

Title: Post COVID-19 paradigm shift in social science, technology, and public health

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Abstract: During the time of the pandemic, the skies became bluer. The chirping noise of birds became louder. Air cleaner. As if mother nature decided to reset and reboot our pace. The pandemic has been a massive international shock to global health, and the world economy. Many families have been impoverished. Businesses built up over decades have gone under. A generation of children has missed out on education and social contact at critical periods in their development. These events led us into a dark place. But there is now some light coming through the darkness as we realize the benefits of a greater understanding of how this airborne virus is transmitted, a growing number of vaccines and treatments, and improved models of care. So, as we look to the future, it is time to ask what needs to change. The COVID-19 pandemic has altered the business world in historic proportions. Whereas the short-term effects have been felt by many, the long-term effects of the pandemic will likely create paradigm shifts of unknown impact. The novelty of this situation has had a drastic and potentially lasting organizational effect. We use existing research to explore and presage the result of these paradigm shifts across multiple domains including job security, financial consequences, hybrid work, worker well-being, and technology. By examining the implications in each area of business, the hope is that researchers and practitioners can better prepare for a post-pandemic future.

Keywords: job security, hybrid work, financial consequences, worker well-being, and technology

Overview: The pandemic was not just predictable; it was predicted by many commentators. The starting point is a diagnosis of what went wrong. Yet governments had failed to invest in preparedness. Even when they had developed and tested plans, they had failed to learn the necessary lessons. Political leaders struggled to know what to do, or how seriously to take the threat. And even if they acted decisively—which few did—they often looked in vain for clarity from their scientific advisers, who were themselves trying to make sense of the rapidly expanding, but variable quality evidence. The immediate priority was often to prevent the health systems—in which governments had failed to invest—from collapsing under the pressure. Thus, the first, rather obvious lesson was that we need to strengthen health systems and invest in traditionally neglected areas, such as community health and primary care. Healthcare systems were just about coping before the pandemic, after years of austerity and cost containment. They were stretched to breaking point by the pandemic and had to rely almost exclusively on their most important resource: people. It became obvious that what has been advocated by the health community for years is urgently needed: we need to find ways to recruit and retain a highly trained and motivated workforce. We need to look at the role of different health workers, of patients, and their careers, and of

increasingly sophisticated technology, and decide what is the best way to provide care that is responsive to the needs and expectations of patients. We cannot simply go back to doing what we did before. But is it enough? Will the investment in health systems and allocation of resources be enough for tackling future challenges?

We need to expand our horizons and look ahead. The world has changed during the pandemic. Health systems face massive backlogs, with far too many people missing out on necessary treatment over the first 18 months from the spread of Covid-19. On top of this, they must care for those who continue to become infected with covid-19 and the large numbers of people with organ damage post-infection or long Covid. Many health workers, tired and battered, have called it a day. Children have to catch up on missed education. But we have also changed the ways that we work, questioning the need for long daily commutes and business travel. And if more of us are to work from home then we may want changes to our physical environment. Just as after previous pandemics, the world will not be the same again and we must acknowledge it. We need a new paradigm.

One overarching idea underpins all of the report's recommendations. The spread of SARS-CoV-2 to humans arose, like so many emerging infectious diseases, at the interface between humans, animals, and the natural environment, a place where the concept of one health resides. Yet our responses continue to inhabit silos, with physicians, vets, and ecologists living in separate communities speaking different languages. We need to bring them together. Much progress has been made in fostering collaboration between the UN agencies involved, the world health organization (WHO), the food and agriculture organisation (FAO), the world animal health organization (WAHO), and the UN environment programme (UNEP). But much more needs to be done at the national and local level and, above all, in the way we think about these challenges and the solutions we propose to the common challenges.

The pandemic has shown light on the fractures that existed in our societies. Although many governments did release the purse strings, providing salary replacement and other forms of support for those unable to work, many still fell through the gaps. The steep social gradients and risks of infection, hospitalization and death are testament to the challenges that many people—especially those whose lives are precarious—have faced. There is no real choice when the options are either to isolate at home or earn the money needed to feed one's family. Yet, in many countries, these problems are invisible because we simply failed to collect the data, especially the data required to reveal the stark differences associated with ethnicity. So, an essential component of national resilience must be to fix the social safety nets that have been torn asunder.

The power of scientific innovation to promote and protect health. Yet we have long known that the way that we organize medical innovation is far from perfect. Too much effort still goes into products that offer little benefit, while those that are needed, in particular, antimicrobials to combat the challenge of resistance, attract little investment. We also need to ask why governments take most of the risks, funding basic science, while the pharmaceutical industry reaps the benefits. So, we need to look systematically at where further advances are needed, based on the

simple criteria of whether they offer the potential to improve one health and how we can create a true (3P Model) partnership between the public and private sectors in which the risks and the returns are shared. None of this will be possible with changes to the global governance of health. These include a new pandemic treaty, a global health board, modeled on the financial stability board created by the G20 after the global financial crisis, and new pan-European structures, including a health threats council to secure high-level political commitment and a health surveillance network that spans the entire 53 countries European region. And we need new ways of accounting for the money spent, seeing many elements of health spending as an investment, in the same way as we view expenditure on education and physical or digital infrastructure.

Will any of this happen?

Too often we have seen how political attention drifts away once the worst of a crisis is over. Yet maybe this time it is different. When there is a strong shock there is also a strong activation of minds—scientific, political, and public opinion in search of solutions. The aim is to reap the benefits of this extraordinary movement and make the effects of the shock last on our ability to remember the lessons from Covid-19. Above all, the financial sector has realized the cost of failing to invest in health and preparedness. The doors are opening. The fight for health has spread beyond the borders of the healthcare systems. The question now is whether the health community will seize the opportunity to enter and engage.

Towards a new society brought about by the pandemic; COVID 19 – paradigm shift challenges and opportunities

The pandemic no doubt has created a paradigm shift, impacting the way we work, emote and interact. It has allowed us to spend more time than before with our family and plan our work better. It stimulated and accelerated the use of technologies and promoted much higher standards of hygiene. It allowed us to appreciate the importance of walking in a friendly urban environment and nature.

It also challenged hierarchical and vertical organizations and challenged the notion of bringing large crowds under one roof and centralization.

The new tendency now is how to spread resources, adopting a network organizational structure, focusing on open communication and relationships rather than a traditional hierarchy.

Headquarters (HQ) will need to rethink its densities, and the corporate environment should be attractive and have a reason for people to come. Working stations will become bigger than before. Corridors wider, greater personal distances. Mobility will change.

Agility and speed, the ability to quickly restructure, regroup, team up with freelancers, and partners, and setting instant satellite offices will be essential for remote working.

Homes are likely to undergo notable changes in the future, to be reinforced with facilities and infrastructure facilitating comfortable remote working, as well as being aging society friendly, and having higher hygiene and safety monitoring.

COVID has challenged the notion of centralization, of highly concentrated hospitals and urban campuses with high population density. Healthcare and education are likely to see a decentralization and distribution of smaller units across the urban fabric in closer vicinity to the communities, and greater digitalization.

Asian cities showed the importance of discipline and made a remarkable effort to contain the spread in high-density areas. Aviation, tourism, and hospitality have become domestically oriented, stimulating local economies, and giving rebirth to local infrastructure.

For engineers post-COVID opens a new era of opportunities to challenge the conventional working, living, studying, and leisure environment, to make our world a better place.

How technological revolution fits in the (post)-pandemic narrative and accelerated priorities

With Industry 5.0, many people wanted to bring the human, social, and environmental dimensions back into the equation. They felt this wasn't the case in industry 4.0 and initially mainly focused on the human touch.

One of them is Frost & Sullivan. In this paper, you can read what the company means with industry 5.0, how it compares to industry 4.0, and some technology enablers.

A quote from the 2019 article: "Industry 4.0 relies heavily on automation and has been intimidating workers on factory shop floors. Frost & Sullivan envisions a futuristic scenario of the next big thing—Industry 5.0, which will bring back empowered humans to the shop floor."

In an older article, the international society of automation (ISA) also wrote about it, with a focus on cobots (the article is by Esben H. Østergaard, Ph.D., nowadays CEO at REInvest Robotics). Quote from the article: "By placing humans back at the center of industrial production, Industry 5.0 gives consumers the products they want and gives workers jobs that are more meaningful."

So, Industry 5.0, as we know it now, brings in this 'human' touch and several topics that receive much attention nowadays. Among all these topics: resilience (business resilience and cyber resilience), sustainability and environment, purpose and values/ethics/diversity, circular economy, the place of people in a future of work with more human-machine collaboration, human-centric solutions, and, well, also some technical matters.

Industry 5.0 recognizes the power of industry to achieve societal goals beyond jobs and growth to become a resilient provider of prosperity, by making production respect the boundaries of our planet and placing the well-being of the industry worker at the centre of the production process.

And of course, quite some business and economic progress. ‘People first’ also means skilled workers (and we lack digital factory skills), training, and a focus on talent, on top of ‘empowered workers’ who can count on improved safety and well-being.

It is indeed not a coincidence that the attention to Industry 5.0 is accelerating now. Just as the COVID-19 pandemic accelerated digital transformation, it accelerated the focus on other challenges of our time and the importance of people, the environment, and societal changes.

However, just as is the case with another phenomenon that existed before but now gets loads of attention, hybrid working models, the drivers behind Industry 5.0 aren’t new. It’s just that they are adapted to the modern Zeitgeist – and accelerated by it.

Industry 5.0 is a complement to Industry 4.0 and mainly focuses on a sustainable, human-centric, and resilient industry.



Figure 1: Industry 5.0 is a solution provider for people and for our planet

1. Benefits of Industry 5.0

1.1 Cost optimization

Industry 5.0 takes over past improvements that, since the first industrial revolution, have generated more effective processes. The search for business models that use the least resources to obtain the highest profits finds in factory 5.0 their highest level of perfection to date since man and machine work together to make the best financial decisions for a company.

1.2 Greener solutions

None of the above-mentioned industrial transformations has focused on the protection of the environment as a priority. With Industry 5.0, new corporate technologies and sensitivities are changing this trend. This has led to the emergence of sustainable policies where, for example, a minimal generation of waste and its

management become essential, cross-cutting processes, also making the organization more effective.

This shift is in line with what international organizations, government regulations, and consumers have been increasingly demanding.

1.3 Personalization and creativity

Technological innovation does not allow for a degree of personalization that meets the demand of the customers. The personnel that is part of Industry 5.0 will leverage the potential of technology, but will also find room to add their ideas that lead to a product that is developed with personalization in mind.

Furthermore, the automation achieved during Industry 4.0 allows workers to free themselves from certain repetitive tasks, focusing on crafting more powerful strategies or applying their creativity.

2. What is required in Industry 5.0?

2.1 Trained personnel

Factory 5.0 has brought about the role of chief robotics officer. This person specializes in the interaction between machines and operators and also knows in fields such as robotics and artificial intelligence (AI). His role in the company implies making decisions around these factors.

The training of employees will also leap forward with virtual education becoming widespread. This allows for lower costs for companies since it does not require production to be stopped to train its employees. In addition, this also leads to safer training that prevents workers from being exposed to unnecessary risks during training. Communication and employee motivation are also boosted by the resulting interactive learning environments.

The generation of a myriad of employment positions related to the interaction with robotic systems and artificial intelligence (AI), among other technologies, is also expected.

2.2 The right technology

The term “cobots” has been coined for industry 5.0: collaborative robots designed for simple and intuitive interaction with humans.

This technology takes humans into account for processes such as plant safety and goals. In a certain way, they act as apprentices, capable of observing the actions of a human and replicating them, helping operators.

The expansion of digital twins will also be another necessary technology in factory 5.0. These are visual models of a product or process, and their generation allows them to be better understood and tested.

In addition, the appearance of increasingly complex processes will require suitable software that is capable of managing this vast amount of data and providing human operators with a space that they can use to interact with machines.

Note that industry 5.0 in no way is only for companies that are further in their Industry 4.0 journey. Well on the contrary.

Way forward

So far, the industry 5.0 concept has not gained a lot of traction yet. Businesses are still heavily engaged in industry 4.0, or even earlier versions. Also, the sustainability bandwagon has just begun to start moving seriously. However, the fact that the Government of India (GOI) pushes companies toward the next level and builds its industry 5.0 framework on these three pillars, provides companies with a vision of what true progress will mean over the next years.

Whether one finds this vision appealing or daunting will differ greatly between companies and between people. And the extent to which it will be embraced will radically differ as well. But given the current major challenges and crises that we are facing, it is evident that industry 5.0 is a plausible and preferred answer. Once organizations—and as a result societies—are becoming more human-centric, resilient, and sustainable, we can expect solutions to emerging.

Enabling technologies

Several enabling technological trends such as edge computing (EC), digital transformation (DT), internet of things (IoT), big data analytics, cobots, 6G, and blockchain are integrated with cognitive skills and innovation that can help industries increase production and deliver customized products more quickly. These enabling technologies make industry 5.0 an advanced production model with a focus on the interaction between machines and humans. Smart machines are designed to work collaboratively with human beings, and this collaborative work facilitates

Conclusion

In this paper, I have shared some paradigms shift in social science, public health, technologies and potential applications of Industry 5.0. Some concepts of industry 5.0 from the perspective of both industrial and academic communities. There are various potential applications of Industry 5.0 such as intelligent healthcare, cloud manufacturing, supply chain management, manufacturing production, etc.

Example: Lipstick effect seen in sales of skin products in post-Covid Era

Technology will make Fashion more immersive

After the second wave of Covid -19 pandemic, websites like Nykaa registered higher sales of skin products.

The lipstick effect is a well-documented phenomenon where people spend on small pleasures as they can't splurge on major goods after a recession. During pandemic due to use of masks the effect in skin products was seen.

Due to longer screen time, people became conscious of their skin, and it was observed an upward trend in sale of skin care products. The sale of fragrances

peaked after COVID-19, so much so that some categories reported shortage. It's because people want to feel good; it's associated with their sentiments.

The impact of technology on fashion and cosmetics business, advancement in technology is a big boost.

Today every user generates about 2,000 odd tags when they navigate the websites. The use of machine learning and artificial intelligence is a must to correlate these points and predict behaviour. It leads to tailor-made recommendations for personalization. The implemented 5G would also be a major boost with tech such as use of a screen as a mirror to try out products in real-time being rolled out for apps/websites.

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