initiatives need to focus on aiding access to quality education and vocational training programmes, along with labour market and business regulatory reforms to rapidly expand the scope of the organised sector. Programmes need to support adapting workforce skills for jobs that can be foreseen, and higher-order transferable skills for jobs unforeseen, along with emphasising learning to learn and lifelong learning for an agile knowledge economy. In anticipating skills for India's future, all policies and programmes of the government and the private sector should aim to make the Indian worker able to exchange lifetime employment for lifetime employability.



The e-commerce sector could create 14 million jobs in logistics and delivery, and 6 million in customer care, information technology and management

Adapting to structural and technological change

Skilled labour and technology are complementary, but unskilled labour and technology are substitutes. Technology is more likely to substitute for routine cognitive jobs such as clerical work, accounting and factory shop floor assembly-line work, repetitive activities that can be performed within pre-defined guidelines.<sup>1</sup> But jobs that require higher-order cognitive skills, such as creativity and complex problem solving, are likely to thrive.

Skill-intensive industries in India’s total workforce remain small, posing a challenging scenario for policymakers—how to incentivise the creation of more well-paying jobs.<sup>2</sup> In India skill-biased and capital-biased technological change has translated into declining labour intensity, even for labour-intensive firms in organised manufacturing.

In India’s changing economy as elsewhere, labour is exiting the agricultural sector, but is not moving to markedly better jobs. Most jobs created in the past 10 years have been in unregistered manufacturing and construction, where labour productivity is not much higher than in agriculture (figure 4.1). The formal manufacturing and services sector are not generating the additional good jobs the country needs.

Employment growth in relation to output growth has been falling in agriculture and was negative in the second half of the 2000s. It also fell in manufacturing, though not as much. In contrast, construction witnessed an upswing (table 4.1). And even though services registered growth in labour productivity of 6.3% between 2000 and 2010, employment growth has not kept pace.<sup>3</sup>

A thriving e-commerce sector could change that. A young population, digital disruption, rapid Internet penetration in cities below the top tier and widespread adoption of smart-phone and digital payments could fuel the growth of e-commerce and create jobs through forward and backward linkages. And as rural India gets more digitised and connected to markets through the Digital India initiative, e-commerce growth could also link village retailers and livelihood entrepreneurs and create job opportunities over the next decade.

With growth in online purchases, the e-commerce sector could create 14 million jobs in logistics and delivery, and 6 million in customer care, information technology (IT) and management.<sup>4</sup> Although retail stores may suffer from the rise of e-commerce, the sector could create 12 million net new jobs.

But technological change can be a double-edged sword, rendering technical advances overseas harmful to IT jobs in India. Such

TABLE 4.1 Sectoral output and employment

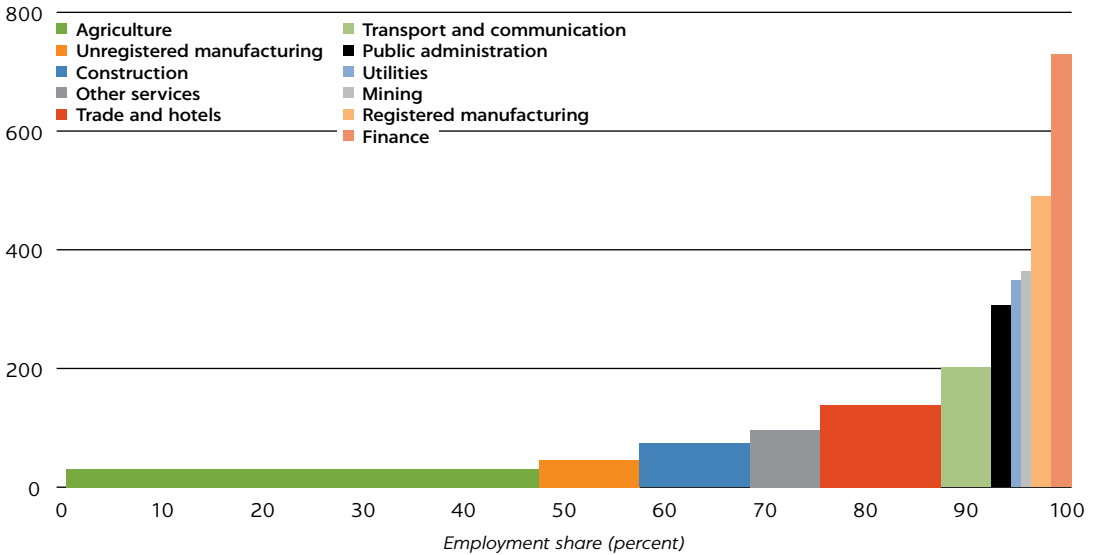
SECTORS	SECTORAL GDP SHARE (%)		SECTORAL EMPLOYMENT SHARE (%)		OUTPUT ELASTICITY OF EMPLOYMENT	
	2004-05	2011-12	2004-05	2011-12	1999-2000 TO 2004-05	2004-05 TO 2011-12
Agriculture, forestry & fishing	19.0	14.4	58.3	48.8	0.855	-0.460
Industry	27.9	28.2	18.1	24.2	0.805	0.556
Mining & quarrying	2.9	2.1	0.6	0.5	0.771	-0.053
Manufacturing	15.3	16.3	11.6	12.5	0.717	0.167
Electricity, gas & water supply	2.1	1.9	0.3	0.5	0.462	1.456
Construction	7.7	7.9	5.6	10.6	0.847	1.142
Services	53.0	57.4	23.6	27.0	0.451	0.261
Trade, hotels & restaurant	16.1	16.1	10.3	11.0	0.126	0.179
Transport, storage & communication	8.4	10.6	3.9	4.9	-0.795	0.317
Financing, insurance, real estate & business services	14.7	18.0	1.6	1.1	1.426	-0.362
Community, social & personal services	13.8	12.7	7.8	10.0	0.323	0.587
All sectors	100.0	100.0	100.0	100.0	0.426	0.068

Note: The output elasticity of employment is computed using the CAGR (compound annual growth rate) approach; the calculation of unit-level employment data is from various National Sample Survey Office (NSSO) rounds. Misra and Suresh (2014) follow a similar CAGR approach for calculating output elasticity of employment for various years. Source: NCAER estimates based on data from Central Statistical Office (CSO) and NSSO. Data on GDP in constant prices for 2004-05 and 2011-12 from CSO Employment data (usual principal and subsidiary status) are from the 61st and 68th Rounds of NSSO’s Employment-Unemployment Survey, respectively.

Technology cycles are shorter than ever, and digital disruption in India is likely to recur with greater frequency, changing the job landscape again and again

FIGURE 4.1 Low-productivity sectors employ higher proportions of the workforce and vice versa

Sectoral labour productivity as a percentage of average labour productivity



Note: Other services includes education, health and social work. Source: Hasan et al. 2012, Bhandari and Srinivasan 2016; estimates based on Central Statistical Organisation and National Sample Survey Office 2011-12.

a give-and-take appeared with a vengeance in 2017 in India’s IT industry, which faced high layoffs, expected to continue for several years and potentially numbering in the hundreds of thousands as western businesses explored automation, robotics and innovative technologies such as cloud computing to replace jobs formerly subcontracted to Indian firms like Infosys, Wipro and Tech Mahindra. This highlights the importance for workers and employers of nonroutine and higher-order cognitive skills that are difficult to automate—unlike routine, repetitive, well-defined cognitive skills, even at a high professional level, that can be easily automated.

Simply training workers for existing jobs, as under Pradhan Mantri Kaushal Vikas Yojana skill development programmes or other vocational and technical training initiatives, will not serve them in the long run, because change is accelerating. As mentioned earlier, technology cycles are shorter than ever, and digital disruption is likely to recur with greater frequency, changing the job landscape again and again.

Even today’s training preparing workers for existing jobs is not working well. As one

commentator has said, “Most of those who come out of our vocational programmes pack a single, terminal skill that resists upgrading. Not surprising then that 44% of those with computer training and 60% of those with textile related expertise are all dressed up, but sitting at home. Obviously there is no tie-in with industry, or else why should there be such a glut of vocationally trained workers? Worse, have the skills they learnt now become obsolete?”<sup>5</sup>

Trainees just a couple of years after graduating from ITIs face high unemployment. Industrial on-the-job training and public-private training partnerships (PPPs) promise to match skills and work better, but they face high dropout rates. Among 2,000 trainees surveyed by Accenture from PPP programmes, one-third either declined jobs on offer or left jobs within a month of starting them.<sup>6</sup> And PPP programmes are found only in the organised sector, so they miss 95% of the workforce.

Instead, training should also provide skills to enhance worker mobility across occupations, giving them the flexibility to meet changing employment demands.<sup>7</sup> Occupational mobility has a variety of forms. It can take place within



Transferable skills relevant to multiple workplaces are the key to promoting workforce agility

an organisation as a worker changes jobs, perhaps through a promotion. It can be a transfer from one employer to another to do a similar job in the same industry. Or it can mean a worker using the skills gained in one occupation to get a job in a very different occupation that partly relies on existing skills.<sup>8</sup> Key to ensuring greater worker mobility are transferable skills that can aid workers in adapting to firms’ changing needs, and in achieving career goals.

Enhancing the transferability of skills

Transferable skills relevant to multiple workplaces are the key to promoting workforce agility (chapter 2 discussed how portable skills require innovative teaching approaches). To begin with transferable skills mean core or foundational skills. Traditional social and communication skills include being punctual, communicating with others and reading and writing (see appendix 2.1). And new foundational cognitive and personal skills emphasise learning and the ability to make judgements, solve problems and acquire additional skills.<sup>9</sup> Computer skills, English-speaking skills and civic knowledge will enhance the employability of individuals from rural and low-income locations.<sup>10</sup> Such foundational skills, relevant to all kinds of occupations at all levels, are highly transferable.

General vocational and technical skills offered at ITIs and other technical institutes, including those offered in collaboration with the industry or in skilling programmes under the NAPS, may include operating or maintaining industrial machines, developing software and applying IT. Those skills can be applied in

many different sectors in an economy.<sup>11</sup> Other skills apply a trade’s basic principles and techniques specific to an industry, so their transferability is limited to that industry.

Transferable skills also include higher-order skills. An array of higher-order cognitive and non-cognitive soft skills related to creativity, self-initiative and self-control, overlapping with other foundational skills, are among the most valued transferable skills (table 4.2). While short-term skilling initiatives, such as those offered under the PMKVY programme and DDU-GKY, impart basic transferable skills such as digital literacy and financial literacy, some higher-order transferable skills are harder to teach and tend to get left out—they need a longer-term approach.

Human resource specialists catalogue transferable skills as:

- Speaking, writing, facilitating, negotiating, persuading, listening, interviewing, editing
- Forecasting, identifying problems, creating ideas, solving problems, setting goals, defining needs, analysing
- Developing rapport, providing support, expressing empathy, motivating others, cooperating, representing others (being collegial and all-inclusive)
- Initiating new ideas, coordinating tasks, managing groups, delegating, teaching, coaching, counselling, selling ideas, decision-making, managing conflict (especially important within consulting)
- Implementing decisions, cooperating, enforcing policies, being punctual, managing time, attending to detail, meeting goals, accepting responsibility, organising (on time/on budget)<sup>12</sup>

TABLE 4.2 What skills are most transferable?

TYPE OF SKILL	HARD SKILLS Technical, job-specific skills that are usually easily observed, measured, trained and closely connected with knowledge	SOFT SKILLS Non-job specific skills, which are usually intangible, hard to measure and closely connected with attitudes
GENERIC Skills applicable in most companies, occupations and sectors	Generic hard skills Examples: Digital skills, language skills, financial literacy, numeracy, reading, writing	Generic soft skills Examples: Communication, attitude towards work, time management
SPECIFIC Skills applicable in a few companies, occupations and sectors	Specific hard skills Examples: Cloud computing, mechanical engineering, copy-writing, singing	Specific soft skills Examples: Entrepreneurial spirit, managerial decisionmaking, customer orientation

Note: Hard skills are primarily technical, job-specific cognitive skills, whereas soft skills can combine higher-order cognitive and non-cognitive skills. Generic skills, which can be both hard and soft skills, are more transferable in nature.  
Source: Adapted from European Commission (2011).

For workers to actually be able to make the jump from one job to another—what the ILO calls “portability”—employers have to recognise transferable skills. For this the ILO calls for “certification and recognition of skills within national and international labour markets.”<sup>13</sup> Some kinds of cognitive skills can be certified through tests or, in more complex areas, formal accreditation. Non-cognitive skills such as insight, intuition, creativity and judgment are hard to measure and have to be observed in operation.<sup>14</sup>

Exchanging lifetime employment for lifetime employability,<sup>15</sup> workers may not work for the same company, but may instead be constantly reskilling, upskilling and identifying and exercising transferable skills to have a satisfying, profitable career through a succession of jobs. For example Denmark’s “flexicurity” offers a model in which firms have great flexibility to hire and fire, and workers have generous unemployment benefits along with a requirement that they retrain for new employment and participate in job placement programmes.<sup>16</sup> Even in advanced economies, this is not simple: Questions were raised about the adequacy of practices like flexicurity when the 2008 financial crisis led to persistent unemployment in some European countries.<sup>17</sup>

Anticipating the skills of the future

21st century jobs will no longer be confined to task-specific roles. Instead, the demand for multidimensional skills will increasingly grow. Unprecedented technological progress has ushered in an era where the future of work looks very different from how people worked in the past. Drivers will compete with driverless cars, and humans with robots. For the 21st century worker to thrive in a world of automation, acquiring foundational skills and deploying strong non-cognitive and higher-order cognitive skills will be vital. It is no longer sufficient for an Uber or Ola driver to have expertise in driving. It is equally important for her to navigate the GPS on her smartphone (digital literacy), use a payment wallet for rider fees (financial literacy), and possess language skills for effective communication and congenial interpersonal skills (non-cognitive skills) for a customer-centric approach.

While technical and vocational skill development programmes tend to focus on job-specific

technical skills, financial literacy and digital literacy, noncognitive skills (such as behavioural skills) and higher cognitive skills (such as flexibility) set humans apart from machines. For instance, while medical knowledge and corresponding skill certification have been compulsory for doctors and health workers, compassion and empathy with the patient make a health worker indispensable in an increasingly automated health industry. Many jobs with traditional required skills will add new ones in the 21st century (table 4.3).

Promoting innovation-led entrepreneurship to signal changing skill demands

Entrepreneurs are the key to exploiting technology to generate new jobs at the cutting edge of technology. Their success or failure can be vital to signalling how skills need to change as entrepreneurial success gets mainstreamed. In the past decade India has seen a spurt in startups in services, primarily through e-commerce and technology platforms. In fact India has become the third largest startup ecosystem after the United States and United Kingdom in the number of startups, though the entrepreneurial ecosystem lags behind in catalysing successful innovation.

A recent study found that 90% of Indian startups collapse within the first five years, with a lack of innovation a primary factor.<sup>18</sup> Of the venture capitalists surveyed, 77% thought Indian startups suffer from a lack of innovation based on new technologies or unique business models (figure 4.2). Other factors that stymie startups in India include a lack of skilled workers, difficulties in financing, inadequate mentoring and poor business ethics.

Most startups that failed attempted to emulate pre-existing western prototypes, such as e-commerce and e-wallets. Such models took off as new innovations in western countries, but were merely repackaged and relaunched in the Indian market. Such startups are examples of structural innovations, and are not necessarily examples of innovation-led entrepreneurship. Required at this juncture are startups that innovate and provide solutions for challenges faced, for example, by Tier-1 and Tier-2 cities (such as in education, health and sanitation, transportation and energy) and by farming communities—adapting business models to local needs.

21st century jobs will no longer be confined to task-specific roles. Instead, the demand for multi-dimensional skills will increasingly grow

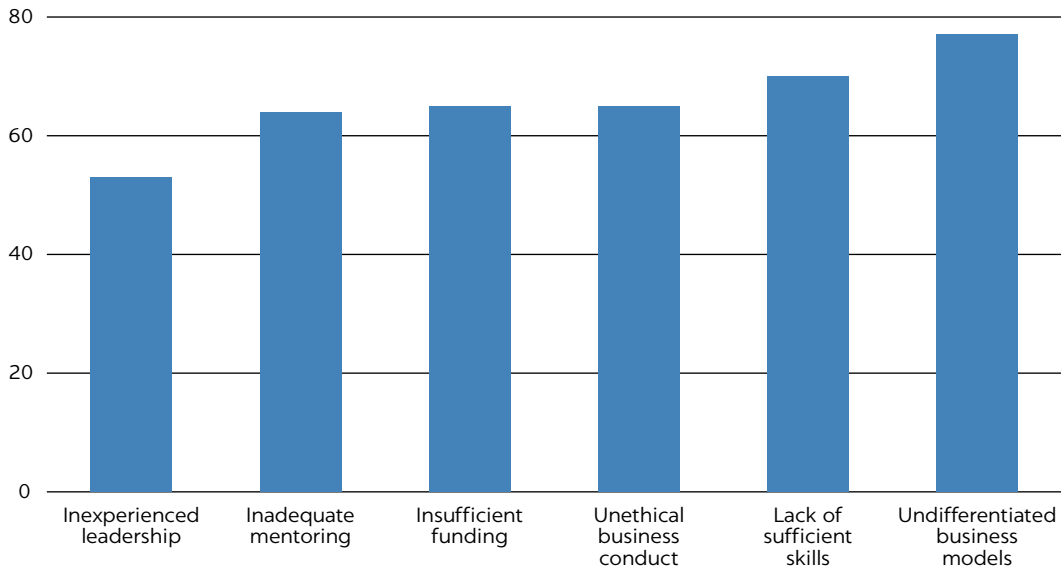
TABLE 4.3 Transitioning from skills to jobs in 21st century India

SKILLS		JOB
TRADITIONAL REQUIREMENTS:		
JOB-SPECIFIC SKILLS	NEW REQUIREMENTS	EXAMPLES
Business skills, managerial skills, product knowledge	Higher cognitive skills such as critical thinking, creativity, cognitive flexibility, digital skills, research skills, technical problem-solving skills, digital skills, financial literacy Noncognitive skills such as emotional intelligence, interpersonal skills Ability to cater to and knowledge of local economy	Innovation-led entrepreneur
Nursing, basic care services, literacy, numeracy	Noncognitive skills such as empathy, compassion, patience, flexibility, teamwork	Compassionate health worker
Driving, literacy	Digital literacy (for accessing smartphone) and map reading for GPS Financial literacy (for operating payment wallet) Language and communication skills—include both local and English language skills (interacting with tourists and local customers) Noncognitive skills such as empathy, politeness, time to report for 5-star rating	Uber driver
Computing skills	Cognitive skills such as critical thinking, creativity, cognitive flexibility, advanced analytical skills, technical problem-solving skills, business intelligence, advanced digital skills Noncognitive skills (client and customer orientation, team work, leadership) Advanced technical degree, consulting experience	Data scientist, artificial intelligence expert
Crafts skills	Literacy and numeracy Digital literacy (for app-based sales) Financial literacy (for operating payment wallet) Language and communication skills—include both local and English language skills (for connecting to markets across borders and connecting to digital platforms such as Flipkart or Myntra where content is provided in English) Awareness of latest market trends and customer pulse	Rural handicraft entrepreneur

Source: NCAER compilation based on literature review and stakeholder discussions.

FIGURE 4.2 Venture capitalists identify why Indian startups fail

Percent of venture capitalists responding



Note: Survey includes responses from 100 venture capitalists.  
Source: IBM 2017.

With strategic vision and clarity of purpose, success is possible in urban and rural India. The NASSCOM established a Centre of Excellence for Internet of Things along with the Ministry of Electronics and Information Technology of the Government of India (MeiTY) and ERNET (the Education and Research Network of the Government of India) to harness Indian start-up entrepreneurs’ creative capacity.

One of the centre’s first incubated startups, IoT Pot, launched Klove Knob, a product that aims to make cooking safer, smarter and more convenient for Indian households.<sup>19</sup> farMart, launched in 2016, is an on-demand machinery renting platform for farmers from farmers. It allows small and marginal farmers to rent machinery and allows machinery owners to earn from underused assets (box 4.1). Now scaling up its business model across other states, farMart has attracted angel investors. Project Mo00 is another example of a pioneering startup aiming to support dairy farmers

with sustainable technology. Common in such entrepreneurship models is the role of technology in providing innovative solutions for local challenges.

Many Indian government programmes for entrepreneurship, such as the Pradhan Mantri YUVA Yojana education and training scheme (see box 3.2) or Deen Dayal Upadhyay Swaniyojan Yojana (DDU-SY), aim to upskill people who are entrepreneurs by necessity in the unorganised sector, those with no access to formal jobs. These “necessity” micro-entrepreneurs, the vast majority of India’s entrepreneurs, can then be readier to enter formal employment as soon as they have the opportunity.

Other programmes promote “opportunity” entrepreneurs, those led by the opportunity to innovate. Examples of such programmes are innovation centres at leading business schools, the IIE, the Entrepreneurship Development Institute of India and the NASSCOM Centre

BOX 4.1 Entrepreneurial initiatives to improve farm productivity

Nearly 70% of agricultural households own less than a hectare of farmland, according to the 2012–13 NSSO survey. Small and marginal holdings preclude mechanisation and deny productivity benefits from economies of scale. This also makes it unviable for small and marginal farmers to own tractors and tillers solely for their own farm. A survey of 1,500 farmers in June 2015 across Uttar Pradesh, Uttarakhand and Punjab showed that 93% regularly face severe challenges in renting machinery.

A team of professionals—with backgrounds in farming, digital payments and mechanical engineering—joined to launch farMart in 2016. farMart is an on-demand agro-machinery renting platform connecting large farmers who own machinery to farmers who don’t—booking is carried out on mobile apps or through call centres, with payments using Aadhaar biometric numbers. The business aims to augment the prevailing rental market for agro-machinery, which is highly fragmented due to information asymmetry, lack of standard pricing and poor rural information and communications technology infrastructure.

The low income-generating capacity of small and marginal farmers also prompts farmers to venture into dairy farming to supplement their income. Project Mo00, launched by UDAY, a skill development initiative, aims to transform the socioeconomic landscape of dairy farmers and boost the quality and production of dairies in India.

Project Mo00 seeks to create rural startup ventures headed by “village entrepreneurs,” primarily rural youth and women. These village entrepreneurs travel to villages in a technologically advanced dairy van and impart hands-on skills to dairy farmers, along with improving connectivity for forward and backward linkages. Project Mo00 also has an app-based service that provides farmers with regular alerts during the entire lifecycle of the dairy animal using sustainable dairy management practices to tackle dairy deficits, milk traceability and the lack of agricultural extension.

UDAY signed a contract with a large milk producer in Punjab to provide skill training for 10,000 dairy farmers in 337 villages across three districts. The project aims to scale up further, connecting one million farmers on the Mo00 App by 2021.

Sources: NCAER interview with farMart entrepreneurs (November 2016); Kurian 2017.

Many government programmes aim to upskill people who are entrepreneurs by necessity in the unorganised sector



Customer-facing jobs with non-routine interactive tasks that depend on soft skills can be expected to grow. So can jobs depending on higher-order cognitive skills

of Excellence for the Internet of Things (see chapter 3). They teach knowledge and skills for harnessing entrepreneurs' creative ability and connect them with funding, networking opportunities, incubation support, research and consultancy services, and cluster development.

Some of the most famous innovation-led industry clusters, such as Silicon Valley in California and Eindhoven in the Netherlands, have sprouted up around hi-tech university campuses, with knowledge sharing between startup enterprises and universities and technical institutes. Such collaborations, along with investments in infrastructure and research and development, can lead to successful innovation-driven startups and spinoffs. India has vast unexploited opportunities here.

Entrepreneurs operate in uncertain environments and must take risks, but sound technical know-how and business skills provide greater scope for a business's sustainability and job creation. National Institute for Transforming India (NITI Aayog) recently launched Mentor India to nurture an entrepreneurial mindset among school students from class 6 to 12.<sup>20</sup> The programme aims to engage business leaders to mentor students across 900 Atal Tinkering Labs established by the Atal Innovation Mission in schools across India. The labs introduce students to new-age technologies such as robotics, sensors, 3D printers and the Internet of things, and guide them in developing innovation skills, acquiring technical knowledge and imparting business entrepreneurship.

#### *Upskilling women to increase labour force participation and future employability*

Women are at higher risk of structural unemployment in India arising from technological disruption because their employment is concentrated in agriculture and unorganised manufacturing, where capital intensity is increasing and labour intensity decreasing. Within manufacturing there have recently been massive shifts away from labour-intensive production in textiles, food and beverages and machinery and equipment.

The share of female participation in the technology sector is particularly low, and even lower at the managerial level. The share of female managers in computer manufacturing was 5.9% in 2011–12, and in computer programming 11.5%. And employed women face substantial wage discrimination, with men

earning almost 90% more in the rural sector and 37% more in the urban sector.<sup>21</sup> Explaining much of the gap is men's higher educational attainment, except for urban workers with jobs in the formal sector.

Higher education for women, training in digital skills, greater allowance for part-time work, skill training for working in male-dominated industries (box 4.2) and infrastructure and education for entrepreneurship all require support (see chapter 3). Increasing women's labour force participation, especially at higher levels of the economy, would support their livelihoods and open a vast source of productivity for India.

#### *Responding to increasing digitisation*

India's economy will continue to change through digitisation. Worldwide up to 45% of the tasks people do in the workplace could be automated—though that does not mean 45% of jobs could be automated. In retail, for example, packaging and stocking goods and keeping sales records, customer information and product information could all be automated, but advising customers, which requires judgement and emotional intelligence, is much more demanding. In finance and insurance, about the same portion of a workforce's time is spent on tasks that could be automated, such as processing customer records and product information, preparing contracts and verifying the accuracy of records.<sup>22</sup>

Of the jobs that Millennials will perform, experts estimate that 65% do not exist yet.<sup>23</sup> Customer-facing jobs with nonroutine interactive tasks that depend on soft skills can be expected to grow. So can jobs depending on higher-order cognitive skills, such as creativity and cognitive flexibility, including many IT jobs.

India has vast room to expand digital employment. NCAER's Business Expectations Survey attempted to capture the ICT readiness of firms in September 2016, tracking more than 500 Indian companies in the organised sector across Bengaluru, Chennai, Delhi National Capital Region (NCR), Kolkata, Mumbai and Pune. Only 46% of the firms had an IT department or a dedicated IT manager, while 34% provided ICT training to permanent workers and 55% to managers (figure 4.3).

The NCAER survey also revealed that a much higher proportion of firms in the sample

#### **BOX 4.2 Young women in plastics**

A three-month training course for young women in plastic engineering took place in Murthal, Haryana, which has one of the lowest female workforce participation rates in India. The curriculum blends theory and soft skills, as well as practical hands-on training in operating machines used for injection moulding and plastic processing. It will enable young women across the state to find employment on factory floors in the plastic engineering and technology

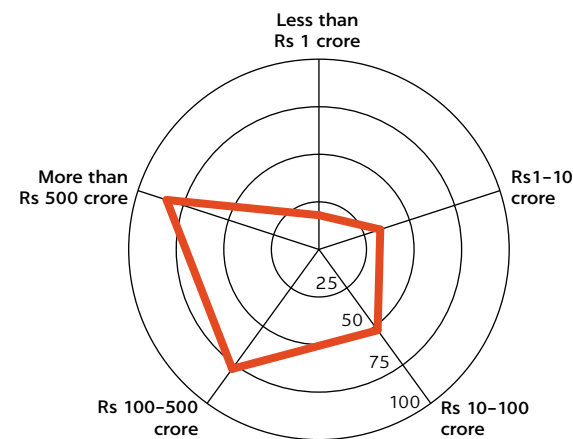
sector. Half the trainees in the first batch were placed in companies in neighbouring industrial hubs.

The course was facilitated by the Central Institute of Plastics Engineering and Technology, an autonomous institute under the Ministry of Chemicals and Fertilizers. It was a pilot as part of a three-year collaboration between the India Development Foundation, the UNDP and Xynéo, supported by the IKEA Foundation.

Source: UNDP 2018.

**FIGURE 4.3 Smaller firms are far from ready to use information and communications technology**

Percentage of firms with an IT department or manager



Note: Figure shows percentage with an information technology (IT) department or IT manager across 500 firms of different sizes across Bengaluru, Chennai, Delhi National Capital Region, Kolkata, Mumbai and Pune. Measured by annual turnover.

Source: National Council of Applied Economic Research Business Expectations Survey, September 2016.

required digital literacy as a prerequisite for hiring permanent and managerial workers, compared with temporary or unskilled workers (figure 4.4). In a similar vein firms are more likely to upskill permanent and managerial workers than unskilled or temporary workers, indicating the need for digital skills to increase the likelihood of landing a permanent job. Firms may not always have the resources to impart training to all their workers to make them ready for jobs so they are more likely to recruit workers who are already digitally literate.

A study by KPMG and Google found that the majority (68%) of Indian small and medium businesses are completely offline, with another 15% connected to digital technologies but yet to use digital services for business purposes (figure 4.5).<sup>24</sup> Only 2% marketed their business online, yet such digitised firms experienced twice as much growth in revenue and customer base as their offline counterparts. Increasingly firms that remain offline, and those less likely to adopt and use digital services, will run the risk of declining market share and suffering from a greater disconnect with consumer tastes and preferences.

Within the IT-business process outsourcing BPO sector, the threat of automation has made it imperative for firms to reinvent themselves, adopt the latest technologies and reskill and upskill their workforces. NASSCOM estimates show that 1.5–2 million people (both fresh entrants and existing employees) need to be reskilled and upskilled—or 38–50% of the workforce in a sector that employs 3.9 million workers.<sup>25</sup> As interlinkages between the IT/ITES (IT enabled services) and manufacturing and other service industries grow, the demand for workers with expertise in advanced analytics and computing skills, along with subject matter expertise and higher non-cognitive skills, is expected to increase. NASSCOM noted the importance of subject matter expertise in areas such as design, humanities, sociology, security, finance and payments.

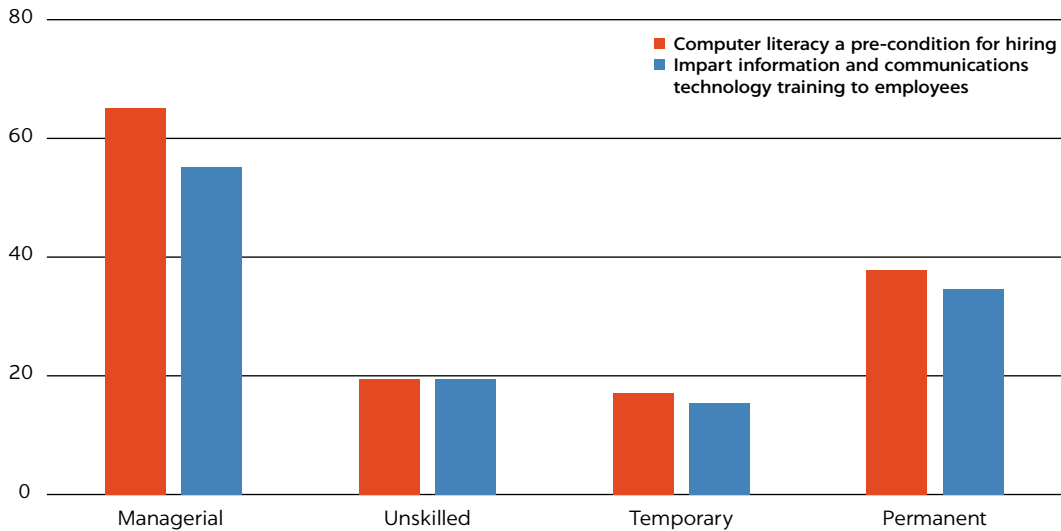
Bringing informal workers into the formal economy is likely to be increasingly driven by technological disruption. As own-account workers become Uber and Ola drivers using smartphones to get directions and e-wallets

A much higher proportion of firms require digital literacy as a prerequisite for hiring permanent and managerial workers

The Internet has changed how people connect to work, with more workers using cloud computing, video conferencing and other means to work anywhere, anytime

**FIGURE 4.4 Digital literacy is required for managers and permanent workers**

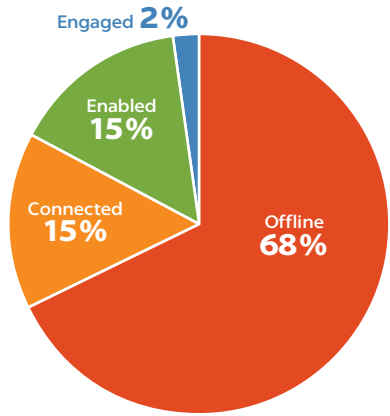
Percent of SMEs



Note: Figure shows percentage of 500 firms of different sizes across Delhi NCR, Mumbai, Pune, Kolkata, Bengaluru and Chennai. Source: National Council of Applied Economic Research Business Expectations Survey, September 2016.

**FIGURE 4.5 Small and medium-size enterprises are not digitally engaged**

Percent of SMEs



Note: Offline = no Internet connectivity, connected = use Internet for general information only, enabled = own website or social media for business purposes, engaged = active use of digital technologies for business purposes. Source: Analysis by KPMG and Google (2017), based on Kantar IMRB's ITOPS Business 2015 and Business 2016 data.

to get paid, their new economic position will allow them to get a loan, buy a car and start paying taxes.<sup>26</sup> The e-commerce platform IndaMart employs 3,600 workers and provides market linkages to the small and medium-size enterprises sector. The cab aggregator Ola has 6,000 employees and more than 400,000 driver-entrepreneurs, about the same number of drivers as Uber in India. The service aggregator UrbanClap, which matches urban customers to

certified self-employed home and business service providers, offers the services of more than 65,000 professionals, ranging from wedding photographers to chartered accountants.<sup>27</sup>

Seeing UrbanClap's vast potential the NSDC signed an agreement with UrbanClap in 2016 to open the service portal to NSDC-certified workers. UrbanClap will verify and absorb 300–500 candidates a month from NSDC's skilled workforce database, targeting plumbers, electricians, carpenters and beauty sector workers. The database includes about 60,000 candidates in these areas.

The Internet has changed how people connect to work, with more workers using cloud computing, video conferencing and other means to work anywhere, anytime. Demographic changes along with technological disruptions are gradually resulting in a shift towards a new work order, giving birth to free agents or gig workers, independent workers or micro-entrepreneurs, who contract with a range of employers. The trend has picked up in India. Apart from cab and service aggregators such as Ola, Uber and UrbanClap, tech service companies are also hiring workers on a project basis. The notion of a "job for life" is evolving with surprising rapidity as freelancing spreads across a spectrum of ages.

Recent estimates from the Telecom Regulatory Authority of India show that India had 1.2 billion mobile subscriptions and 413 million broadband Internet subscriptions on 31

March, 2018 (including wired subscribers, mobile device users and fixed wireless subscribers). Broadband Internet subscriptions registered 27% growth during the first half of 2017,<sup>28</sup> a number expected to grow.<sup>29</sup> New jobs are expected in Internet-related commerce, whether via broadband or via mobile phones. But India has a big digital capability gap, affected by the climate for business and the quality of human capital. Mere digitising serves little purpose unless the workforce is equipped with digital skills and, more importantly, unless digital disruptions create jobs in traditional sectors.

#### *Providing for future skilling needs and opportunities in rural areas*

The rural sector remains the most vulnerable to digitisation and technological shocks. Internet adoption has been low due to poor ICT infrastructure. More than 94% of 168.5 million rural households do not have a computer (figure 4.6), and most are digitally illiterate. The Digital India initiative aims to bridge the rural–urban digital gap and connect rural households with high-speed Internet networks. As a follow-up to the National Digital Literary Mission, the government launched the Pradhan Mantri Gramin (Rural) Digital Sakshatra Abhiyan (PMGDISHA) in February 2017

to make 60 million rural households digitally literate.<sup>30</sup> Such efforts to connect rural India are supported by private participation, such as ICICI Bank's Digital Village initiative, which sought to digitise 600 villages by 2017 (box 4.3), in addition to supporting rural entrepreneurship networks.

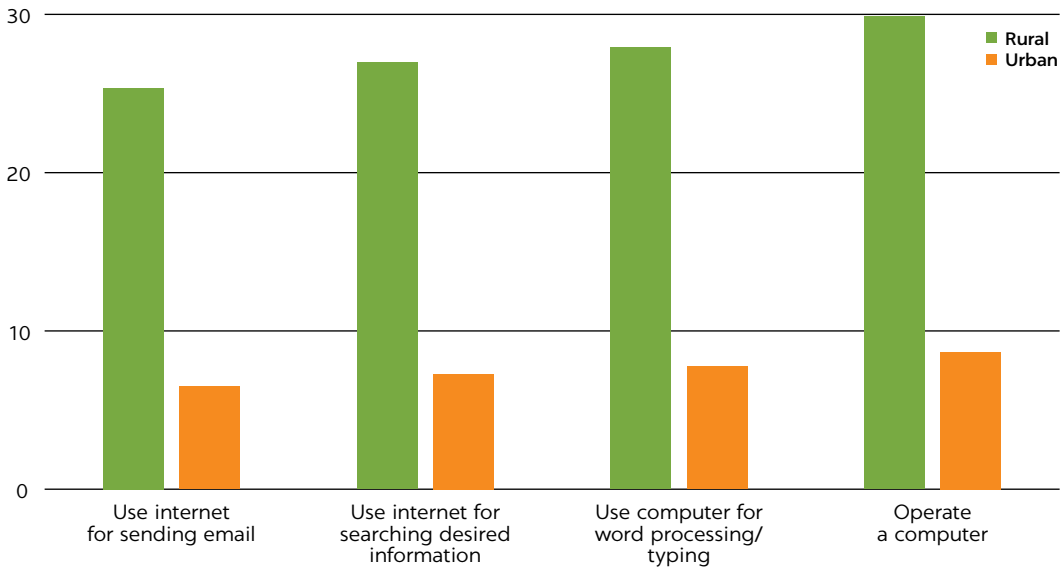
E-commerce has a greater urban footprint, though digital startups are gradually penetrating rural space, connecting unorganised manufacturing across geographical spaces. Small manufacturers and rural artisans have much to gain from digital aggregators with greater access to customers across wider geographic networks. A majority of artisans live in regions far behind the pace of development in Tier-1 or Tier-2 cities in transport and communications infrastructure, educational institutions (both mainstream and skill-based) and common civic amenities.

Most of these workers come from communities with low digital literacy, limited proficiency in English (most e-commerce websites require basic reading and writing skills in English), poor Internet connectivity and low computer or smartphone use. Overcoming these challenges requires sustained training and handholding of artisans early in the transition from offline to online (box 4.4). Modern digital technologies, and digitally controlled logistics services, make it possible to leapfrog from functional illiteracy

Mere digitising serves little purpose unless the workforce is equipped with digital skills and, more importantly, unless digital disruptions create jobs in traditional sectors

**FIGURE 4.6 Computer literacy is low for those 15 and above—and even lower in rural areas, 2014**

Percent of people aged 15 and older



Source: NCAER estimates based on National Sample Survey Office's 71st Round survey data on Social Consumption in India: Education.



Industrial Revolution 4.0 implies that the manufacturing sector will increasingly shift towards skill-intensive jobs as digital technologies transform production, requiring an amalgam of specialised skills

**BOX 4.3 Digital villages**

ICICI Bank launched the ICICI Digital Village initiative in November 2016 to digitise 100 villages in 100 days across 17 states. The programme intended to expand the network to another 500 villages by December 2017. It promotes rural entrepreneurship and women’s empowerment through end-to-end digitisation of transactions and the payments system.

Under the ICICI Academy for Skills–Rural Initiative, villagers receive short-term vocational training. Courses are primarily designed to enhance rural entrepreneurship development, to impart practical job-specific skills based on local economic demand and to provide

Source: ICICI Bank 2017.

sustainable livelihood opportunities using digital technologies.

Under the programme ICICI Bank is providing bank credit linkages, offering doorstep services using tablets for loan approval. With banks 5 kilometres away in most rural areas, such services greatly reduce the distance to travel to a nodal bank. The bank encourages forming self-help groups and joint liability groups and offers loans to group members. It also provides access to markets by linking to local and nearby catchment areas to boost self-employment and micro-entrepreneurship opportunities in the villages.

to digital literacy and overcome many of the infrastructure and other gaps in rural areas of India in ways unthinkable just a few years ago.

*Responding to the need for new manufacturing skills*

No country has advanced without passing through the shift from agriculture through manufacturing to services, because high-productivity manufacturing gives the biggest boost to incomes. Manufacturing output and employment increase domestic demand for manufactured durables and luxury goods, which increases productivity, which increases incomes, and so on in a virtuous circle. India will find it difficult to advance by skipping manufacturing and going straight to service jobs, whatever their productivity. At the same time manufacturing is changing at a pace not known before with rapidly accelerating establishment of global value chains, but India is not yet central to such arrangements. The government’s Make in India programme aims to attract companies from across the globe and make India a high-end global manufacturing hub. But that requires a workforce with skills and educational qualifications on par with international standards.

Industrial Revolution 4.0 implies that the manufacturing sector will increasingly shift towards skill-intensive jobs, as digital technologies transform production, requiring an amalgam of specialised skills. NASSCOM has noted

that manufacturing, healthcare and travel and transportation grew more than 8% driven by new technologies, while increasingly “servicification” of manufacturing is gaining pace.<sup>31</sup> Today’s youth will need to be trained in sector skills, tech skills and higher-order cognitive and non-cognitive soft skills to increase their employability.

Tech services companies such as Infosys work with engineering colleges to update curriculum, train faculty and improve teacher–industry and student–industry links to realign courses with industrial realities. But similar efforts are required from stakeholders in manufacturing industries and across both colleges and vocational and training institutions.

Companies such as Mercedes-Benz India are trying to bridge the skill gaps, aligning itself with the vision of Skill India. In 2016 Mercedes-Benz launched its Advanced Auto Body Repair Training Centre in association with Don Bosco ITI, Chinchwad, near Pune, to train youth with advanced technical skill sets for a career in automotive services.<sup>32</sup> In its collaboration, Mercedes-Benz India is training the trainers, planning and updating curricula based on modern automotive technology, and supplying cars, equipment, and advanced technical tools. Maruti Suzuki is doing similar work.

In June 2017 the Ministry of Science & Technology launched Innovate in India (i3)<sup>33</sup> to promote entrepreneurship and accelerate

**BOX 4.4 Indian weaver micro-entrepreneurs connect to startup digital aggregators**

Handloom weaving is one of the largest employment-generating sectors after agriculture, employing 4.3 million weavers and allied workers directly or indirectly.<sup>1</sup> According to the Handloom Export Promotion Council, India exported handloom products worth \$350 million in fiscal 2015. Many weavers work independently and have limited access to markets and uncertain demand. They also have low digital literacy and remain vulnerable to mechanisation and threats of automation from power looms. To overcome these challenges and preserve cultural heritage and weavers’ livelihoods, the Ministry of Textiles is working with several e-commerce companies to provide direct market links and promote the Indian handloom brand in India and overseas.

The startup Weavesmart was launched in 2015 to connect to weavers in the highly fragmented and unorganised textile and apparel industry and to improve their livelihoods. As an online aggregator it eliminates intermediaries in the value chain, sourcing handloom products directly from the weavers and providing direct access to markets and better margins for products. A mobile app allows weavers to display and sell their products. On National Handloom Day,

1. Ministry of Textiles 2018.  
Source: Weavesmart 2016.

7 August 2017, the company received recognition from the Ministry of Textiles as the most promising handloom startup, with the highest sales figures in fiscal 2016.

With more than 3,000 weavers, Weavesmart operates across 10 clusters in five states, and caters to customers across India and in Australia, Canada, the Middle East, UK and US. To help weavers be e-sellers, it conducts extensive education and training workshops on different aspects of e-commerce, primarily in Hindi or local languages, though the demand for functional literacy in English remains strong.

Platforms such as Weavesmart are gaining ground through social media, with increasing awareness and demand for ethnic products among urban consumers. Okhai, launched by the Tata Chemicals Society for Rural Development, procures products directly from cooperatives and community-based producer organisations, and provides direct market linkages for weavers. In the process weavers are also trained in modern handicraft production, including costing, design and visual merchandising. Factory visits keep weavers in touch with the latest trends in the fashion and apparel industry.

indigenous manufacturing in the biopharmaceutical sector and create a globally competitive industry. The industry–academia collaboration is expected to nurture an ecosystem for preparing India’s technological and product development capabilities and for strengthening the bio-cluster network.

**Policy recommendations for adapting and anticipating skills**

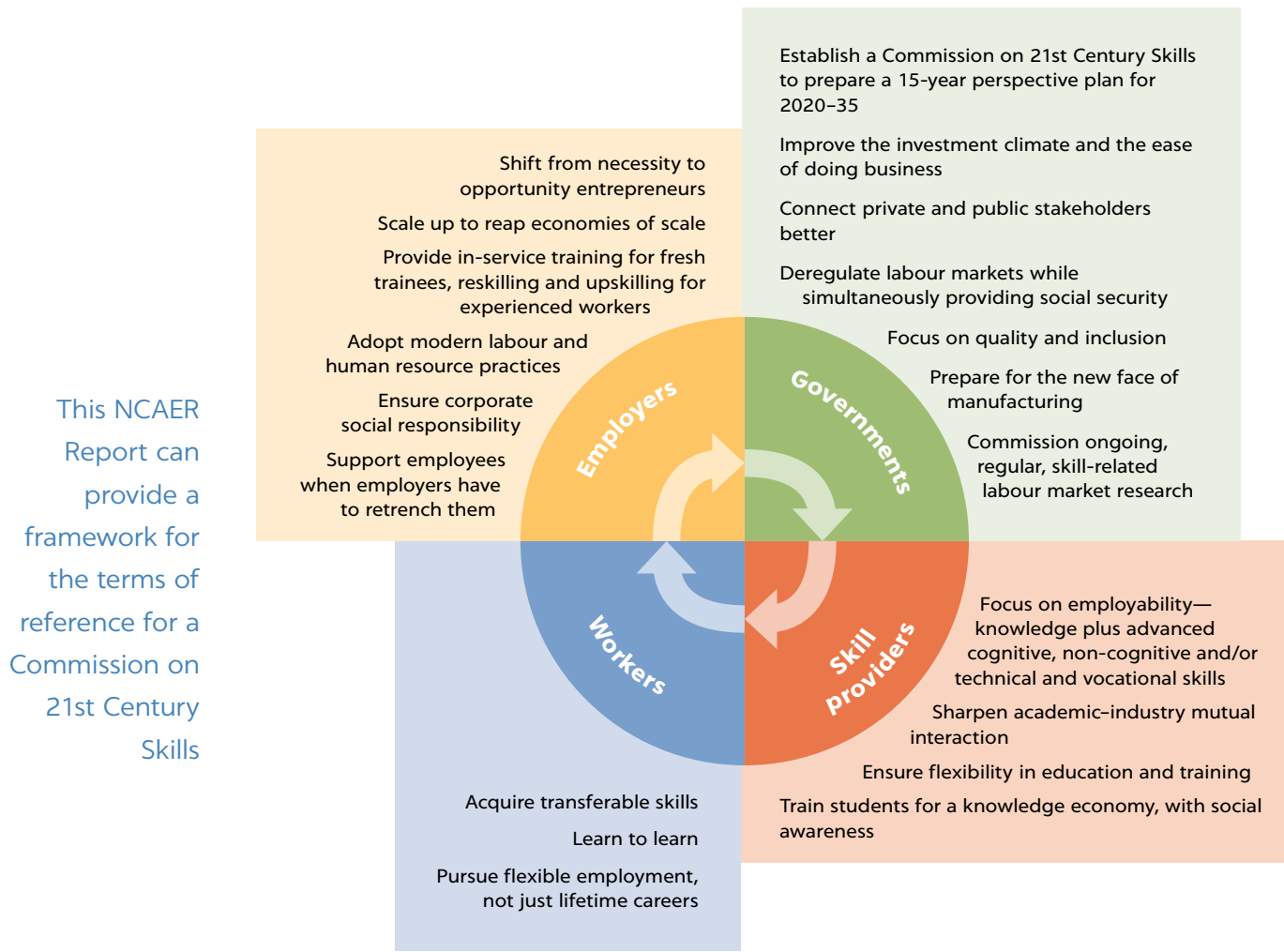
Given the time it takes to skill both existing and new workers, all stakeholders in the skilling space must work together to adapt and anticipate skills that India will need in the next two or three decades to continue to generate good jobs for its rapidly expanding workforce. This imperative calls for distinct roles and responsibilities for employers, for governments,

for skill providers and for workers (figure 4.7). And it calls for mutually reinforcing policies, actions, incentives and understanding among and between these four key stakeholders to successfully adapt and anticipate skills for India in the 21st century.

*Prepare a 15-year perspective plan for 2020–35:* India needs a 15-year perspective plan focused on transferable skills that can meet demand from industries now and in the future. Central and state governments should create appropriate incentives for workers to pursue such skills and make sure that labour markets are working efficiently. To prepare the plan the government should establish a Commission for 21st Century Skills of four or five knowledgeable persons who will reach out to central and state governments, large and small firms, public and private training providers and current

India needs a 15-year, 2020–35 perspective plan focused on transferable skills that can meet demand from industries now and in the future. To prepare the plan the government should establish a Commission for 21st Century Skills

FIGURE 4.7 Working together to skill India: governments, providers, employers and workers



and future workers. The Commission’s terms of reference would include designing a dual strategy for catering both to India’s current skilling needs and doing it in such a way to increasingly poise Indian workers to meet future known and unknown skilling needs. This NCAER Report can provide a framework for the terms of reference for such a Commission.

*Improve the investment climate and the ease of doing business:* Macroeconomic stability and reforms that ensure the effective working of markets are preconditions for accelerating and sustaining long-term economic growth. They are necessary for reaping the benefits of India’s comparative advantage while expanding the formal part of the economy, whether by implementing tax reforms such as the goods and services tax, implementing

effective business reforms, or reforming labour laws. Sectors that can absorb the most labour, whether directly or indirectly, will then create quality jobs.

*Connect private and public stakeholders better:* With a better investment climate and better functioning labour markets, firms will have the conditions to better integrate into both domestic and international supply chains, grow production and therefore create more jobs. The collaboration of State Skill Development Missions and industry associations will be key for tapping into local pools of potential workers and for initiating skill development programmes for key growth sectors.

*Institutionalise flexible social security:* Opening more to trade and rapidly evolving technology

will create gainers and losers. The government needs to shape effective, flexible social security so the losers can be compensated in cash or through reskilling and upskilling support. Without social support systems, flexible systems will be harder to introduce and sustain.

*Focus on quality and inclusion:* India’s education and training systems need to change as quickly as possible to focus on quality, adaptability and learning outcomes. School system reforms (discussed in chapter 2) will especially take time. They need to be mapped to learning outcomes through a National Qualifications Framework so that the education system is adequately geared towards preparing future workers for the ever-changing world of work.

*Prepare for the new face of manufacturing:* The blurring boundaries between industries and between industry and services, along with increasing servicification, make it imperative for any skill development initiative to provide core foundational skills that cut across sectors and aid workers to adapt to changing times. Tech and soft skills, both higher-order cognitive and non-cognitive, will be required for enhancing employability in Industrial Revolution 4.0.

*Commission ongoing, regular, skills-related labour market research:* The new National Skills Research Division in MSDE should carry out labour market research to identify core/transferable and vocational skills, and then use it to help develop course content and training standards in consultation with various stakeholders. Such research can identify trends, provide opportunities for learning from best practices and help adapt core skills based on changing Indian labour market conditions in order to signal forthcoming skill needs. Independent, credible economic research institutions, particularly those that excel at collecting scientific data, should be involved in skills-related research to complement the work by the government. In particular, a combination of scientifically designed household, enterprise and labour market surveys can greatly help understand the triad of acquiring–matching–anticipating skills that NCAER believes holds the key to converting the vicious cycle of low skilling and not enough good jobs to the virtuous circle of better skilling and many good jobs.

Notes

1. Autor, Katz and Kearney 2006; Autor 2015.
2. Azam 2012.
3. Amirapu and Subramanian 2015.
4. Bhandari and Srinivas 2016.
5. Gupta 2014.
6. Accenture 2013, 13.
7. Snell, Gekara and Gatt 2016, 7.
8. Snell, Gekara and Gatt 2016, 12.
9. ILO 2007.
10. Accenture 2013, 17–18.
11. ILO 2007.
12. Deloitte n.d.
13. ILO 2007.
14. ILO 2007.
15. Nieuwenhuis, Nijhof and Heikkinen 2002, 4.
16. New York Times 2010.
17. Auer 2010.
18. IBM 2017.
19. Business World 2017.
20. Government of India 2017c.
21. Agrawal and Vanneman 2014.
22. Chui, Manyika and Miremadi 2016.
23. Manpower Group 2017.
24. KPMG and Google 2017.
25. NASSCOM 2017.
26. Padmanabhan 2016.
27. Padmanabhan 2017.
28. Telecom Regulatory Authority of India 2017.
29. Chopra 2017.
30. Government of India 2017a.
31. Bhattacharya and Bijapurkar 2017.
32. Mercedes-Benz India n.d.
33. Government of India 2017b.

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A combination of scientifically designed household, enterprise and labour market surveys can greatly help understand the triad of acquiring–matching–anticipating skills and provide evidence to support sound policymaking for a 21st century Indian workforce



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# Skilling India

## No Time To Lose

Understanding how structural and technological changes in the 21st century are radically altering today's workplace and the nature of work is imperative. While India must deal with its large and persistent backlog of unskilled informal workers, it must also provide for its future to sustain rapid progress. Firms of different sizes are already demanding different skills—large firms need formal business and high technological skills, smaller firms need multitasking and adaptability to business practises. The 21st century Indian worker has to move from lifetime employment to lifetime employability. Above all, India needs to create an agile workforce that can anticipate and adapt to changes in technology, automation and digitisation.

After suggesting a simple way for thinking about the types of skills required, this NCAER Report offers a

framework for skilling India—acquiring, matching and anticipating skills—that can help break the vicious cycle of poor skilling and few good jobs. Working together, government, industry, skill providers and workers can move India from its low skilling trap to a virtuous cycle of higher skilling and more good jobs. As the nation grapples with the legacy problems of its existing skills-jobs mismatch, it must also pay attention to anticipating the skills of tomorrow.

India needs a 15-year, 2020-35 perspective plan focused on transferable skills that can meet the demand from industries, now and in the future. To prepare such a plan, the Central Government should establish a Commission for 21st Century Skills. This Report can provide a framework for the terms of reference for such a Commission.

### IBM Now Has More Employees in India Than in the U.S.

IBM has shifted its center of gravity halfway around the world to India.

*The New York Times,*  
28 September 2017



### Ever More Indians Are Struggling to Find Work

The country is missing out on its "demographic dividend"

*The Economist,*  
14 September 2017