

RETHINKING EDUCATION FOR TOMORROW'S WORKFORCE TO PREPARE IT TODAY

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Abstract: Tomorrow's workforce will be completely immersed in technology, will have multiple skill sets, will be working in teams with robots side by side or may be even assessed by robots in their next performance review. Employees tomorrow may have multiple careers in the same organisation or may be frequently laid down in the short-term for want of renewal of skill sets, by force or by choice. We know well that education systems today are employment focussed, not knowledge focussed. We may possibly be facing severe skill shortage in case quick and relevant steps are not taken today. These steps shall involve cooperation/contribution from all stakeholders-Government as funding agent and decision maker, businesses as employers, and educational institutions of course as producers of tomorrow's workforce.

Millions of jobs will be lost tomorrow as The Fourth Industrial Revolution has arrived. Newer and unimaginable roles will arise. This will be requiring unthinkable new skills/skill sets. Massive investments in building education infrastructure will be a key to success. Rethinking education systems for preparing future workforce is urgently needed.

The article attempts to explore measures that shall be taken today in the education sector to make it more relevant tomorrow.

Key words: Workforce, technology, skill, jobs, Fourth Industrial Revolution, robotics, AI

The Background

Staying relevant and useful as a job aspirant is a major challenge in the competitive world today. Times are difficult for all: for businesses, for employers, for job-seekers, for present workforce and for students as well who are about to join the world of work. Newer technology has made it more difficult. We are about to hit the age of AI, machine learning, robotics, virtual reality, 3-D printing, biotechnology, nanotechnology, internet of things,.....in a big way. Timely preparedness to face the challenges of tomorrow is critical now. History has proven that the organizations that haven't prepared well in advance are bound to perish/die or face dire consequences. Thus, it is wise to look into the future and take actions today accordingly. Not everyone is good at it. Visionary leadership plays a crucial role here, especially, for those who are in the business of preparing tomorrow's workforce i.e. educational institutions.

As The Fourth Industrial Revolution has arrived and has brought in the 'age of technology', as robotics and artificial intelligence will be widespread in our future, machine learning is important for all. No matter which area of expertise or of interest to you, you need to adapt, and adapt well. For successful adaptation to take place there is serious need to rethink education systems in terms of reviewing and rewriting their processes, contents (course curriculums), delivery modes, performance measurements, results achievement.

According to World Economic Forum Report "The Fourth Industrial Revolution will lead to profound shifts across all industries, reshaping production, consumption, transportation, delivery systems, among other factors....managing these transitions for optimal outcomes for our societies require visionary leadership and a wide range of new knowledge and skills."

Since talent is scarce, too many employers and governments are focussed on a narrow talent pool. Employers today seek "ready-made human capital". At present they are consumers of 'ready talent'. They employ whatever is available and available scarcely. Hence, the employment takes place at competitive prices. Simultaneously, global studies have shown that sizeable people (in the age group of 15-64 years) are unemployable. There is a complete mismatch. This is true when present education systems are increasingly employment-focussed rather than being knowledge-focussed. The idea of one-time education providing people with a lifelong skillset is a relic of the past.

'The Job for Life' Model is now dead.

Innovation occurring at unprecedented rate is causing employers' needs to shift rapidly. Education systems, therefore, are struggling to keep pace, hence, generating gaps in nearly every country, industry and between the skills employees have and the skills employers need/look for. Those who don't have the required skills can quickly learn the additional skills enlarging the talent pool available to employers. This will also be preventing the employees from becoming unemployed whose jobs might be possibly left behind by the ongoing revolution.

The Vision for Tomorrow

Tomorrow the work scenario, in terms of number of jobs left, is not very bright, many experts have feared and predicted. Not everyone hold such a view. Many are still optimistic and hopeful. They say automation and jobs go hand in hand. Technology itself is neither good nor bad – it's what we do with it that makes the difference. As in previous eras, in this era too, new technologies may also carry negative consequences. AI and genetic engineering in the wrong hands could alter our future in undesirable ways. What is important is to rightly visualize and correctly strategize policies and actions in a holistic manner. There is no doubt many categories of jobs will be taken away by robots or AI. But it is equally true that many new categories of jobs will emerge which today doesn't exist. It is for these jobs we need to think seriously about preparing our youngsters as well as current workforce and that too, in a time bound manner.

“Now the information revolution has begun to wane, we are seeing the next wave of innovation in the form of The Fourth Industrial Revolution, so-called for the speed, scale and the force at which it is transforming the entire system of production, distribution and consumption. This revolution, like the ones that came before, brings with it concerns, hurdles and inadvertent consequences. One big challenge is ensuring that in a world of constant connectivity, the power of human touch and social interaction is maintained. Interestingly, the right technologies, applied in the right way, might be the best way to make sure this happens. Industries facing challenges of business models are in need of new skills and are destined to find ways to make deployments scalable. Shifting old habits and aligning stakeholders requires a change in mentality. Technologies, such as mobile, social, Internet of Things, cloud and big data, need to be introduced into full systems, supported by new models, capabilities, processes, roles and responsibilities. Given this disruption, the World Economic Forum has predicted that the rise of robots and artificial intelligence will result in a loss of millions of jobs in the next five years. However, the future isn't so bleak. Yes, certain jobs may be lost, but new ones will rise up or be refined. People will need to maintain the technology as it will never become fully autonomous, thus creating – rather than taking away – jobs. The emergence of new services, industries and new as-a-service business models are expected to have a very high potential value.

These shifts will create the need for larger knowledge-sharing platforms and platforms are what sustain and elevate innovation. Building on shared infrastructure, fuelled by data and marked by multiple user interactions, platforms bring together people, processes, policies and networked technology to create a holistic system. In brief, they allow us to collaborate and transact on a global scale. To be successful in the platform economy, business leaders and policy-makers must ensure they have access to the right talent. This means expanding the current talent pool, through reskilling or hiring outside of isolated, internal groups.

Of course, there are concerns about the hyper-connected reality in which we now live. From security to transparency of usage, issues around data will forever be at the forefront of the technological narrative – and rightly so, given that we're in a time of mounting cyberattacks and threats. Our strategy includes not just staying on top of emerging software-based vulnerabilities and potential external threats, but also includes collaborating with regulatory agencies, industry partners and service providers to close security loopholes and implement safeguards.

Although we're heading towards a tumultuous time of uncertainty in technology, we're also moving towards a time of great opportunity. I'm confident that machines aren't going to bypass the need for human interaction. They will help us to improve access to health and care services by enabling care anywhere, at any time, and by making sure the right care professional is available when needed”, says Chief Information Officer, Philips.

Ensuring the digital revolution is a force for good as we are living in a time of extraordinary change. This is a revolution without boundaries spreading across the world with incredible velocity. Technology is neither good nor bad – it's what you do with it that makes the difference. As in previous eras, new technologies also carry negative consequences. AI and genetic engineering in the wrong hands could alter our future in undesirable ways.

Companies are great universities for educating the workforce of the future. They invest in training employees, as well as interns and apprentices, to drive growth and innovation, which in many cases amounts to specialized instruction and hands-on experience that can't be obtained at even the most prestigious universities. CEOs can and should do much more to build the workforce of the future, while bringing along the workforce of today. Our companies have a vast army of millions of people around the country who could have a tremendous impact by teaching apprentices, working side-by-side with them. In this way, we help close the skills gap, nurture prospective employees, and develop the future workforce that will support a strong and growing economy. Prof. Schwab says, “The Fourth Industrial Revolution can compromise humanity's traditional sources of meaning – work, community, family, and identity – or it can lift humanity into a new collective and moral consciousness based on a sense of shared destiny. The choice is ours.”

To be blunt, trying to predict the future more than two decades at a stretch is more science fiction than anything else. It will be viable to focus on the ‘near horizon’ rather than the ‘distant future’. There are two contexts that converge on the same point. Firstly, most people think of automation through the lens of assembly-line logic. Actually, ‘automation’ is a softer and more pervasive feature of all modern management. Every modern company in the world has been deploying more and more supply chain management (SCM), customer response management (CRM) and enterprise resource planning (ERP) systems in a bid to automate more and more functions. Rather than Human redundancy, improved human productivity has been the chief driver. The question, it would seem then, is not how to remove humans from the chain altogether, but how to embed them more seamlessly. The second point is the issue of ‘unfilled jobs’.

In a recent report George Washington University’s Tara Sinclair showed that a quarter of advertised jobs in the US and about a fifth in other rich countries like Canada and Germany were going unfilled. The report correctly tied this mismatch of human skills and labour requirements with the sluggish growth in global productivity and thereby casts a more interesting complexion on the issue of human redundancy and artificial intelligence, at least in the near-term horizon. In the same way that personnel inadequacies continue to undermine efforts to automate the enterprise, skills imbalances inflate unemployment rates and exaggerate the effect of efficiency-inducing technology. And both dynamics are strongest not in the unskilled or the super-skilled segments (the tail-ends) but in the ‘middle-bulge’ of the employment curve. It is reasonable to infer, given this background, that large-scale human redundancies caused by AI are fanciful, at least in the near-term horizon, given the actual performance of automation and the gaps in the enterprise today.

What is more likely is the proliferation of mid-tier AI systems transforming the capacity of mid-level skilled workers to better fill vacant jobs and *to participate* in human-critical automation of the enterprise, and in the search for novel business methods and models. With superior virtual reality and machine-iteration systems, average food technologists can carry out a more varied range of biochemical explorations. Nurses can perform a wider range of imaging tests. Fashion design trainees can contribute more effectively to the fabric technology sourcing process. With improving personnel agility comes more nimble business models and an expansion of the job market. Add these prospects to the potential productivity lift and the better synching of job openings and personnel availability and a whole new vision of what AI might do for the job market emerges.

It's impossible at this point to predict what the overall impact on employment will be. Disruption will happen; of that we can be certain. But before we swallow all of the bad news, we should understand the earlier industrial revolutions. Because this tells us that it is more often the nature of work – rather than the opportunity to take part in work – that will be impacted. Each industrial revolution has brought attendant disruption, and the fourth wave will be no different. We must remember this and use what we have learned to manage the change:

Focus on skills: Instead of focusing on the specific jobs that will appear or disappear, we should instead concentrate on the skills that will be needed, then educate, train and reskill the human workforce to leverage the new opportunities afforded by technology. HR departments, educational institutions and governments will be at the forefront of driving this.

Protect the disadvantaged: Experience points repeatedly to the need to protect the disadvantaged and create the time and means for them to adjust. As we have seen this year, it is more important than ever not to let inequalities create social groups who have lost all hope on the altar of progress.

Work together to create new ecosystems: Government will have a crucial role to play, along with business and civil society leaders, in driving the appropriate levels of collaboration, regulation and standards that will be needed to ensure that the fourth industrial revolution translates into economic growth and creates benefits for all. This will not be easy particularly in democracies; change will be hard and slow. It will require a mix of forward-looking policy-making, agile regulatory frameworks and – above all – effective partnerships that cross our organizational and national boundaries. Politics, rather than technology, will determine the pace of change. Despite the exponential pace of technological change, we should not forget the all-important role of time. While the changes ahead will be momentous – indeed, revolutionary – they will not land as a big bang. On the contrary, they will likely take place over many decades. We have time, therefore, to adjust; as individuals, as companies and as societies. For sure, this is no reason to wait and see, but rather one to get to work and create the new future.

The Work Ahead

Today's transformations represent not merely a prolongation of the Third Industrial Revolution but rather the arrival of a Fourth and distinct one: velocity, scope, and systems impact. The speed of current breakthroughs has no historical precedent. When compared with previous industrial revolutions, the Fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance.

Many Challenges and opportunities: Like the revolutions that preceded it, the Fourth Industrial Revolution has the potential to raise global income levels and improve the quality of life for populations around the world. To date, those who have gained the most from it have been consumers able to afford and access the digital world; technology has made possible new products and services that increase the efficiency and pleasure of our personal lives. Ordering a cab, booking a flight, buying a product, making a payment, listening to music, watching a film, or playing a game—any of these can now be done remotely.

In the future, technological innovation will also lead to a supply-side miracle, with long-term gains in efficiency and productivity. Transportation and communication costs will drop, logistics and global supply chains will become more effective, and the cost of trade will diminish, all of which will open new markets and drive economic growth. At the same time, as the economists Erik and Andrew McAfee have pointed out, “the revolution could yield greater inequality, particularly in its potential to disrupt labour markets. As automation substitutes for labour across the entire economy, the net displacement of workers by machines might exacerbate the gap between returns to capital and returns to labour. On the other hand, it is also possible that the displacement of workers by technology will, in aggregate, result in a net increase in safe and rewarding jobs. We cannot foresee at this point which scenario is likely to emerge, and history suggests that the outcome is likely to be some combination of the two. However, I am convinced of one thing—that in the future, talent, more than capital, will represent the critical factor of production. This will give rise to a job market increasingly segregated into “low-skill/low-pay” and “high-skill/high-pay” segments, which in turn will lead to an increase in social tensions.

In addition to being a key economic concern, inequality represents the greatest societal concern associated with the Fourth Industrial Revolution. The largest beneficiaries of innovation tend to be the providers of intellectual and physical capital—the innovators, shareholders, and investors—which explains the rising gap in wealth between those dependent on capital versus labour. Technology is therefore one of the main reasons why incomes have stagnated, or even decreased, for a majority of the population in high-income countries: the demand for highly skilled workers has increased while the demand for workers with less education and lower skills has decreased. The result is a job market with a strong demand at the high and low ends, but a hollowing out of the middle. This helps explain why so many workers are disillusioned and fearful that their own real incomes and those of their children will continue to stagnate. It also helps explain why middle classes around the world are increasingly experiencing a pervasive sense of dissatisfaction and unfairness. A winner-takes-all economy that offers only limited access to the middle class is a recipe for democratic malaise and dereliction. Discontent can also be fuelled by the

pervasiveness of digital technologies and the dynamics of information sharing typified by social media. More than 30 percent of the global population now uses social media platforms to connect, learn, and share information. In an ideal world, these interactions would provide an opportunity for cross-cultural understanding and cohesion. However, they can also create and propagate unrealistic expectations as to what constitutes success for an individual or a group, as well as offer opportunities for extreme ideas and ideologies to spread.

Four main effects that the Fourth Industrial Revolution has on business—on customer expectations, on product enhancement, on collaborative innovation, and on organizational forms. Whether consumers or businesses, customers are increasingly at the epicenter of the economy, which is all about improving how customers are served. Physical products and services, moreover, can now be enhanced with digital capabilities that increase their value. New technologies make assets more durable and resilient, while data and analytics are transforming how they are maintained. A world of customer experiences, data-based services, and asset performance through analytics, meanwhile, requires new forms of collaboration, particularly given the speed at which innovation and disruption are taking place. And the emergence of global platforms and other new business models, finally, means that talent, culture, and organizational forms will have to be rethought. Overall, the inexorable shift from simple digitization (the Third Industrial Revolution) to innovation based on combinations of technologies (the Fourth Industrial Revolution) is forcing companies to re-examine the way they do business. The bottom line, however, is the same: business leaders and senior executives need to understand their changing environment, challenge the assumptions of their operating teams, and relentlessly and continuously innovate.

Effect on business: An underlying theme in my conversations with global CEOs and senior business executives is that the acceleration of innovation and the velocity of disruption are hard to comprehend or anticipate and that these drivers constitute a source of constant surprise, even for the best connected and most well informed. Indeed, across all industries, there is clear evidence that the technologies that underpin the Fourth Industrial Revolution are having a major impact on businesses. On the supply side, many industries are seeing the introduction of new technologies that create entirely new ways of serving existing needs and significantly disrupt existing industry value chains. Disruption is also flowing from agile, innovative competitors who, thanks to access to global digital platforms for research, development, marketing, sales, and distribution, can oust well-established incumbents faster than ever by improving the quality, speed, or price at which value is delivered. Major shifts on the demand side are also occurring, as growing transparency, consumer engagement, and new patterns of consumer behavior (increasingly built upon access to mobile networks and data) force companies to adapt the way they design, market, and deliver products and services. A key trend is the development of technology-enabled platforms that combine both demand and supply to disrupt existing industry structures, such as those we see within the “sharing” or “on demand” economy. These technology platforms, rendered easy to use by the smartphone, convene people, assets, and data—thus creating entirely new ways of consuming goods and services in the process. In addition, they lower the barriers for businesses and individuals to create wealth, altering the personal and professional environments of workers. These

new platform businesses are rapidly multiplying into many new services, ranging from laundry to shopping, from chores to parking, from massages to travel.

Effect on government: As the physical, digital, and biological worlds continue to converge, new technologies and platforms will increasingly enable citizens to engage with governments, voice their opinions, coordinate their efforts, and even circumvent the supervision of public authorities. Simultaneously, governments will gain new technological powers to increase their control over populations, based on pervasive surveillance systems and the ability to control digital infrastructure. On the whole, however, governments will increasingly face pressure to change their current approach to public engagement and policymaking, as their central role of conducting policy diminishes owing to new sources of competition and the redistribution and decentralization of power that new technologies make possible. Ultimately, the ability of government systems and public authorities to adapt will determine their survival. If they prove capable of embracing a world of disruptive change, subjecting their structures to the levels of transparency and efficiency that will enable them to maintain their competitive edge, they will endure. If they cannot evolve, they will face increasing trouble. This will be particularly true in the realm of regulation. Current systems of public policy and decision-making evolved alongside the Second Industrial Revolution, when decision-makers had time to study a specific issue and develop the necessary response or appropriate regulatory framework. The whole process was designed to be linear and mechanistic, following a strict “top down” approach. But such an approach is no longer feasible. Given the Fourth Industrial Revolution’s rapid pace of change and broad impacts, legislators and regulators are being challenged to an unprecedented degree and for the most part are proving unable to cope. How, then, can they preserve the interest of the consumers and the public at large while continuing to support innovation and technological development? This means regulators must continuously adapt to a new, fast-changing environment, reinventing themselves so that they can truly understand what it is they are regulating. To do so, governments and regulatory agencies will need to collaborate closely with business and civil society.

The Fourth Industrial Revolution will also profoundly impact the nature of national and international security, affecting both the probability and the nature of conflict. The history of warfare and international security is the history of technological innovation, and today is no exception. Modern conflicts involving states are increasingly “hybrid” in nature, combining traditional battlefield techniques with elements previously associated with non-state actors. The distinction between war and peace, combatant and non-combatant, and even violence and nonviolence (think cyberwarfare) is becoming uncomfortably blurry. As this process takes place and new technologies such as autonomous or biological weapons become easier to use, individuals and small groups will increasingly join states in being capable of causing mass harm. This new vulnerability will lead to new fears. But at the same time, advances in technology will create the potential to reduce the scale or impact of violence, through the development of new modes of protection, for example, or greater precision in targeting.

Effect on people: The Fourth Industrial Revolution, finally, will change not only what we do but also who we are. It will affect our identity and all the issues associated with

it: our sense of privacy, our notions of ownership, our consumption patterns, the time we devote to work and leisure, and how we develop our careers, cultivate our skills, meet people, and nurture relationships. It is already changing our health and leading to a “quantified” self, and sooner than we think it may lead to human augmentation. The list is endless because it is bound only by our imagination. As early adopter of technology, one can wonder whether the inexorable integration of technology in our lives could diminish some of our quintessential human capacities, such as compassion and cooperation. Our relationship with our smartphones is a case in point. Constant connection may deprive us of one of life’s most important assets: the time to pause, reflect, and engage in meaningful conversation. One of the greatest individual challenges posed by new information technologies is privacy. We instinctively understand why it is so essential, yet the tracking and sharing of information about us is a crucial part of the new connectivity. Debates about fundamental issues such as the impact on our inner lives of the loss of control over our data will only intensify in the years ahead. Similarly, the revolutions occurring in biotechnology and AI, which are redefining what it means to be human by pushing back the current thresholds of life span, health, cognition, and capabilities, will compel us to redefine our moral and ethical boundaries.

Shaping the future: Neither technology nor the disruption that comes with it is an exogenous force over which humans have no control. All of us are responsible for guiding its evolution, in the decisions we make on a daily basis as citizens, consumers, and investors. We should thus grasp the opportunity and power we have to shape the Fourth Industrial Revolution and direct it toward a future that reflects our common objectives and values. To do this, however, we must develop a comprehensive and globally shared view of how technology is affecting our lives and reshaping our economic, social, cultural, and human environments. There has never been a time of greater promise, or one of greater potential peril. Today’s decision-makers, however, are too often trapped in traditional, linear thinking, or too absorbed by the multiple crises demanding their attention, to think strategically about the forces of disruption and innovation shaping our future. In the end, it all comes down to people and values. We need to shape a future that works for all of us by putting people first and empowering them. In its most pessimistic, dehumanized form, the Fourth Industrial Revolution may indeed have the potential to robotize humanity and thus to deprive us of our heart and soul. But as a complement to the best parts of human nature—creativity, empathy, stewardship—it can also lift humanity into a new collective and moral consciousness based on a shared sense of destiny. It is incumbent on us all to make sure the latter prevails.”

It’s Time to Act

Educational institutions shall act as visionary leaders to think proactively and to stay relevant in changing times as the nature of work rather than opportunity to take part in work will be impacted. Governments shall provide funding on a massive scale because that is what is urgently needed and also as investment. Businesses shall take over some responsibility of skilling its people on-the-job as it is the ultimate consumer of workforce. Companies shall invest in training employees, as well as interns and apprentices, to drive growth and innovation, which in many cases amounts to specialized instruction and hands-on experience that can't be obtained at even the

most prestigious universities. In essence the whole-hearted efforts form all stakeholders in necessary and expected to make these dreams a reality and to embrace the impacts of technology in a welcome manner.

