

"A man is  
great by  
deeds, not by  
birth"

-Chanakya

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INDIAN INSTITUTE OF MANAGEMENT KOZHIKODE



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**Post Covid-19 World: Scenarios and opportunities for major sectors of the economy**

**Ashutosh Sarkar<sup>1</sup>**

**Krishnan T. N.<sup>2</sup>**

**Rajesh S Upadhyayula<sup>3</sup>**

**Ram Kumar Kakani<sup>4</sup>**

**Rudra Sensarma<sup>5</sup>**

<sup>1</sup>Associate Professor, Quantitative Methods and Operations Management, Indian Institute of Management, Kozhikode, IIMK Campus, Kunnammangalam, Kozhikode, Kerala 673 570, India; Email: [asarkar@iimk.ac.in](mailto:asarkar@iimk.ac.in), Phone number: (+91) 495 2809424

<sup>2</sup>Professor, Organizational Behaviour and Human Resources, Indian Institute of Management, Kozhikode, IIMK Campus, Kunnammangalam, Kozhikode, Kerala 673 570, India; Email: [tn\\_krishnan@iimk.ac.in](mailto:tn_krishnan@iimk.ac.in), Phone number: (+91) 495-2809244

<sup>3</sup>Professor, Strategic Management, Indian Institute of Management Kozhikode, Kozhikode, India. IIMK Campus P.O., Kozhikode, Kerala 673570, India; Email: [rajesh@iimk.ac.in](mailto:rajesh@iimk.ac.in); Phone Number (+91) 495- 2809432

<sup>4</sup>Professor, Finance, Accounting & Control, Indian Institute of Management Kozhikode, Kozhikode, India. IIMK Campus P.O., Kozhikode, Kerala 673570, India; Email: [ramkumar@iimk.ac.in](mailto:ramkumar@iimk.ac.in); Phone Number (+91) 495- 2809421

<sup>5</sup>Professor, Economics, Indian Institute of Management Kozhikode, Kozhikode, India. IIMK Campus P.O., Kozhikode, Kerala 673570, India; Email: [rsensarma@iimk.ac.in](mailto:rsensarma@iimk.ac.in); Phone Number (+91) 495- 2809423

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# 1 THE COVID-19 PANDEMIC, ECONOMY AND SOCIETY

## 1.1 Introduction

The crisis related to the COVID-19 pandemic is unprecedented in its impact and scope. Economies around the world have faced recession or slowdown, people have lost jobs and extended lockdowns and social distancing related restrictions have brought both economic and psychological stress. There is hardly any sector of the economy which has not been impacted by the pandemic and the ensuing lockdown. Businesses are expecting short-term and longer-term changes to their business environment and, in some cases, viability of their business models is under doubt. They are continuously exploring alternatives and making changes to the way they are used to do business. While the old is being rewritten, newer models and opportunities are also emerging. Organizations find it hard to navigate and envision the future post the pandemic. In this context, this study carries out a macro-environmental analysis of the impact of the pandemic, how such impact would affect economies, society and the government, and portray medium to long term scenarios on how the macro economic situation could evolve post the pandemic. It would particularly focus on trends in Social, Technological, Economic, Environmental and Political (STEEP) changes that the Indian economy could witness. We believe the analysis would help firms to adapt business models to overcome challenges of COVID-19 as well as prepare them to exploit some of the possible opportunities going forward. Given the sudden and wide spread impact the pandemic has caused to the world and Indian economy, and the uncertainty related to the time spread of its impact in the country, any assessment and recommendation for the way forward for the sectors is going to be at best indicative. Within these constraints, the white paper tries to understand the impact of the pandemic better and its implications for five major sectors of the economy - Agriculture, Education, Tourism, IT and Construction.

## 1.2 Methodology Used

The study takes a two stage approach to analyse the impact of the pandemic and its effects on key sectors of the economy. The first step deals with understanding, imagining, and brainstorming the COVID-19 and its effect on the economy and society. For this the team reviewed and analysed literature, reports and publicly available data which is followed by brainstorming and internal discussion and carried out a STEEP (Social, Technological, Economic, Environmental and Political) analysis. The STEEP analysis helped the team to imagine and build post-COVID scenarios and characterise them. We also took inputs from few senior executives and industry experts in order to better understand how each of the five sectors (areas of Agriculture, Education, Tourism, IT and Construction) are hit by the pandemic and explored potential opportunities that exists within these sectors. The framework characterising the various post-COVID scenarios was used as a template to illustrate and to analyse the emerging trends for various sectors. We make suggestions on key indicators to be tracked in order to ascertain the direction of movement to a particular scenario.

### 1.3 STEEP Analysis

The impact of COVID-19 is quite unprecedented for the economy and society in general. In ascertaining how, this impact is likely to unfold is still an open question, there are some emerging trends that could be observed from the pandemic. While the impact is multi-dimensional, specifically we look at the areas of *social, technological, economic, environmental and political* factors that are likely to get impacted and derive some preliminary implications. This approach is based on the *STEEP* analysis methodology that is used by organizations to evaluate the impact of external factors on business. The trends that we analyse and highlight are those that are likely to surface in the medium (post 18 months) to long term scenario (36 months and beyond) post COVID.

STEEP analysis is a popular tool to promote discussions and figure out various influences for organizational planning and forecasting especially in situations of high uncertainty. It helps to consider a variety of external factors beyond our individual experiences and values. These have been used in previous research and practice especially by sectors where quantifying the risks is less feasible. For instance, Shell as an organization actively use this tool in their strategic planning exercises. With regards to the pandemic few early socio-economic trends are as follows.

The impact of *social* factors post COVID is likely to accentuate certain trends. High value for personal hygiene, health and immunity could create demands for goods and services in these areas. For instance, there is some evidence that demand for Ayurveda and herbal immunity boosters increased quite significantly during the pandemic and ensuing lockdown and this is likely to carry forward in the future given the uncertainty in having cures for similar kinds of diseases. The increased demand for immuno-boosters has implications for agriculture and tourism businesses. The demand for good physical and IT infrastructural support for remote working could give rise to demand for building up / refurbishing spaces which has corporate-like facilities for remote working. While urbanization is likely to continue, it is likely to focus on smaller towns and cities. Large cities suffer from a variety of challenges in the areas of transportation, pollution, crime rate etc. which would make it unattractive in the long-run. The COVID scenario has also highlighted the closed living spaces and inadequate health and public infrastructure as major detriments when health or other havoc strikes large cities. Work is likely to shift to smaller urban areas or suburban areas of large cities. Infrastructural facilities in the areas of work spaces, affordable housing etc. in smaller towns could see a major boost. Nature of socialising/ entertainment may move to smaller groups/ social bubbles.

*Technology* having a major impact in the construction business is likely to see a boost. Pre-fab, modular designs, integrated solutions in construction and town planning are being extensively used in many countries. Technology in tele medicine and health (especially in diagnostics and fitness and wellness) is likely to increase. Health and fitness technology-based infrastructure is going to see a rise. Technology based precision farming and vertical farming ventures are likely to see an upsurge. Traceability of supply chain especially in the areas of food production and warehousing is likely to see an increased use of technological solutions. Technology

penetration in daily life in the areas of infotainment, communication, e-commerce etc. is also likely to pick pace. Equipment and infrastructure in these areas are likely to have an upsurge.

While the *economic* outlook is quite negative in the short term, the medium to long term trends largely depend on the duration of the pandemic. Chances of a recession in the middle east are high due to the twin factors of pandemic driven economic slowdown and collapse in oil prices. The resulting slowdown in job opportunities and remittances would lead to reduced cash inflows to the state and national economy. Global demand slowdown, accentuated by a deglobalization trend, would also hurt exports particularly to traditional markets or those countries that remain in lockdown for a longer time. In the short run service exports are being impacted particularly in tourism but India bound medical tourism may recover faster once international travel opens up. ITES exports may be affected by slowing global demand and if there is higher preference for local vendors in foreign countries. Calls for ‘atmanirbhar bharat’ and ‘vocal for local’ may increase opportunities for participation in government projects and nationalist sentiment driven branding. The reforms in agriculture will boost inter-state trade in agriculture particularly for commodities (cereals, edible oil, oilseeds, pulses, onions and potato) that have been freed up from the Essential Commodities Act. Private investments can be expected in warehouses, cold storage and farm-to-fork supply chains. Domestic economic policies may favour infrastructure and social sector spending particularly in affordable housing, rental housing and healthcare sectors. Liquidity will continue to flow due to RBI’s policies but rising government deficit may prevent interest rates from falling too much. Rising non-performing assets after IBC suspension is lifted may make larger banks risk averse.

#### 1.4 Scenario Analysis

As highlighted earlier, there is a very high degree of uncertainty about post-COVID world. Based on a brief overview of the STEEP analysis as presented in the previous section, we construct four different scenarios – referred as post-COVID worlds - based on the changes that may likely to have on our society, economy, environment, politics and technology adoption and innovation. For constructing the scenarios, we propose measuring changes along the following two dimensions that captures the changes as mentioned earlier. The first dimension is the *economic environment* that refers to economic growth and reforms, conducive environment for doing business, and technology adoption commensurate with the economic growth. The second dimension is *social and political environment* that is a combination of social and political dimensions. The *social dimension* refers to the shared values, interests, and priorities in life for the society as a holistic unit in terms of their sensitivity to sustainability, consciousness about health, hygiene and safety, inclusivity and social harmony, emphasis on experiential dimension of life, and the capability and emphasis on education and technological innovation. The *political dimension* refers to the citizen empowerment, authority and control exercised by the government.

The economic environment can be measured on a continuous notional scale beginning with underdeveloped at the lowest level and developed on the other extreme. An *underdeveloped economic environment* represents an economic condition characterized by lower growth rate, absence of major economic reforms facilitating economic growth, absence of a conducive environment for business consequently leading to lower adoption of technology by citizens and businesses, lack of opportunities in urban areas, lower urbanization and lesser migration to cities and few regions. On the hand, a *developed economic environment* represents an economic condition characterized by higher growth, economic policies that creates a positive environment for business, and can afford higher level of adoption of technology by citizen and businesses, consequently leading to greater urbanization and migration.

Similarly, the social and political dimension can be measured notionally as progressive on one extreme while as conservative on the other. A *progressive social and political environment* represents a social and political environment that is represented by a society that is more sensitive to sustainability, physical and mental wellbeing emphasizing on health, hygiene, safety, education, and experiential dimensions of life such as comfort, convenience, and happiness by engaging into activities like, travel and leisure, spending time with family and community, interacting with the nature, learning and educational activities etc. The society has skills, capability and a shared orientation towards technology innovations. The society is more peaceful and social harmony is exemplary. People's voice matters for the government decision making and there is more empowerment of the local administration. A *conservative social and political environment* represents a social and political environment that is represented by a society that is less sensitive to sustainability, physical and mental wellbeing emphasizing on health, hygiene, safety, education. For such society learning and education is more of an economic necessity than a process of internal inquiry. The society prioritizes comfort, entertainment, and luxury than on experiential dimensions like, nature travel, exploration, community activities etc. The lacks any shared orientation and emphasis on technological innovation. The society is less cohesive and the community feeling is poor. There are social conflicts based on affiliations, caste, religion etc. Politics is characterized by more of nepotism and is controlled by closed groups. There is an increased tendency of the political class to exercise control and authority. Governments policies do not support and thus would be regressive towards openness in trade. Table 1.1 summarizes the characteristics at the extreme ends of the two dimensions.

### 1.5 Key characteristics of the post-COVID scenarios

<b>Low Economic Environment</b>	Lower/slower <i>economic growth</i> No significant <i>economic reforms</i> Non-conducive <i>environment for business</i> Lack of <i>private capital</i> for big infrastructure projects Lower <i>Government spending</i> on public infrastructure Focus on self-sufficiency and lesser <i>integration with the world economy</i> <i>Availability of advanced technologies</i> are poor Reverse <i>urbanization</i>
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	Technology adoption <i>is lower</i>
<b>High Economic Environment</b>	<p>High <i>economic growth</i>  More <i>economic reforms</i>  Conducive <i>environment for business</i>  Higher <i>Government spending</i> on public infrastructure  Availability of <i>private capital</i> for big infrastructure projects  More <i>integration with the world economy</i>  <i>Availability of advanced technologies</i> are high  Increased <i>urbanization</i>  Technology adoption <i>is higher</i></p>
<b>Conservative Socio-Political Environment</b>	<p><i>Technology innovation</i> is poor  Less sensitive to <i>sustainability</i> and unwilling to pay for it.  Lesser sensitive and <i>awareness</i> about health, hygiene, and safety  Less sensitive to things that affect <i>experiential aspects of life</i>  High <b>political instability</b> and violation of <i>democratic values</i>  Government overlooks <i>social welfare</i> issues and higher <i>political opportunism</i>  More <i>social tensions</i> and lower <i>communal harmony</i>  More centralization of <i>governance and administration</i></p>
<b>Progressive Socio-Political Environment</b>	<p><i>Technology innovation</i> is high  More sensitive to <i>sustainability</i> and willing to pay for it.  High <i>awareness</i> about health, hygiene  More sensitive to things that affect <i>quality of life</i>  High <i>political stability</i> and upholding of <i>democratic values</i>  Government driven by greater <i>social welfare</i> and lesser <i>political opportunism</i>  Lower <i>social tensions</i> and higher <i>communal harmony</i>  Empowered local <i>governance and administration</i></p>

Using the above two dimensions we construct four different mutually exclusive scenarios for the post-COVID world. Figure .1 describes the worlds. We have also appropriately named the four scenarios as shown in Figure 1 as self-sufficient World, protective world, consumerist world, and progressive world.



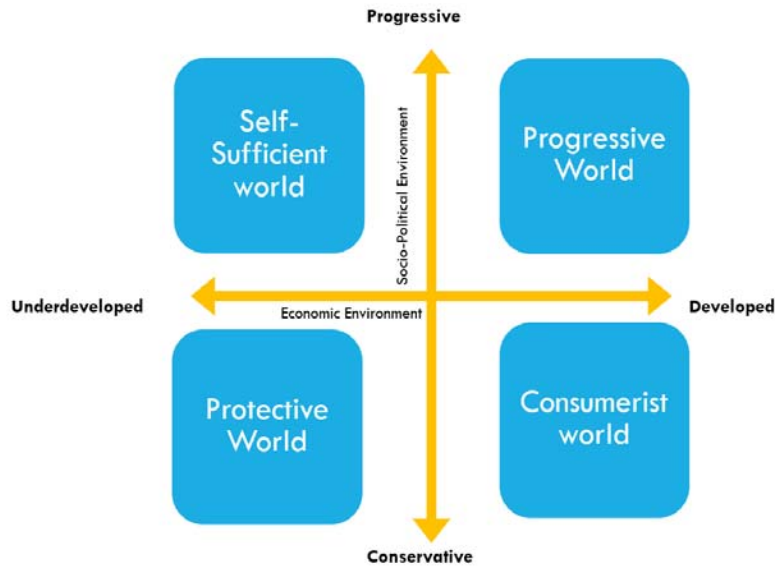


Figure 1 Post-COVID scenarios (Refer to Annexure 1 for a detailed diagrammatic representation)

The characteristics of the *Self-Sufficient World* is as follows:

- ❖ **Technology Innovation, Adoption and Availability:** While there is lot of emphasise on technology innovation, however, the overall adoption and availability of technology is subdued due to the poor economic capacity of the population and the Government. Therefore, technology innovations are directed towards achieving efficiency, and affordability and more driven by immediate and pressing needs of the society.
- ❖ **Urbanization:** Reverse urbanization and migration for economic reasons would be significantly higher. Women participation in workplace would be moderate but the proportion of joint families would increase.
- ❖ **Consumption Behaviour:** There would be more emphasis on healthy nutrient-rich affordable foods. Consumption of basic health, hygiene, and sanitation items would be more. There would be more emphasis on holistic education. The expectation on public spending on health and education would be higher.
- ❖ **Quality of Life and Social Habits:** There would be more emphasis on 'how we live' than mere living. Happiness, comfort and convenience in life would be more emphasized. There would be healthier social and community engagements. There would be more expectations of more basic essential services and public amenities from the Government. People would value more on sustainable living but will always explore innovations in natural and affordable ways of ensuring sustainability.
- ❖ **Business environment:** The overall business environment would be poor. Although society would encourage entrepreneurship but overall, there would be high entry to

barriers for entrepreneurs and such initiatives would lack access to global capital flows and be driven more by Government support and local capital.

- ❖ **Government Expenditure:** The people would expect the government to spend on public health, educational institutions, urban and village roadways, and essential quality of life services. The spending on economic infrastructure like, highways, logistics infrastructure, ports and other public facilities would be only need basis.
- ❖ **Social and Political Order:** People are more aware about their rights, and the duties of Government. Political leadership would be under pressure to deliver. However, people will have frustrations about economic failures and hence, politics would be more competitive and would change regularly. Although, overall, there would be social harmony but economic frustrations may give rise to the social and political fault lines leading to localized tensions and political violence.

Early indicators of the occurrence of a self-sufficient world can be restrictive policies on trade and movement of people. Spending by Government on Social infrastructure rather than urban infrastructure. Reverse migrations of population. Oil Prices continue to be low.

The characteristics of the *Protective World* is as follows:

- ❖ **Technology Innovation, Adoption and Availability:** Technology usage and penetration is minimum. More labour-intensive works.
- ❖ **Urbanization:** Urbanization would be slower with minimum level of migration due to lack of opportunities. Unemployment would be very high, women participation in workplace would be minimum and joint families would increase.
- ❖ **Consumption Behaviour:** People would be very conservative with consumption habits and emphasize consumption more as a need. The demand for health, hygiene and sanitation items would be subdued. Psychological problems rise in society to unmanageable levels. Education would be more an imitating and certification process. There would be minimum spending on health and education and such infrastructure and services would remain poor.
- ❖ **Quality of Life and Social Habits:** Living would face many difficulties and hence, essentials like, 'roti, kapda aur makan' would define the life. There would be minimum availability of basic public services and essentials would be emphasized more over comfort and convenience. Communities would be overpopulated with very poor per capita availability of living space. Community spaces would be minimum, and diseases and unhealthy living would be a common sight. Exploitation of resources would be the priority and economics would dominate over long-term environment sustainably.
- ❖ **Business environment:** There will always be supply-side issues and the supply chains including for essential items would witness more supply disruptions. The overall business environment would be very poor and oligarchs and politicians would form cartelization to dominate all major businesses. Entrepreneurship would be almost

absent and the major employment would be government services and with the rich. High taxation and depreciating rupee would deter private investments.

- ❖ **Government Expenditure:** The government spending would be under serious constraint. As a result, investments in public health, educational institutions, urban and village roadways, and essential quality of life services would be very minimal. The spending on economic infrastructure like, highways, logistics infrastructure, ports and other public facilities would be very minimal would be driven more by political influence rather than serious need.
- ❖ **Social and Political Order:** Political power keeps changing to opportunistic coalitions; holdout issues remain. There would be more influence of the oligarchs and feudal in politics and governance. There would be regular social tensions and communal/political violence.

Early indicators of the occurrence of a protective word can be concentration of power. Reduced democratic processes. Governments and few businesses rule the world. Dependence on government increases and active policing of all sections by the government.

The characteristics of the *Consumerist World* is as follows:

- ❖ **Technology Innovation, Adoption and Availability:** High usage of well-established technologies and technological systems. Very little innovation locally and technology needs are met through purchase from technologically advanced nations.
- ❖ **Urbanization:** Urbanization would be higher due to more economic opportunities. Women participation would be moderate and the society would be a mix of nuclear and joint families.
- ❖ **Consumption Behaviour:** There would be more spending on taste-bud triggering food items and luxury products. Consumption would be more driven by social trends rather than inherent needs. There would be more emphasis on health facilities and medical interventions than prevention based on healthy consumption, life style, and awareness. Consumption of health services to be higher. Basic consumption of health, hygiene, and sanitation items and fancy gadgets would be more. Professional and vocational education would be more emphasized.
- ❖ **Quality of Life and Social Habits:** While basic comfort and convenience of life would be very high, people would prefer more glamorous living than quality living. People would spend more time on entertainment and pleasure activities. Public infrastructure would be marked by more of showpiece and would imitate global landmarks. There would be significant investment on economic and business infrastructure projects. Basic public services would be of excellent quality and would be available on a rental basis. Communities living would be more spacious and focus on luxury. Exploitation of resources would be the priority and economics would dominate over long-term environment sustainably.

- ❖ **Business environment:** The overall business environment would be conducive and the nation would emerge as an important market. There would be inward capital flights and entry of MNCs. Cartelization and Industry concentration moves up.
- ❖ **Government Expenditure:** Government would spend and buy best of the systems for urban infrastructure like, basic drainage and sewerage, urban roads, and public infrastructure. However, such services may be on payment basis and hence, private institutions may be actively involved and financing schemes like, BOT, BOLT, Build and Maintain etc. would be very popular. The spending on economic infrastructure like, highways, logistics infrastructure, ports and other public facilities would be purely on the basis of financing schemes to involve private capital. There would also be significant investment on mega infrastructure projects.
- ❖ **Social and Political Order:** Reactive global response enables more power to anti-state voices. There would be undermining of democratic principles. Technology and data-based governance would be used more for surveillance and to control people. Governance systems would be more centralized and States response to disasters and wars is very powerful.

Early indicators of the occurrence of a consumerist world can be enhanced trade and movement of people. More allowances for free flow of capital, investments and people. Oil prices strengthen significantly. Lower consumption on alternative sources of energy. Consumption of goods and services is very high. Low adoption of good and sustainable innovations

The characteristics of the *Protective World* is as follows:

- ❖ **Technology Innovation, Adoption and Availability:** Creative usage and large-scale innovations of advanced technology. Technology dependency is lesser and the economy is driven significantly by technological innovations. Personal gadgets offering various personalized services would be in high demand.
- ❖ **Urbanization:** Urbanization and migration (including cross-border) for economic reasons would be significantly higher. Women participation in workplace would rise and there would be increase in nuclear families.
- ❖ **Consumption Behaviour:** There would be more spending on healthy nutrient-rich organic foods with emphasis on the experience rather than mere consumption. Consumption of health, hygiene, and sanitation items and advanced gadgets would be more. Education would be more broad-based and would spend on value-based and professional education equally.
- ❖ **Quality of Life and Social Habits:** People would spend on things that make their life happy, comfortable and convenient. Community spaces like, restaurants, recreational facilities, theme parks, entertainment facilities etc. and personalized health services would increase. Their quality expectations from services would be high and environmental and social sustainability of businesses would be more valued.
- ❖ **Business environment:** The overall business environment would be very conducive for all and the nation would emerge as an important economic destination. There would

be inward capital flights and high levels of business innovations mostly driven by new entrants.

- ❖ **Government Expenditure:** In addition to spending on basic public health, educational, urban and village roadways, and essential quality of life services. However, there would also be a significant role of private capital and institutions for providing personalized services. The spending on economic infrastructure like, highways, logistics infrastructure, ports and other public facilities would be extensive and would be more creative in terms of involving private capital. There would also be significant investment on creative infrastructure projects.
- ❖ **Social and Political Order:** Nation become more democratic and people would demand more effective governance. There would be extensive use of technology and data-based governance model for the benefit of people. Peaceful global response enables people fall in line to the new norms.

Early indicators of the occurrence of a progressive word can be enhanced trade and movement of people. More allowances for free flow of capital, investments and people. Oil prices strengthen. Early adoption of renewables and lower consumption of fossil fuels.

## 2 CHAPTER 2: ANALYSIS OF THE CONSTRUCTION SECTOR

### 2.1 Understanding the market demand

Major portion of construction business comes from either the infrastructure projects from Government or projects that are sold to individual consumers such as housing projects of services offered to private organizations. We elaborate and characterise the above businesses as projects under government spending and projects for market need.

#### *Nature of Government Spending:*

We categorise the nature of Government spending into *Economic Infrastructure Projects (EIP)*, *Basic Urban (also mean rural amenities for villages) Infrastructure Projects (BUIP)*, and *Quality of Life Infrastructure Projects (QoLIP)*.

#### *Economic Infrastructure Projects (EIP)*

Economic infrastructure projects refer to projects are initiated for facilitating economic activities. They include projects like, highways and bridges, warehouses, trade facilities, logistics hubs, industrial perks, cold storage facilities, flood control and irrigation projects, power projects including thermal, hydel, and non-renewable sources, transport corridors, airports, public transport facilities and infrastructure, rapid transport systems etc.

#### *Basic Urban Infrastructure Projects (BUIP):*

Basic Urban Infrastructure Projects refers to infrastructural facilities that are deemed to be essential for modern living. They include projects like, urban (rural) roads, sewerage and drainage system, waste collection and disposal, water supply, electricity supply etc. The scale and sophistication of the systems depends on affordability of the Government. They also include basic civil works related to maintenance and upkeep of existing facilities.

#### *Quality of Life Infrastructure Projects (QoLIP):*

Quality of life refers to social and public infrastructures like, footpaths, perks, sports facilities, amphitheatres, community gathering places, green space, community markets, affordable housings for the poor and the marginalized, traffic management and safety related projects, quality of water and electricity, environment sustainability projects like, water harvesting, energy savings and non-renewable energy sources, recycling of wastes etc., social sustainability projects like, working men and women's hostel, orphanages, physio and naturopathy facilities, geriatric care and old age home etc., advanced medical services, sanitation and hygiene, smart city projects etc. They are not only about just making the facilities but also emphasises on the aesthetical aspects of the projects and the subsequent management of them.

**Assumption:** Please note that while scale of expenditure on economic infrastructure and BUIP is purely dependent on economic growth and the borrowing power of the Government, spending on QoLIP follows a long-term intention of the Government and the nature of citizen's demand on their Government.

### *Nature of Market Need*

Unlike in the case of Government spending where the target customer is the Government, market needs, for our purpose, refers to the nature of the expressed as well as the felt needs by the general population including private organizations. Consideration of market needs arise for businesses where a construction firm carries construction activities, sells assets, or provides infrastructure-related services to individuals or private entities. We categorise the nature of Market Need as *Commercial Infrastructure*, *Basic Utilities*, and *Residential Units*. One may find overlaps between the expenditure by individuals and government spending specially for utility projects. What differentiates between government spending and market need is the who is initiating the project. For example, government spending on a sewerage system represents development of such systems for a geographical area while market need refers to sewerage system of an individual residential unit.

#### *Commercial Infrastructure Projects*

Commercial infrastructure projects refer to projects are initiated by individuals or individual firms or other organizations. They include projects like, construction of roads, buildings and other civil works, parks and gardens, township projects, sports and recreational facilities, warehouses, hotels, commercial plazas and shops, cold storage facilities, captive power projects etc.

#### *Basic Utilities*

Basic Utilities refers to the construction, operation, and management of utility services like, drainage, sewerage, water supply, electricity, swimming pools, playareas and recreational facilities etc. within a residential and commercial facilities.

#### *Residential Units*

Residential units refer to the construction, operation, and management of residential houses and complexes meant for direct selling to the general public.

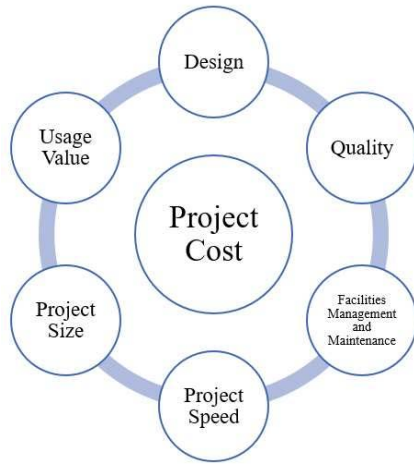
## 2.2 The Uncertainties of the Post-COVID World

The future business of a construction firm depends a lot on how the future unfolds once the pandemic gets over and normal life and economic activities resumes. Although there are some trends that we can visualize for the future, overall the future remains very unpredictable. Hence, this research team from IIMK carried out a scenario analysis and identified four clear scenarios

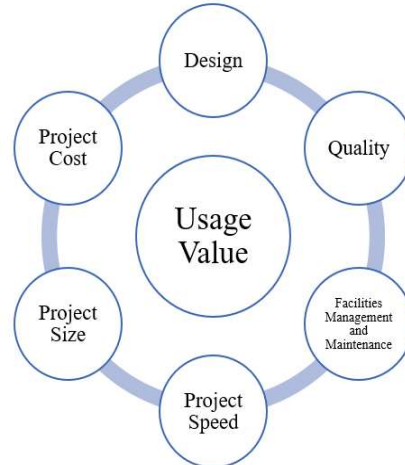
of the world that may unfold post-pandemic. The actual world that we would finally see depends on the events and actions of the various governments individually and jointly. The four worlds are: self-sufficient, progressive, consumerist, and protective world. For formulating business strategies for a construction firm for the post-pandemic world would depend a lot on how the nature of government spending and the market need evolves. Figure 1 describes the nature of need that are likely to be observed in the four different worlds.

The needs of the government and the market are interrelated. While this is very obvious when we have scenario where both the social and political environment are progressive. When they are not so progressive, the economics dominates the need of the government as well as the market. We have tried to characterise the need for construction projects along the following dimensions: (1) project cost, (2) project quality (refers to the choice of materials and workmanship), (3) project speed (completion time), (3) usage value (refer to the value derived by the users through usage of the project), (4) project size, (5) post construction facilities management and maintenance, and (6) design (refers to the level of customization and innovation and newness in the design). We argue that all of the above dimensions can be trade-off with each other based on some criteria. For example, the level of customization of standard designs and the extent of innovation or newness depends a lot on the intended purpose and the nature of usage by the users of the facility, costs, and post-construction operations and maintenance. Figure 1, depicts the trade-offs that would be made by a government or market in a self-sufficient world, progressive world, consumerist world, and protective world. As shown in Figure 1(a), the trade-offs in a self-sufficient world world would choose design, quality, post-construction operations and maintenance, project size, quality of materials and workmanship, speed of completion based on the criteria of cost. Similarly, for the progressive world (Figure 1(b)) the usage value becomes the criteria for all the above choices. While usage value remains the criteria in the consumerist world (Figure 1(d)), the government and the market prefer well established systems and technologies from across the world and as a result design innovation and newness in design remains absent. However, for the protective world (Figure 1(c)), cost becomes the determinant criteria without any emphasis on usage value and newness in design. A detailed description of the choices that are made by the government and the market in the different worlds are presented in Table A1 in the Annexure.

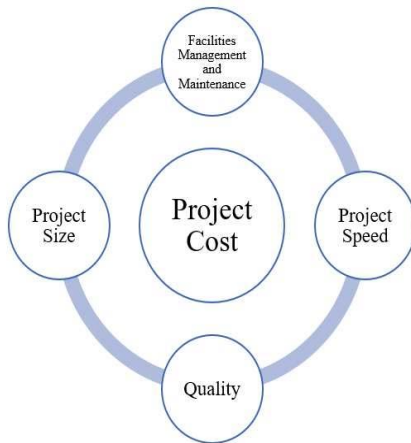




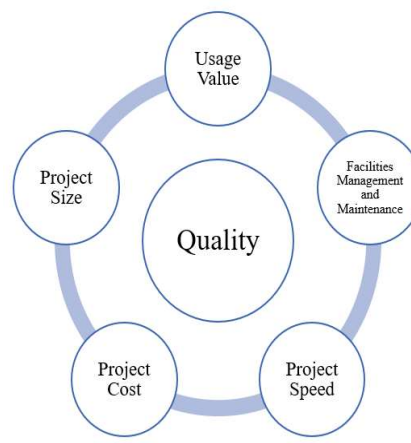
(a) Need Trade-offs in a Self-sufficient World



(b) Need Trade-offs in a Progressive World



(c) Need Trade-offs in a Protectice World



(d) Need Trade-offs in a Consumerist World

Figure 1: Government/Citizen's Need in Different Worlds

The government generally involve outside consultant for converting the need into specifications and, in most cases, the contractors are invited to participate for construction against the specification. In many cases, the design and the construction may also be integrated as part of the same contract. So we take a '*construct-to-specification*' view for all government spending and explain how such specifications may change in the different scenarios and the consequences for an individual contractor. Such a view also represents the reality that the contractor may not have the freedom to choose its own design and thus, affecting its choice of materials, use of construction equipment, construction processes, and post-construction operations and maintenance.

On the other hand, for non-governmental projects there is always some flexibility, by the contract, in choosing and influencing the specification which vary from one project to another.

There would also be customization requests from the clients which would call for changes in basic design to a completely new design specification. It's the characteristics of the need and affordability of the client that would define the choice of materials, construction equipment and processes, and post-construction operations and maintenance. Therefore, we take a *'construct-to-customized-specification'* view for these group of projects. Figure 1 describes how the specifications evolve across different scenarios.

A consequence, for a construction firm, of the differences in the need, as mentioned above, is reflected in the differences in specifications and the type of projects that it is likely to handle. The nature of specification change for both government spending and market need has serious consequences to the construction design and planning, execution, and post-construction operations and facilities management. Whether it is government spending or the market needs, changes in the specification and the customization need comes from various specific needs from the final user of the facilities. Figure 2 summarises the nature of changes that may be expected by a contractor for the different worlds in terms of specifications against which the construction work has to be carried out.

<p><b>SELF-SUFFICIENT WORLD</b></p> <p>Creativity and customization in designs is limited by affordability and hence, the some changes and modification of specifications are observed regularly.</p> <p>New projects would be small to medium scale with an emphasis on time-phased integration of modules. Moderate level of repairs and upgradation projects would exist.</p>	<p><b>PROGRESSIVE WORLD</b></p> <p>Highly creative and customized designs, and continuously evolving specifications.</p> <p>New projects would be large-scale end-to-end integrated or module-based integration projects. Repairs and upgradation projects would be of smaller to medium scale, in general while emphasising complete overhauling occasionally.</p>
<p><b>PROTECTIVE WORLD</b></p> <p>Specifications rarely change and no customization.</p> <p>New projects would be small to medium scale piece-meal projects. Repairs and upgradation projects would be few and of smaller size.</p>	<p><b>CONSUMERIST WORLD</b></p> <p>Designs try to imitate the best across the world and hence, would see continuous borrowings of standard specifications from others.</p> <p>New economic and basic projects would be large-scale end-to-end integrated projects or module-based integration while QoL projects would be small to medium scale with module-based integration. Repairs and upgradation projects would be of smaller to medium scale, in general while emphasising complete overhauling occasionally.</p>

**Figure 2: Consequences of Need for a Construction Company in Different Worlds**

Figure 2 suggests that specifications that are to be expected in the four worlds may not be same and therefore, such differences also has consequences for the contractor in terms of the choice

in construction technology, construction methodologies, project management practices, post-construction support, and the expertise and competencies to be nurtured and developed. We take a project life cycle approach to the effect of the government's and market needs on the contractor and group such affects into design and planning, project execution, monitoring & control, operations and maintenance. We also analyse the effects on the competencies that are to be developed and nurtured for the different worlds. Table A2 gives more tangible ideas about the nature of project management practices that are appropriate for the different worlds. Similarly, Table A3 describes how, the organizational and individual competencies that would be required in the different scenarios. There are also technology consequences in different worlds and few of them are highlighted in Table A4.

Within the construction sector, we also did some analysis of various sub-segments mainly in roads, real state, urban infrastructure, and smart city projects. In the ANNEXURE to this chapter, we present a sample of such analysis for the real-estate sector mainly in terms of customer expectations and technology choices. Table B1 presents how customer expectations would shape in different worlds. However, although a large number of technology alternatives exists, a detailed analysis of technology selection is beyond the scope of this study. However, Table A4 and Table B2 lists some of the emerging technologies in the road construction and the real estate sector respectively.

## 2.3 Firm-Level Strategies in a Post-Covid World

### 2.3.1 Business Level Strategy

Based on the analysis as presented above, we agree that there is lot of uncertainty about the future of India's economy and socio-political environment. We envision four different scenarios for the future and the competitiveness of construction business and the future growth of such firms depend on how the future unfolds in terms of the above scenarios. So, firms must watch out for the events on a continuous basis to understand the scenarios that is crystalizing over time and prepare itself for the unfolding scenario. After characterizing the four possible worlds we have prepared suitable strategies to be adopted in the event of occurrence of any one of the scenarios. The first question that we try to understand is what businesses a construction firm should be in when it faces one of the scenarios. A subsequent follow-up question is, given a business under a scenario what competitive strategy that the firm should pursue. The recommendations for the above questions are as follows:

#### **Protective World**

Under this scenario, a construction firm should focus mainly on highways & Bridges while bidding for only medium to large road projects under EPC contract for urban roads. The urban infrastructure projects, however, would not be very attractive in the short-to-medium term and hence, can hold any such plans for a suitable opportunity in the future. In case of real estate, it should focus more on affordable, LIG & MIG housing. The strategy to be adopted in a protective world would be to focus on low-cost, make-to-specification construction projects. The following summarises the business focus.

Highways & Bridges – Should be major focus.

Urban Roads – Bid for only medium to large road projects and only if an EPC contract

Urban Infrastructure – Not very attractive in the short-to medium term.

Real Estate – Affordable, LIG & MIG housing

### **Self-Sufficient World**

In a self-sufficient world, a construction firm should have major focus on highways & Bridges while bid for only medium to large road projects under EPC contract for urban roads. The urban infrastructure projects, however, should on getting basic urban infrastructure projects (like sewerage, drainage, perks and government offices etc.). In case of real estate, it should focus more on affordable, LIG & MIG housing with an emphasis on frugality in bringing down costs, and increasing QoL features. As a strategy, the firm in a self-sufficient world should focus on developing capabilities for providing cost effective solutions to its clients. The following summarises the business focus.

Highways & Bridges – Should be the major focus

Urban Roads - Bid for only medium to large road projects and only if an EPC contract

Urban Infrastructure – Basic urban infrastructure projects

Real Estate – LIG & MIG housing with frugal design in bring down cost, and increasing QoL features.

### **Consumerist World**

In a consumerist world, a construction firm should prepare itself for its participation not just as a construction company but more as a long-term partner willing to take responsibilities in operations and post-construction facilities management and maintenance. As Highways and bridge construction of be significant and involve mega projects focusing on it would give a significant boost to its business. A similar approach needs to be adopted for urban roads. As there would be more investments on urban infrastructure it would be prudent for the firm to enter into this segment. However, the it should be prepared to do provide end-to-end integrated solutions rather than stand-alone execution of a small or medium scale modules. In consumerist world, people would have more disposable income to spend on luxury projects and hence, should be a natural focus for the firm. As a business strategy, the firm should focus more on developing itself as a trustworthy integrated solutions provider and build a capability for executing high-quality projects. The recommended business focuses are summarised below.

Highways & Bridges – Participation not as a contractor but as a partner with operational and maintenance responsibilities.

Urban Roads - Participation not as a contractor but as a partner with operational and maintenance responsibilities.

Urban Infrastructure – Large-scale state-of-the art integrated projects

Real Estate – Luxury Apartments

### **Progressive World**

In a progressive world, a construction firm's business focus should be similar as in the consumerist world. However, as a business strategy, there is a finer difference in the way the firm should compete in the market. In the progressive world, unlike in the consumerist world, the firm should focus more on developing itself as a trustworthy integrated Solutions Provider with value creation abilities for clients. The recommended business focuses are summarised below.

Highways & Bridges – Participation not as a contractor but as a partner with operational and maintenance responsibilities.

Urban Roads - Participation not as a contractor but as a partner with operational and maintenance responsibilities.

Urban Infrastructure – Large-scale state-of-the art innovative and integrated projects.

Real Estate – Housing with emphasis on QoL Features

### 2.3.2 Functional Level Strategy

While the business focus and the competitive strategies provide important directions for the construction firm, we recommend functional level strategies also in order to make the business strategies as highlighted above more effective and can be executed more effectively. We focus mainly, on project execution, capability building, organizational design, and technology strategies. The different functional level strategies recommended for the firm are summarised below.

#### **PROTECTIVE WORLD**

***Project Execution Strategy:*** Should focus more on achieving low-cost through optimal usage of resources. The following may be aggressively pursued by a construction firm:

- Adopt lean systems.
- Minimize wastes
- Increase labour productivity.
- Basic mechanization.

***Capability Building:*** Emphasis should be put on developing and nurturing the following capabilities:

- Contract bidding and liaisoning with the Government.
- Supervisory skills.
- Accounting, budgeting, and cost control.
- Expertise in understanding design standards.
- Material control.

***Organizational Design:*** A construction firm should focus on creating a lean organization with more top-down approach management control structure.

**Technology Strategy:** In a protective world, there is not much value in the usage of automation technologies in project execution and post-construction facilities management. Hence, the firm should emphasize on using basic construction equipments that enhances productivity and cost reduction in project execution only.

## **SELF-SUFFICIENT WORLD**

**Project Execution Strategy:** Focus on developing a culture that are open to experimenting with newer ideas and at the same time have expertise to critically evaluate such ideas.

- Adopt agile systems.
- Research team that analyses alternative ideas and can plan efficient execution
- Emphasize labour productivity, use of alternative materials, and modular construction methodologies.
- Use of basic mechanization.

**Capability Building:** The following capabilities need to be emphasised significantly:

- Frugality in facility design and architectural engineering
- Expertise in usage of sustainable construction technologies and materials.
- Expertise in planning and monitoring
- Small- to medium-scale customization and integration of modules.

**Organizational Design:** A construction firm should focus on giving controlled empowerment to employees for encouraging frugality and learning.

**Technology Strategy:** In a self-sufficient world, emphasise should be put more on using basic mechanization and frugality in developing and usage of tools and equipments that helps in improving productivity, quality, and cost-effective solutions. An emphasis should also be made on frugality in making facility maintenance free.

## **CONSUMERIST WORLD**

**Project Execution Strategy:** A construction firm should use of advanced technologies for automating project execution with highest level of efficiency and workmanship.

- Extreme consciousness to quality of design and materials, and workmanship.
- Use of intelligent and advanced systems for project planning, and real-time monitoring and control.
- Highly capable research team focusing on architectural and structural design.
- Use of automated robotic systems for project execution.
- Using modular construction and 3D printing technologies extensively.

**Capability Building:** The following capabilities need to be emphasised significantly:

- Capability of large-scale facility design and architectural engineering.
- Expertise in planning and monitoring
- IoT based fault diagnosis and AI-based intelligent systems for facilities management.
- Large-scale integration of modules.

- Working with technology-based project monitoring capabilities.
- Project finance.

**Organizational Design:** Focus more on creating an organization where more flexibility and empowerment given at the design, financing, and other business aspects while focussing more on flexible control approach for project execution.

**Technology Strategy:** In a consumerist world, emphasise more on using automation in construction and post-construction facilities management, and IoT-based real-time monitoring and fault-diagnosis systems for smooth operations and maintenance. An emphasis should also be made on robust technologies in making the usage facility uninterrupted and without any disruption.

## **PROGRESSIVE WORLD**

**Project Execution Strategy:** The following may be aggressively pursued by a construction firm:

- Use of advanced technologies for automating project execution with highest level of efficiency and workmanship.
- Extreme consciousness to quality of design and materials, workmanship, sustainability, and usage value.
- Use of intelligent and advanced systems for project planning, and real-time monitoring and control.
- Highly capable research team focusing on architectural and structural design.
- Use of automated robotic systems for project execution.
- Using modular construction and 3D printing technologies extensively.
- Continuous evolution and innovation of construction and project execution methodologies.
- Use of diverse and innovative project financing mechanisms.

**Capability Building:** The following capabilities need to be emphasised significantly:

- Capability of large-scale and creative design and architectural engineering
- Experimentation with more sustainable construction technologies and materials
- Expertise in planning and monitoring
- IoT based fault diagnosis and AI-based intelligent systems for facilities management.
- Large-scale integration of modules.
- Working with technology-based project monitoring capabilities.
- Project finance.

**Organizational Design:** Focus more on creating a learning organization willing to experiment with newer ideas and concepts. Make organization more flexible, agile, and imbibe creativity through more empowerment.

**Technology Strategy:** Emphasise more on using automation in construction and post-construction facilities management, IoT-based real-time monitoring and fault-diagnosis systems for smooth operations and maintenance, and extensive use of sustainable technologies and environment friendly construction materials. An emphasis should also be made on robust technologies in making the usage facility uninterrupted and without any disruption.

## 2.4 Conclusions

Construction being one of the major revenue earners for a construction firm, this sector becomes a primary focus of analysis in this study. The study divides the whole construction business of the firm into Government projects and market-driven projects. The uncertainties associated with project expectations and budgets may differ significantly between the two groups. We first brainstormed the post-COVID scenarios based on dimensions common to both the groups. The dimensions primarily considered are: (1) project cost, (2) project quality, (3) project speed, (3) usage value, (4) project size, (5) post construction facilities management and maintenance, and (6) design. We argue that, in spite of lower economic growth, in a protective world emphasis would be more on project cost while the self-sufficient world would emphasise on affordable innovation based on frugality. On the other hand, the scenarios with higher economic growth would see emphasizing imitated design and superior quality in a consumerist world while the emphasise would be more on extreme levels of innovation and utility in a progressive world.

The characterization of the four scenarios helped us build recommendations at two levels – first, at business-strategy level and, second, at functional level so that the firm can prepare itself for the emerging worlds in the future. The competitive strategy, in protective world, should be to emphasise low-cost, make-to-specifications construction projects. In a we recommend that a construction firm would do better if it continues with its present focus on EPC-based highways & bridges construction projects, and affordable, LIG & MIG housing. However, in a self-sufficient world we envision some investments on basic urban infrastructure projects and spending on affordable QoL features. In a consumerist and progressive world, on the other hand, we envision lot of economic activities. While the projects on offer would be unimaginably bigger with an emphasis on integrated solutions, however, the nature of such changes would differ in the two worlds. In both the worlds, a great emphasis would also be made on post-construction operations and facilities management. Highways and bridges and other economic and urban infrastructure projects would be mega projects and hence, it would be appropriate for the firm to focus on building capabilities for taking such challenging projects. This would require the firm to spend more on developing technology capabilities, research and training on building in-house expertise, and make necessary changes in organizational design appropriate for handling mega projects.



### 3 CHAPTER 3: ANALYSIS OF THE AGRICULTURE SECTOR

Food and agriculture have gained increased prominence in the post pandemic phase not only because this sector deals with essentials for living and health but because of the livelihood and employment creation potential of the sector which has been affected because of the pandemic and ensuing lockdown. For instance, Kerala has long been a major producer of cash crops and spices, including nutmeg, cinnamon, cardamom, ginger, pepper etc that form the cash crops of the state. Largely these are grown in home gardens which are a significant portion of the agricultural produce of the state. In recent years there has been an increased interest in cultivating fruits and vegetables especially because of increased concerns about chemical usage in imported agricultural commodities and also because of the additional livelihood options provided by the sector. The three new Agricultural reforms acts passed by the Central government have liberalised the agricultural market and has provided further avenues and impetus for the role of private players in agriculture, at the same time expanded avenues for sale of produce which could benefit both farmers, producers and private sector organizations in the long run.

Looking at the possibilities in Agribusiness and entrepreneurship, the opening up of the farm sector with the recent farm bills, the interest in health and wellness because of the pandemic and the interest espoused by many returning NRIs in the Agriculture and dairy sector, organizations are poised for a good opportunity in this sector.

#### **Post COVID**

Agriculture, dairy and food processing sectors is perhaps one of the beneficiaries of a post COVID world. People are concerned with essentials especially grains, pulses, fresh fruits and vegetables. This is also indicated by the number of new vegetable/fruit selling shops that have sprung up post COVID. As the average land holding in the country has been reducing over the years, consolidation of agriculture production, processing and market related activities could bring in economies of scale and scope and could benefit farmers and hence this is an opportune role for non-governmental players in the sector. The recent protests against the farm bills notwithstanding, there is bound to be increased market forces playing an active role in the sector.

The four possible scenarios for the post-COVID world, as highlighted in Chapter 1, have important implications for this sector. Based on the scenarios, we list out the market related, production and processing related as well as supply chain related challenges and opportunities for the agricultural sector.

### 3.1 Agricultural Markets - Challenges & Opportunities

The challenges associated with each of the scenarios are quite distinct. While the self-reliant and protective worlds have lesser urbanisation and adoption of technology which creates its own opportunities, few of the concerns are applicable across all the scenarios. For instance, the concern for food safety and hygiene, increased demand for health and wellness products would be equally relevant for all scenarios. There are also quadrant specific features. For instance, because of higher urban concentration in the progressive and consumerist world, investment in technology and infrastructure for reducing post-harvest losses would be a bigger concern in these scenarios. We provide a list of these challenges and opportunities in each of the scenarios (Figure 3.1).

Self-reliant	Progressive	Protective	Consumerist
<ul style="list-style-type: none"> <li>Reducing post-harvest losses (though this is a lesser challenge as against the progressive scenario – markets local)</li> <li>Fear of food safety and hygiene</li> <li>Increased demand for health and nutrition based foods and lack of processing facilities</li> <li>Limited demand for processed packaged foods but increased demand for semi-processed foods</li> <li>Promoting genetic heterogeneity (risk of infection spread lesser)</li> <li>Traceability from farm to fork not a big issue, since processed and packaged foods volume is not high and consumers are also locally placed.</li> </ul>	<ul style="list-style-type: none"> <li>Reducing post-harvest losses</li> <li>Fear of food safety and hygiene</li> <li>Increased demand for health and nutrition based foods and lack of processing facilities for the same</li> <li>Huge demand for processed foods but lack of agri and food processing facilities for processed and semi-processed foods is a challenge</li> <li>Promote genetic heterogeneity</li> <li>Traceability from farm to fork (through technology)</li> </ul>	<ul style="list-style-type: none"> <li>Reducing post-harvest losses (though this is a lesser challenge )</li> <li>Fear of food safety and hygiene</li> <li>Increased demand for health and nutrition based foods and lack of processing facilities</li> <li>Limited demand for processed packaged foods</li> <li>Promoting genetic heterogeneity (risk of infection spread lesser)</li> <li>Traceability from farm to fork not a big issue, since processed and packaged foods volume is not high and consumers are also locally placed.</li> </ul>	<ul style="list-style-type: none"> <li>Reducing post-harvest losses</li> <li>Fear of food safety and hygiene</li> <li>Increased demand for health and nutrition based foods and lack of processing facilities for the same</li> <li>Huge demand for processed foods but lack of agri and food processing facilities for processed and semi-processed foods is a challenge</li> <li>Promote genetic heterogeneity</li> <li>Traceability from farm to fork (through limited use of technology)</li> </ul>

Figure 3.1 Challenges and Opportunities in the Agriculture Sector

### 3.2 Market / Customer features in each of the scenarios

The demographic features in terms of urbanization, gives rise to a concentrated population either in urban areas or could lead to reverse migration where people move back to rural areas. Coupled with this the economic revival in these geographies gives rise to a paying clientele which aspires to buy food and agricultural produce. Concern for health, adoption of technology and lifestyle choices could also lead to aspirations for certain set of produce. Based on this understanding, each of the scenarios gives rise to a distinct set of market features as showcased below (Figure 3.2).

Self-reliant	Progressive	Protective	Consumerist
<b>Market Features</b> <ul style="list-style-type: none"> <li>Paying clientele (markets) are distributed to rural areas – they are conscious of health, nutrition and are willing to pay more for the products which cater to these needs.</li> <li>Selective exports of processed, value added products to Gulf and metro markets in India.</li> </ul>	<b>Market Features:</b> <ul style="list-style-type: none"> <li>Paying clientele (markets) are concentrated in urban areas – they are conscious of health, nutrition and willing to pay more for the products which cater to these needs.</li> <li>Selling in largely metro markets/big cities and for exports</li> </ul>	<b>Market Features</b> <ul style="list-style-type: none"> <li>Paying clientele (markets) are fewer and distributed to rural areas – they are conscious of health, nutrition but ability to pay for these products is less.</li> </ul>	<b>Market Features:</b> <ul style="list-style-type: none"> <li>Paying clientele (markets) are concentrated in urban areas – there is limited concern on health, nutrition etc and less willing to pay for these products.</li> <li>Selling in largely metro markets/big cities and for exports.</li> <li>Junk processed foods could predominate in demand.</li> </ul>

Figure 3.2 Market Features in Different Worlds

### 3.3 Production facility features in each of the scenarios

The production features would vary based on the extent of technology use, the mix of small and large units in the production process and the concern on health. One of the significant features of the Progressive and Consumerist worlds are greater urban concentration and technology adoption which could give rise to more centralised and technology integrated farm produce. The features are described below (Figure 3.3).

Self-reliant	Progressive	Protective	Consumerist
<b>Production:</b> <ul style="list-style-type: none"> <li>Scientific (with limited technology) Integrated farming could be predominant in production (knowledge intensive).</li> <li>Mix of Small farms + large farms (with technology) in production</li> <li>Organic cultivation in small land holdings (since the consumers are 'neighbours' of producers, One has to be careful of how they produce)</li> </ul>	<b>Production:</b> <ul style="list-style-type: none"> <li>Precision farming, technology intensive integrate farming (knowledge intensive)</li> <li>A few large Inorganic farms (esp for processing) + a few large organic farms.</li> <li>Medicinal plants production on large farms using technology (for health and nutrition produce)</li> </ul>	<b>Production:</b> <ul style="list-style-type: none"> <li>Integrated farming could be predominant in production (labour intensive)</li> <li>Large number of small farms</li> <li>Organic cultivation (since the consumers are 'neighbours' of producers)</li> </ul>	<b>Production</b> <ul style="list-style-type: none"> <li>Intensive integrated farming – with limited technology (knowledge intensive)</li> <li>Large scale farms producing Inorganic produce (esp for processing) with niche organic farming</li> </ul>
<b>A large part of the Producers in all the quadrants are rural households with small land holdings distributed across the state/country</b>			

Figure 3.3 Production Features in the Different Worlds

### 3.4 Processing facility features in each of the scenarios

The features of the processing facilities vary based on the distribution of large and small units, the extent of technology use and the scale and scope of products demanded by the market (Figure 2.4). Lifestyle choices especially in the Progressive world for healthy products and in Consumerist world for larger variety with less concern on nutrition could also give rise to differences in product portfolios in these worlds and has a corresponding impact on the processing facilities. The characteristics of processing facilities in each scenario is elaborated in the table below.

## Processing facility features

Self-reliant	Progressive	Protective	Consumerist
<b>Processing</b> <ul style="list-style-type: none"> <li>Largely distributed processing facilities with one/two large facilities for processing</li> <li>Predominant use of intermediate tech processing + few high value – high processed food products in centralised facility</li> <li>Large number of cottage manufacturing with intermediate technology adoptions</li> </ul>	<b>Processing</b> <ul style="list-style-type: none"> <li>Largely centralised processing facilities with few pockets of distributed processing.</li> <li>Use of high end technology in making variety of products, ensuring hygiene, food quality and safety</li> <li>Large number of high value – nutrition products+ large variety of processed food products</li> <li>Small number of cottage manufacturing with large technology adoptions</li> </ul>	<b>Processing</b> <ul style="list-style-type: none"> <li>Largely distributed processing facilities with one/two large facilities for processing</li> <li>Predominant use of low tech processing + few high value – processed food products in centralised facility</li> <li>Large number of cottage manufacturing with minimal technology adoptions</li> </ul>	<b>Processing</b> <ul style="list-style-type: none"> <li>Largely centralised processing facilities with few pockets of distributed processing.</li> <li>Large number of high value –processed food products. Limited number of nutrition based products.</li> <li>Small number of cottage manufacturing</li> </ul>

Figure 3.4 Characteristics of the Processing Facilities in the Different Worlds

### 3.5 Supply chain features in each of the scenarios

Each of the scenarios project a distinct market feature in terms of urban or rural spread, technology adoption, life style choices and subsequent product demands. This has implications for the distribution network, cold chain infrastructure deployment, the extent of technology use in distribution and brand deployment (Figure 3.5). We provide in the table below some broad dimensions on which the supply chain features could vary.

Self-reliant	Progressive	Protective	Consumerist
<b>Supply chain</b> <ul style="list-style-type: none"> <li>Hyper local supply chain</li> <li>Cold chain in the entire food chain (incl delivery)</li> </ul>	<b>Supply Chain</b> <ul style="list-style-type: none"> <li>Cold chain infrastructure plays an important role as markets are in far off metro/big cities.</li> <li>Large number of refrigerated trucks, and smaller unrefrigerated commercial vehicles for delivery to nearby towns.</li> <li>Technology Investment in Inventory management, food tracing and control systems</li> </ul>	<b>Supply chain</b> <ul style="list-style-type: none"> <li>Hyper local supply chain</li> <li>Limited use of cold chain (less technology and limited paying clientele)</li> </ul>	<b>Supply Chain</b> <ul style="list-style-type: none"> <li>Cold chain infrastructure plays a big role as markets are in far off metro/big cities.</li> <li>Large number of refrigerated trucks, and smaller unrefrigerated commercial vehicles for delivery to nearby towns.</li> </ul>
Strong local brand	Strong regional/national brand	Strong local brand	Strong regional/national brand

Figure 3.5 Characteristics of the Supply Chain in the Different Worlds

### 3.6 Forward looking thoughts on the Agricultural sector

The emergence of the four scenarios that are described above can be tracked through early indicators including macro and micro economic trends. We list out few indicators that need to be tracked for the agricultural sector to serve as early warning signals on the scenario that we would encounter one to three years from now. These are:

1. Distribution of urban vs rural spend on fresh food and processed food
2. Data on Rural unemployment vs urban unemployment or rural vs urban work force
3. Spend on health and wellness services
4. Price trend on petrol and diesel
5. Contribution of renewables to the total energy generation

**Self-reliant and Protective Worlds:** The self-reliant and Protective Worlds would see further fragmentation of production and processing units with adoption of relatively low or intermediate technology in production, processing, marketing and supply chain. With regards to production and processing facility features, we would still expect that the Self-reliant and the Protective Worlds would have few large scale production and processing facilities catering to urban centres producing value added products with long-shelf life. However the vast majority of consumption in these worlds would still be for essentials and fewer number and variety of processed foods would be needed.

**Progressive and Consumerist Worlds:** The Progressive and Consumerist Worlds would see large scale investment in technology including high tech agricultural cultivation and superior technological investment in supply chain. While there would be greater health concern and hence a shift towards nutrition, health and immunity related products in the Progressive world, the Consumerist World would continue with the status quo in product preferences.

## 4 CHAPTER 4: ANALYSIS OF THE TOURISM SECTOR

The Indian tourism and hospitality industry have emerged as one of the key drivers of growth among the services sector in India. According to WTTC, India ranked third among 185 countries in terms of travel & tourism's total contribution to GDP in 2018. India was ranked 34th in the Travel & Tourism Competitiveness Report 2019 published by the World Economic Forum. The industry could take up to 10 months to recover after the outbreak is over.

India's travel and tourism industry has huge growth potential considering the rich cultural and historical heritage, green ecology, diverse terrains and places of natural beauty spread across the country. The widespread practice of Ayurveda, yoga and naturopathy makes India a potential global wellness destination. Tourism is also a potentially large employment generator besides being a significant source of foreign exchange for the country. The industry also looks forward to the expansion of E-visa scheme which is expected to double the tourist inflow to India.

### 4.1 Foundations of Post COVID Tourism

- 1) International tourist arrivals could see a negative growth. Hence, domestic tourism will likely be a key driver in the Tourism sector's initial recovery from COVID-19. In this new era, guests are more cautious; initially gravitating to destinations closer to home, first locally, then nationally. For instance, high net worth individuals who have travelled frequently for business or leisure pre-COVID-19, now remain closer to home. To encash on this, for instance, one tourism board in China launched the "Locals Travelling Locally" initiative to capitalise on domestic tourists.
- 2) Choice for travel is subject to a new accessibility with safety and legal acceptability at this post-COVID point of time. Therefore, scope for promoting lesser known and excursion destinations are more than never before (as tourists would prefer road travel and avoid crowded areas cum public transports). Ultimately, tourists are drawn to destinations that ensure a safe environment, through the implementation of protocols, as well as uplifting experiences, where social distancing can be calmly observed.
- 3) All niche tourism, special interest alternative tourism planning and policy issues need a new orientation. Safe tourism in institutional segments and all types of alternative tourism among millennial tourists can be good options. New and alternative profit centres in these areas are to be found.
- 4) People will move more towards health and wellbeing maintenance than pleasure in the future.

The four possible scenarios for the post-COVID world, as highlighted in Chapter 1, have important implications for this sector. The challenges associated with each of the scenarios are quite distinct. While the self-reliant and protective worlds have lesser urbanisation and adoption of technology which creates its own opportunities, few of the concerns are applicable

across all the scenarios. For instance, the concern for healthy lifestyle, increased demand for health and wellness products and services would be equally relevant for all scenarios. There are also quadrant specific features. For instance, higher urban concentration in the progressive and consumerist world could see investment in technology and infrastructure in these scenarios. Based on the scenarios, we also list out few indicators that need to be tracked for the tourism sector to serve as early warning signals on the scenario that we would encounter one to three years from now.

## 4.2 Segment Wise Scenario Evaluation

Given the nature of interested clientele, tourism sector in India can be broadly divided into a few clear segments, namely, (i) Arts and Crafts Tourism; (b) Cultural Experiential Tourism; (c) Agricultural Tourism; (d) Medical Tourism; (e) Eco Tourism; and (f) Public Administration Tourism. While, Arts and Crafts Tourism is a well-known segment that can be related to – we elaborate a little more on the other segments below:

### **Medical Tourism**

- ❖ **Medical tourism** refers to people traveling abroad to obtain *medical* treatment. Tourists seek specialised medical treatments, mainly Ayurvedic, spa & other therapies. The primary purpose is achieving, promoting or maintaining good health & a sense of well-being. Ayurveda healing properties and authentic medical local foods that create through the natural ingredient collections can be a potential USP.

### **Eco Tourism**

- ❖ **Ecotourism** is catering for holiday makers in the natural environment without damaging it or disturbing habitats. It is a form of **tourism** involving visiting fragile, pristine, and relatively undisturbed natural areas, intended as a low-impact and often small-scale alternative to standard commercial mass **tourism**. For instance, Thenmala in Kerala is one of the first planned ecotourism destination in India.

### **Cultural experiential tourism**

- ❖ Cultural experiential tourism concerned with a traveller's engagement with a region's culture, specifically the lifestyle of the people in those geographical areas, the history of those people, their way of recreations, architecture, religion(s), and other elements that helped shape their way of life

### **Agricultural Tourism**

- ❖ Agri-tourism offers the tourist many experiences while living in rural environment. The concept is simple, the urban tourists go the farmers home; stay like a farmer, engage in farming activities, experience the bullock cart, tractor ride, fly kites, eat authentic food, wear traditional clothes, understand the local culture, enjoy the folk songs and dance, buys fresh farm produce and in turn the farmer maintains home and farm hygiene, greets new tourists, sells his farm produce at a better price, earns a livelihood all year round. Rural crafts, dress materials, farm gate fresh agriculture products, processed foods are the few items which tourist can buy as memento for remembrance.

### **Public Administration Tourism**

- ❖ Public Administration Tourism is one of the largest sectors in the western world. It is linked to the capacity building activities that are created for relatively less developed states and nations. It implies that the target audience will not only attend conferences and trained but also experience the more developed states and nations. This specific segment is possibly the second largest in the United States. The time for this segment has arrived in India and it should not be neglected in the emerging policy process. This segment involves state-level interactions and territorial tourism interactions regarding budgets, personnel needs, inter-governmental relation, and political support functions. Troubling, however, is the absence in the past regarding this segments socio-political evaluation and monitoring. A little interest in hiring personnel with such administrative tourism skills can go a long way. The impact of public sector tourism management on related careers and specialties is an added advantage.

In table 4.1, the four scenarios provided in chapter one are visualized and evaluated. The table also shares a list of the potential challenges and opportunities in each of the scenarios for each of these segments.



**Table 4.1: Segment-Wise Scenario Analysis for Tourism Sector**

	<b>PROGRESSIVE</b>	<b>SELF SUFFICIENT</b>	<b>PROTECTIVE</b>	<b>CONSUMERIST</b>
<b>Arts and Crafts Tourism</b>	<p>Leisure travel expected, perspective towards traditional craft may support. Urbanisation and labour migration may create a lack of artisans in the crafts villages. Cheaper, mass production of commodities due to large-scale innovations balance the demand for handicrafts.</p> <p><b>Revenue</b> will possibly stay there</p> <p><b>Cost</b> - Lack of demand, Lack of artisans</p> <p><b>Profitability</b> will possibly remain steady</p> <p><b>Indicators</b> Traditionalized Urbanisation and supportive technology will possibly be in demand.</p>	<p>Reverse urbanisation will possibly lead to increase in demand for jobs in the crafts villages. Demand for Indian handicrafts will also increase- providing better livelihood.</p> <p><b>Revenue</b> will possibly increase</p> <p><b>Cost</b> – Demand for jobs in craft villages</p> <p><b>Profitability</b> for service providers will possibly increase</p> <p><b>Indicators</b> Domestic flight resumed, Government initiative like ‘Vocal for Local’, ‘Dekho Apna Desh’ Reverse urbanisation will lead to increase in</p>	<p>Fall in outside consumption, labour moving back to villages may increase demand for crafts related jobs.</p> <p><b>Revenue</b> will possibly increase</p> <p><b>Cost</b> – Demand for jobs in craft villages</p> <p><b>Profitability</b> for service providers will possibly increase</p> <p><b>Indicators</b> Domestic flight resumed, Government initiative like ‘Vocal for Local’, ‘Dekho Apna Desh’ Consumption of local handicrafts by the people of the country will easily provide livelihood to people in the crafts village.</p>	<p>Excessive migration, urbanization and fast culture will lead to a huge drop in demand for local handicrafts and their training. Business travel may not support as well</p> <p><b>Revenue</b> will possibly decline</p> <p><b>Cost</b> - Lack of demand, Lack of artisans</p> <p><b>Profitability</b> will possibly get impacted</p> <p><b>Indicators</b> Urbanisation and Commodities of high-end technology will possibly be in demand. Increase in global trade and advancement in global technology will decrease demand for local handicrafts and will be unable to provide employment to the people involved. Business travel may not support as well.</p>

		demand for jobs in the crafts villages. Demand for Indian handicrafts will also increase- providing better livelihood.		
<b>Cultural Experiential Tourism</b>	Leisure travel expected, perspective towards traditional cultural experiencing may support. A high rate of labour migration to cities and industrialization may not be beneficial to culture tourism.	A greater workforce including women in rural areas, reverse urbanisation may create a larger demand for Swadeshi experiential culture and jobs regarding it. A stronger cultural link will attract more tourists.	Fall in outside consumption, labour moving back to villages may increase demand for cultural experience related jobs.	Excessive migration, urbanization and fast culture will lead to a drop in demand for local cultural experience and their training. High Cartelization and Industry concentration may be an offshoot. Business travel may not support as well.
<b>Agricultural Tourism</b>	Increased leisure travel and technologically advanced agriculture producing better results and better farming techniques may seem more attractive to tourists given conspicuous consumption patterns	Increased workforce in agriculture. Downfall in fast food demand will lead to more focus on agricultural infrastructure, leading to more tourists.	Fall in outside consumption, labour moving back to villages may increase demand for agriculture jobs. May lead to rise in demand for agricultural tourism.	Most farmers may move to urban areas; weak agricultural infrastructure will lead to a downfall in agricultural tourism. There will be limited focus on conserving resources and sustainability. Business travel may not support as well.
<b>Medical Tourism</b>	With more focus of the country on health and education, highly advanced	While technology globally changes but adoption is hindered due	Lack of innovations and technological advancement	Consumption of health services to be higher; yet the slow local

	medical science and high rate of creative innovations adoption may have good consequences.	to lack of proper health infrastructure will lead to fall in demand for medical tourism.	in medical science will be disadvantageous.	technology absorption may be disadvantageous to the sector.
<b>Eco Tourism</b>	Conspicuous consumption by the haves along with a more sustainable environment, immense greenery with more cleanliness will attract more crowds.	Impressive sustainability measures of the government and stakeholders and greenery will lead to a boom in eco-tourism.	Limited focus on environment and sustainable measure will lead to a poor environment.	Limited focus on conserving resources and sustainability will attract fewer tourists. Business travel may not support as well.
<b>Public Administration Tourism</b>	Local disaster management skills will be in demand. Higher women work force participation, use of impressive data governance and innovation to improve public administration will prove to be beneficial.	Immense social tensions, communal, political violence and inefficient administration will not attract much crowd.	High unemployment levels and rise in psychological problems in society will discredit public administration. Lead to a fall in this sector.	Strong administration- efficient disaster management, advanced data governance will attract more tourists.

### 4.3 Forward looking thoughts on the Tourism Sector

With the Unlock initiatives by the Central Government, people have gradually started coming to normal life with more precautions. Social events, Tourists foot hold etc. could give boost to the sector. The following forward looking suggestions for the tourism sector players should help to grow and sustain themselves.

- **Progressive scenario** will definitely work as a booster for Medical Tourism, Eco Tourism, Agricultural Tourism etc since there are limited professional players in India for these areas.
- Based on the different lead indicators, the various scenarios are required to be forecasted. For example,
  1. Trends in number of flight advance bookings and star hotel advance bookings can be an indicator high income/ spending tourists. Similarly, increase in the railway advance bookings and budget advance hotels can indicate the increase in budget travellers.
  2. The age group of travellers can also be an indicator to identify the scenario. Travel by senior/retired citizens and kids can be an indicator of a **progressive scenario** whereas travel by individuals between the age group of 20-50 years can be used as an indicator of **protective scenario**.
- Post COVID, the value for money travellers are expected to outnumber the luxury travellers. All-inclusive packages are expected to do better as compared to specific packages. Thus, tour packages should be designed after dividing the cost into two components – (a) out of pocket/ immediately payable costs/ costs directly related to the passenger numbers and (b) costs related to the time period like rent, depreciation, interest charges, etc. Such a division can help in designing a competitive package where type (a) costs can be charged fully while some portion of the type (b) cost be postponed for some time so that the fixed cost burden is not more on the travellers pocket. This *marginal cost* technique can boost up the willingness of passenger spending when they see value for money in the package.
- Medical Tourism would be helpful in the current scenario. For instance, COVID experience will force the tourists towards the Medical Tourism irrespective of the scenario. Travellers now will be more inclined towards medical treatments especially Ayurvedic, spa and other treatments.
- With the expected gradual rise in social events, students and tourist foothold, the demand for the handicrafts could be expected to go up. Looking into the technology boom– various handicrafts items for sale can be converted to the digital platform for display. Tourist firms should conduct regular training drill for social distancing, disinfection, and other safety precautions. This could help in developing the confidence in the tourists, student community, etc. to conduct various social events with full support and confidence with digital marketing and print marketing mode. This would indirectly support the Food and accommodation segments, Handicraft sales segment etc

- The major threat on Master Craftsmen; can be overcome by providing training to the existing craftsmen.
- Training and empowering the local artists to supply various services in tourism value chain will increase the craftsmen
- Provide the unique experience by re-orienting the heritage arts and crafts villages
- Digitalize all related activities for enriching the tourist experience.
- Train students and the younger generation in handicrafts making by giving an opportunity to explore it.
- Training to think out of the box and develop new value-added products.
- Conduct exhibition, fairs, and online marketing with the help of the administration and student's community.

## 5 CHAPTER 5: ANALYSIS OF THE VOCATIONAL TRAINING SECTOR

### 5.1 Introduction

Education is the cornerstone of human capital that can lead to a productive workforce and higher economic output. The Government of India has recognized the importance of reinvigorating the education sector through the new education policy announced on July 30, 2020. Among several proposals, the new policy places high importance on application-oriented learning and the use of technology in education. The policy lays emphasis on experiential learning and problem solving as part of the curriculum and it encourages systems of internship and vocational education. Clearly the emphasis on skills training is going to go up with the implementation of this policy as well as in general due to the dynamic nature of knowledge and technologies in the coming decades. The education sector and particularly vocational training has huge growth potential in the years ahead.

While the government has been emphasizing skill based education for a long time, we are far from reaching the level of countries like Germany or Australia where skilling and education are seamlessly integrated for enhancing employability. Apart from the central government's policies, states like Kerala have announced a 'earn while you learn' scheme. More such policies to support skill-based learning and vocational education are expected in the near future. Due to the Covid pandemic, a large number of workers who had migrated to foreign countries (referred to as migrants) have returned to India (referred to as returning migrants) and may continue to seek employment in the domestic economy. This is over and above the rising numbers of youth who are entering the workforce every single day. In this situation there is an urgent need and demand for skill training that will help workers find suitable and rewarding employment. Skill building academies have the unique opportunity to lead the country in the area of vocational education that would have multiplier effects on the economy and society.

### 5.2 Post COVID trends for vocational training

1. Blended learning or hybrid forms of education will become popular. Instead of attending physical classes every day, students may mix it up with videos, assignments, online meetings on certain days of the week or parts of the day.
2. Use of technology will increase in delivery of training and education – simulations, augmented reality and digital media will become important modes of learning as well as valuable skills in the workplace.
3. Employers will increasingly look for skills of resilience in the employees such as flexibility, creativity, adaptability and interpersonal skills.
4. We can expect increasing emphasis on skilling to revive economic growth at the level of states and national level to aid post-Covid recovery.

Next we analyze the four possible post-COVID scenarios introduced in Chapter 1 and the implications for vocational education sector. This sector is expected to benefit in the case of strong economic recovery along with behavioural shift towards sustainability (i.e. progressive

scenario). Behavioural change along with economic slowdown (i.e. self-reliant world) will create training needs in health sector and customized programs/ entrepreneurial skills would be in demand. Economic slowdown and poor sensitivity about health, society (i.e. conservative world) would drive demand for upskilling, entrepreneurship. Economic recovery with poor sensitivity (i.e. consumerist world) would require training programs in consumer-oriented areas. The detailed analysis is presented below.

### 5.3 Segment Wise Scenario Evaluation

The vocational education sector has been classified into the following segments: (i) Craftsmen training; (ii) Soft skills and language training; (iii) Business skills; (iv) Skill park and entrepreneurship centre.

#### **Craftsmen training**

***Craftsmen training*** refers to imparting skills in various vocational trades to meet the skilled manpower requirements for technology and industrial growth in different trades. These include skills like electrical (e.g. refrigeration and air conditioning), computers (hardware, software, networking), apparel (embroidery, sewing), automotive (service technician), construction (painter, mason, electrician), logistics (warehouse packing, consignment tracking and delivery) etc. The objective of these training courses is to enhance employability of the educated youth by giving them technical and trade skills and certification.

#### **Soft skills and language training**

***Soft skills and language training*** include English and foreign language skills that are in demand for the purpose of improving employability in India and abroad (such as to clear tests like IELTS required by some countries or languages like Japanese which are expected to be in demand). Also, soft skills such as business communication, interview preparation, accent training will help to bridge the gap between technical training and job readiness, particularly in services/ sales sectors.

#### **Business skills**

**Business skills** refers to a variety of management skills like office administration, financial management, project management, marketing, sales and customer service. These skills are not only industry agnostic but also important in any of the post-Covid scenarios. Demand would come from global as well as local industry, large as well as small businesses including entrepreneurs.

#### **Skill park and Entrepreneurship centre**

**Skill park** is a hub-and-spoke model training as the hub and local industries as spokes. This can enable continuous feedback from local businesses on their changing needs, keep the curriculum updated and industry-oriented with live projects, guest trainers, as well as on-the-job experience by providing internship opportunities leading to final placements. The skill park can offer customized upskilling and reskilling to returning migrants as well as aspiring migrants. **Industry tie-up** with a well-known business group will bring benefits of industry

collaboration such as branding, credibility, quality and sustainability of the training programmes. **Entrepreneurship centre** can provide support to start ups in terms of office infrastructure, technology/ prototype development facilities, business consulting, fund raising, marketing services etc. Talented youth who wish to be self-reliant and have sustainable business ideas can be invited to join the centre.

We present in table5.1 the detailed analysis for these segments in the four post-Covid scenarios. For each scenario we present the challenges and opportunities as well as early warning indicators (EWI) that can signal the emergence of a particular scenario.



**Table 5.1: Segment-Wise Scenario Analysis for Vocational Training Sector**

	<b>PROGRESSIVE</b>	<b>SELF RELIANT</b>	<b>PROTECTIVE</b>	<b>CONSUMERIST</b>
<b>Craftsmen training</b>	Higher migration will generate demand for skills in the new economy. Urbanization and higher government spending will drive skill needs for the construction and infrastructure sectors. Technology innovation will create opportunities in data analytics and IT skills. High use of technology for delivery of training.	Greater focus on health and hygiene will drive demand for skill development related to health and wellness sectors. Returning migrants may look for skilling for career change. Lower economic growth and fewer opportunities may incentivize training.	Returning skilled migrants will look for upskilling. Higher unemployment will drive training needs to cater to local industry needs. Skill development needed for constructing low cost or rural homes.	Higher training needs in retail and hospitality sectors. Automotive, electrical/ electronics, fashion and wellness sectors will need trained personnel. New areas like fashion designing may be explored.

<b>Soft skills and language training</b>	Higher demand for English language skills will drive demand for internationally accredited language training, including opportunities for Japanese and German (due to demographic changes in those countries).	Self-reliant world may see muted demand for English language skills. Demand may shift to digital skills in vernacular.	High unemployment will create demand for language skills and also communication/ soft skills for job readiness.	High demand for English and other foreign language skills. Demand for more generic communication skills to go with language competency.
<b>BUSINESS SKILLS</b>	Economic and technological progress will require managerial skills like office administration, accounting.	Small and medium businesses will need skilled managers. Entrepreneurial farmers may look for cash management or marketing knowledge. Training to run home-stays or sustainable tourism.	Returning migrants may look for entrepreneurial training or upskilling or skills for a new career.	Need to train local youth to take up office jobs abroad.
<b>SKILL PARK &amp; ENTREPRENEURSHIP CENTRE</b>	High economic growth, dynamic business environment and tech progress will require continuous updating of the training courses to keep up with the changing needs of	Offer customized training for needs of local industry. Talented youth as well as returning migrants will benefit from	Offer internships at local industry for developing job readiness among unemployed youth.	Create synergies across sectors and skills that will appeal to a fast moving and

	industry. Entrepreneurship centre can help entrepreneurial youth to take their tech based innovations to market in a dynamic business environment	entrepreneurship centre's hand-holding to become self-reliant wealth generators and employers	Fewer employment opportunities will drive talented youth and returning migrants towards setting up own ventures	aspirational growth trajectory. Ventures can be incubated in consumerist areas like retail, hospitality, automotive, electrical/ electronics, fashion and wellness sectors
<b>EWI for the scenario</b>	Recovery of local and global economies; resumption of international travel; government increases support for skill development	De-globalization, resumption of domestic economic activities, government focus on skill development for self-reliance	De-globalization, resumption of domestic economic activities, government focus on skill development for self-reliance	Recovery of local and global economies; revival of consumerist sectors; government increases support for skill development

#### 5.4 Forward looking thoughts on the vocational training sector

The emergence of the four scenarios that are described above can be tracked through early indicators including macro and micro trends. For example, recovery of general economic activities and GDP along with a behavioural shift towards sustainability and political maturity would signal the advent of the progressive scenario. All the business proposals provided above will benefit from such a scenario. However, a behavioural change alone along with continuing economic slowdown will indicate a self-reliant world where training needs would arise in certain sectors like health and wellness. Customized programs and entrepreneurial skills support would be the need of the hour. Slowdown in GDP along with low level of sensitivity about health, society, values etc. will imply a conservative world where unemployment will drive demand for upskilling and entrepreneurship. Finally, a recovery in economic activities but with low level of sensitivity would be an advance signal of a consumerist world where customized training programs in specific consumer-oriented areas would hold promise. Other than the scenario specific recommendations and the four new initiatives suggested above, some general observations are in order:

- Expansion of activities under each of the programs is quite possible, however government sponsored training programs such as the DDUGKY (Deen Dayal Upadhyaya Grameen Kaushalya Yojana) depends on the fiscal constraints and priorities of the government. Therefore, it is good to maintain a diverse training portfolio without becoming too dependent on government funded programs.
- Recruitment of high quality faculty, continuous faculty development and regular updation of curriculum and program portfolio are desirable activities in any future scenario.
- Continuous engagement with industry and integration of training with technology are also important activities in any scenario.
- The programs and opportunities created and run by the training academy need to be promoted through various channels including social media, outreach programs at educational institutes, open day visits, webinars etc.

#### References

- a. Websites of skill training providers such as ULCCS education, ASAP Kerala etc.
- b. Collated information from government documents (especially NSDC India and Federal Ministry of Education and Research (BMBF) of Germany)
- c. Interviews with subject matter experts

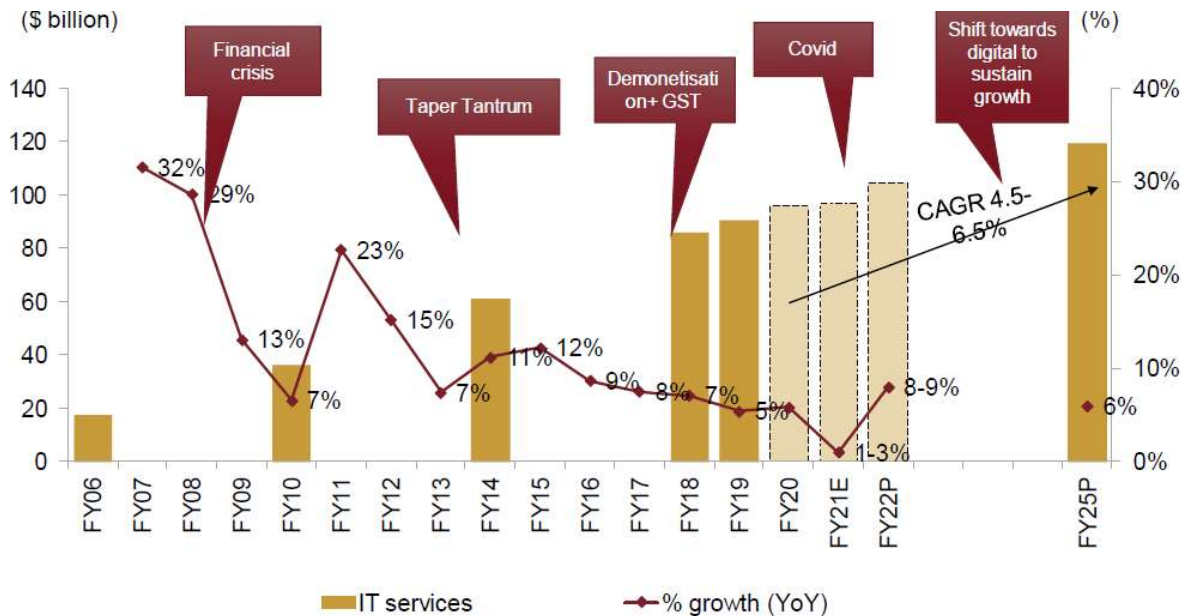
## 6 CHAPTER 6: ANALYSIS OF THE IT AND ITES SECTOR

### 6.1 IT Services Industry

Indian IT Services industry is one of the largest contributors towards the GDP. It is USD 177 bn in size with IT services accounting to nearly USD 100 bn. The structure of the industry is as follows:

Industry	Exports (in USD billion)	Domestic (in USD billion)	Total	Percentage
IT Services	74.0	17.0	91.0	51.4%
IT Enabled Services	31.0	4.0	35.0	19.7%
Software Products (ERD)	31.0	5.0	36.0	20.0%
Hardware	0.4	15.0	15.4	8.5%
Total	136.4	41.0	177.0	

According to CRISIL Research, the growth of the industry is going to significantly decline in the near term (CRISIL, 2020). However, the industry is likely to witness growth again while the demand for services would be quite different from earlier IT services provided by the Indian IT industry. It would include digital, cloud, AI, Blockchain and automation technologies.



Due to the reduction in client spends across geographies and industries, most clients are seeking fixed price contracts with an increased focus towards automation. Rupee is depreciating and with uncertainty around the H1B Visas, there would be a likely increase in offshoring in comparison to onsite projects. Accordingly, the profitability of Indian players to increase. The Tier I players have a significantly higher margin in comparison to mid-tier players.

EBIDTA Margin (%)	FY 17	FY 18	FY 19	FY 20	FY 21 E	FY 22P
Combined Margins	22.4%	22.2%	22.5%	21.4%	22.5%-23.5%	22.5%-23.5%
Tier-I	23.8%	23.3%	23.6%	22.4%	23.5%-24.5%	23.5%-24.5%
Mid-Tier	14.9%	16.5%	16.9%	14.48%	14.5%-15.5%	15.5-16.5%

However, the profitability of tier I players is higher owing to the actions taken by them to improve the profitability. These include:

- Hike and promotions on hold
- Reskilling of existing talent to avoid hiring
- Reduction in SG&A, Travel and Visa Expense
- Benefit of automation

Given the uncertainties and trends in the overall landscape, we propose that there are four different scenarios viz., Self-Sufficient, Progressive, Consumerist and Protectionist. These are described in Annexure 1. In the chapter, we propose how successful IT firms would navigate the challenges in these four scenarios.

## 6.2 Post COVID Scenarios for IT services industry

### **Scenario # 1 Self-Sufficient**

- Reverse urbanization is greater
- Fast food and fast culture slows
- Economy fuelled by intermediate engineering manufacturing
- Technology responses would be adaptive to local conditions- hyper local innovations

#### **Business Model of successful IT Service Firms:**

- ❖ Markets/ Consumers: Domestic demand and greater demand for local innovation. Reduction in demand for IT services from abroad.
- ❖ Revenues: The revenues of Indian IT firms is going to get impacted. Customers pay for innovation and quality domestically. Pressure on pricing of low end IT services further increases. Technology firms providing better technology and local automation thrive.
- ❖ Costs: Adoption of local innovation is greater. Recruitment of manpower for routine jobs lower. Increase in recruitment of specialists Layoffs of low end manpower. Focused recruitment
- ❖ Profitability: Profits would decrease but would be more than domestic level project profits as of now.

#### **Early Warning Indicators:**

- Trade embargo – including lower H1B visas and other restrictions of citizenship in US (primarily before / after US elections).
- Middle East countries clamp on citizens from other countries.
- Oil Prices remain steady at current levels.
- Domestic demand picks up contributing towards self-sufficiency
- Government spending increases on digital

### **Scenario # 2 Progressive**

- No restriction in Movement of people + H1B Visas and other visas are fine
- Women work force participation increases
- Products demanded from IT industry is more towards sustainable IT.
- Automation of IT, AI based systems, Block Chain, Security would fasten at a rapid pace
- Technology adoption will be at a rapid pace

#### **Business Model of successful IT Service Firms:**

- ❖ Markets/ Consumers: Array of Products with more towards adopting greater technology based products. Basic IT services would be automated. Products and Innovation/thought leadership is the key. Integration of services supplements the innovative products
- ❖ Revenues: The revenues of Indian IT firms are going to get impacted. Customers pay for quality of IT services. Technology adoption would be greater among the B2B customers of IT industry. Customers willingness to pay for better technology and experimentation is higher. Pressure on pricing of low end IT services further increases. Technology firms providing better technology, automation, data privacy and security thrive.
- ❖ Costs: Adoption of Automation is greater. Lowering of recruitment. Layoffs of low end manpower.
- ❖ Profitability: Profits would increase for service providers diversifying their service offerings. Short term pressure on balance sheet

#### **Early Warning Indicators:**

- Pricing Pressure on low end IT services from Customers continue.
- Discretionary spending won't increase of the customers even in the long run.
- Transformation deals pipeline would increase. Onsite offshore mix would change to more onsite given the technology adoption.

### **Scenario # 3 Protective**

- Unemployment rises with return of skilled migrants
- Psychological problems rise in society to unmanageable levels
- World would move towards limited outside consumption
- Economic de-growth especially trade de-growth
- Technology adoption would be Slower

#### **Business Model of Successful Firms:**

- ❖ Markets/ Consumers: Limited Domestic IT services market with limited outside market
- ❖ Revenues: The revenues of Indian IT firms are going to get impacted significantly. Need to look for new markets. Focus on platform development

- ❖ Costs: Cost structure to improve due to greater offshore mix (in whatever IT services are provided). Onsite Ratios reduce significantly. No new recruitment or continuous change of Employee mix to lower wage levels to reduce costs
- ❖ Profitability: Revenues and Profits would reduce for larger IT service firms. Smaller and Mid-sized IT firms would shut shops

**Early Warning Indicators:**

- Pricing Pressure on low end IT services due to trade Policies especially after US elections.
- H1B and other visas. Policies of Movement of people across Middle-East/Gulf regions lowers
- Increase in government investment to boost domestic demand

**Scenario # 4 Consumerist**

- Excessive migration both locally and globally. No restrictions on people mobility. It is going to continue to rise after US elections
- Global trade continues to rise
- Cartelization and Industry concentration moves up
- Technology adoption is slower due to slow adoption at industries

**Business Model of Successful Firms (primarily Status Quo):**

- ❖ Markets/ Consumers: Greater IT services being provided by the current set of providers.
- ❖ Revenues: The revenues of Indian IT firms are going to get impacted. Customers pay for efficient provision of IT services. Pressure on pricing of low end IT services further increases.
- ❖ Costs: Adoption of Automation is lesser. Significant pressures on costs. Low end recruitment continues to grow at current rates. Indian manpower benefits significantly. Onsite Ratios reduce significantly. Slow but steady response to employee competencies
- ❖ Profitability: Profits would increase for service providers especially larger IT service firms. The larger IT services would become even larger. High Pressure on Mid and Small end Firms.

**Early Warning Indicators:**

- Pricing Pressure on low end IT services from Customers continue.
- Discretionary spending would come back to normal in the long run.
- Onsite offshore mix would lean toward greater offshore business

**References:**

- d. Websites of CRISIL Research and NASSCOM
- e. Interviews with subject matter experts



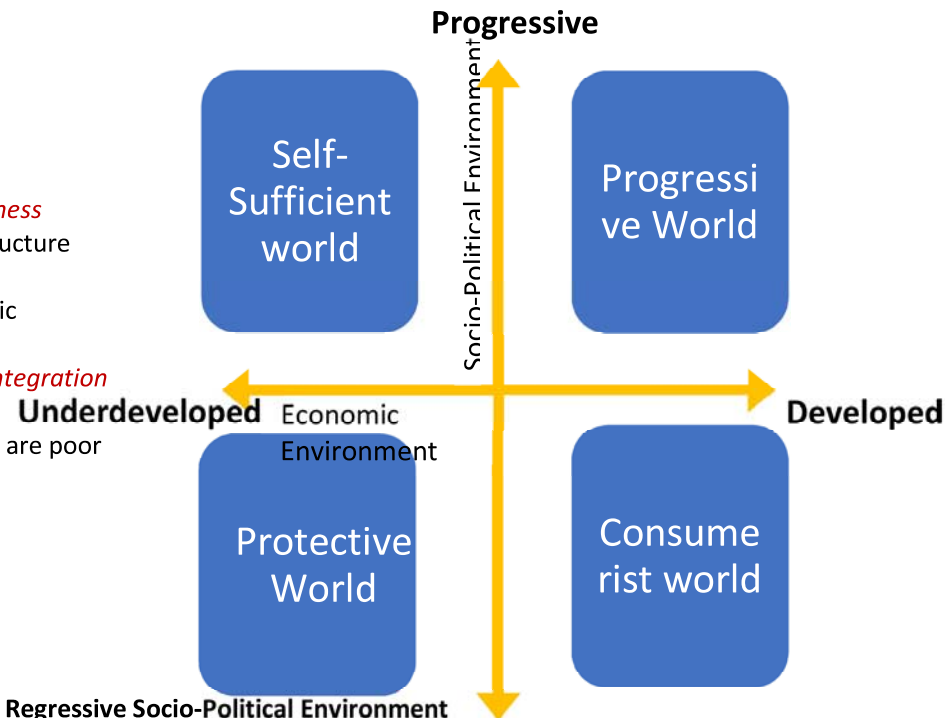
## 7 ANNEXURE: CHAPTER I

### Progressive Socio-Political Environment

*Technology innovation* is high  
 More sensitive to *sustainability* and willing to pay for it.  
 High *awareness* about health, hygiene  
 More sensitive to things that affect *quality of life*  
 High *political stability* and upholding of *democratic values*  
 Government driven by greater *social welfare* and lesser *political opportunism*

### Low Economic Environment

Lower/slower *economic growth*  
 No significant *economic reforms*  
 Non-conducive *environment for business*  
 Lack of *private capital* for big infrastructure projects  
 Lower *Government spending* on public infrastructure  
 Focus on self-sufficiency and lesser *integration with the world economy*  
*Availability of advanced technologies* are poor  
 Reverse *urbanization*  
*Technology adoption* is lower



### Regressive Socio-Political Environment

*Technology innovation* is poor  
 Less sensitive to *sustainability* and unwilling to pay for it.  
 Lesser sensitive and *awareness* about health, hygiene, and safety  
 Less sensitive to things that affect *experiential aspects of life*  
 High *political instability* and violation of *democratic values*  
 Government overlooks *social welfare* issues and higher *political opportunism*  
 More *social tensions* and lower *communal harmony*  
 More centralization of *governance and administration*

### High Economic Environment

High *economic growth*  
 More *economic reforms*  
 Conducive *environment for business*  
 Higher *Government spending* on public infrastructure  
 Availability of *private capital* for big infrastructure projects  
 More *integration with the world economy*  
*Availability of advanced technologies* are high  
 Increased *urbanization*  
*Technology adoption* is higher

## 8 ANNEXURES: CHAPTER II

**TABLE A1: PROJECT EXPECTATIONS IN DIFFERENT WORLDS**

<b>Dimensions</b>	<b>Self-Sufficient World</b>	<b>Progressive World</b>	<b>Consumerist World</b>	<b>Protective World</b>
Cost	Affordable innovation.	Is not a constraint for innovation, quality and value derived.	Is not a constraint for well-established systems.	Cost dominates everything else.
Quality of Materials	Affordable quality.	Highly emphasised.	Highly emphasised.	Cost dominates everything else.
Substitute Materials	Emphasised if they are affordable.	Highly emphasised if they increased sustainability, quality and value to users.	Emphasised only if they are extensively used everywhere and has value for users.	Not in consideration.
Level of Integration	Mix of integrated and module-level projects depending on costs.	Emphasis on Integrated end-to-end solutions.	Always an emphasis on Integrated end-to-end solutions for well established technologies.	Most projects are taken-up on a piece-meal basis and very rarely intergration to provide end-to-end solutions are emphasised.
Quality of Workmanship	Highly Emphasised to the extent they are affordable. They require considerable efforts permitting a handful of organizations capable of doing so.	Highly Emphasised. They need to be acquired and developed due the innovative nature of the requirements and specifications.	Highly Emphasised. They are easy to achieve due to the use of proven technologies and availability of skills.	Emphasised but may be traded-off with other factors and the verification methods.
Level of Customization	Somewhat.	Very high.	Low.	Nil.
Time of Completion	Prioritised.	Must be completed on time.	Must be completed on time.	Frequent delays are observed.
Luxury	Not much emphasised.	Emphasised.	Focussed.	Not a requirement.

Post-completion Operations Cost	Will emphasise more on reducing facilities management costs and automation would be limited by affordability.	Will emphasise more on automation and hassle-free facilities management and operation.	Will emphasise more on automation and hassle-free facilities management and operation.	Operations would be more characterized by manual operations with very minimum use of automation.
Upkeep and Maintenance	Will emphasise lower maintenance overall costs or maintenance-free systems.	Will emphasise on Robustness of the systems making them faultproof. Automatic and autonomous systems would be encouraged.	Will emphasise on Robustness of the systems making them faultproof. Automatic and autonomous systems would be encouraged.	Maintenance is not a significant criteria for project award.
Sustainability	Sustainability would be emphasised as long as it doesn't adversely affect the economics. There would be more legal guarantee for social sustainability.	Both environmental and social sustainability would be a requirement over and above the legal requirements.	Both environmental and social sustainability would be benchmarked with others and would be legalized.	There would be frequent violations of global norms of sustainability.

**TABLE A2: PROJECT MANAGEMENT PRACTICES UNDER DIFFERENT WORLDS**

<b>Project Stage</b>	<b>Functional Areas</b>	<b>Self-Sufficient World</b>	<b>Progressive World</b>	<b>Consumerist World</b>	<b>Protective World</b>
Design & Planning	Research and Expertise	Mostly in-house design capabilities.	Blending in-house design capabilities and also outsourcing consultants and designers.	There would be more emphasis on outsourcing design capabilities.	Design capability requirements would be to the extent of a formal requirement.
	Data Management & Research.	Some use of data based research and management.	Geo technical data and analysis.	Focus would be more on outsourcing research.	Absence of data based research and management.

			Data from structural analysis data. Data management of data from various research experiments. Business analysis and market data. Contract evaluation and analysis.		
	Nature of Contract	There would moderate level of creativity in the contract design.	Contracts would be more creative.	Contracts would be more diverse but be limited to those that are used extensively.	Contracts would be more traditional and EPC based.
	Project Financing	Government spending would see some innovation infincing options used.	Private capital would be extensively used and there would be more creativity in the choice of financing options.	Private capital would be extensively used and there would be a wide portfolio of well established financing options.	Mostly would come from government spending and the sponsors.
<b>Project Execution, Monitoring &amp; Control</b>	Auotomation & Mechanization	Use of construction equipments would be extensively used for achieving efficiency and replacing manual labor.	Use of customizable robots and automatic construction equipments would be extensively used.	Use of starndard robots and automatic construction equipments would be extensively used.	Minimal usage of machines and would depnd more on manual labor.
	Real-time Project Tracking & Monitoring	No usage for high capital investments.	Extensively Used.	Extensively Used.	Project monitoring is more traditional and role of supervisors are very high.

	Project Monitoring Information System	The emphasis would be on cost-effective in-house development than using licensed software.	Extensively Used.	Extensively Used.	Project monitoring is more traditional and role of supervisors are very high.
	Modular Approach to Construction	Moderate use of ready-mix concretes, pre-casts and pre-fabs.	Extensive use of ready-mix concretes, pre-casts and pre-fabs.	Extensive use of ready-mix concretes, pre-casts and pre-fabs.	Minimal use of ready-mix concretes, pre-casts and pre-fabs.
	Working Conditions & Safety environment	Customers expect working conditions and safety requirement to either meet or exceed legal requirements.	Customers expect working conditions and safety requirement to exceed legal requirements.	Customers expect working conditions and safety requirement to meet legal requirements.	Poor working conditions and frequent violation of safety requirements.
<b>Operations and Maintenance</b>	Use of Automatic Systems	Mixed use of automation for operations.	Extensive use of automation for operations.	Extensive use of automation for operations.	Rare use of automation and operations are mostly manual.
	Self-Correcting Autonomous System	Only if they are affordable.	Highly emphasised.	Only if technologies are matured.	Rare usage.
	Use of IT	Cost-effective investment on IT infrastructure for user interaction and fee collection, repairs and maintenance, and basic operations.	Extensive use of IT for user interaction and fee collection, repairs and maintenance, documentation, and basic operations.	Extensive use of IT for user interaction and fee collection, repairs and maintenance, documentation, and basic operations.	Very minimal use of IT.
	Extent of Training	Training would focus on both manual handling as well as upkeep and management of automatic	As systems would be more automatic, training would focus on the upkeep and management of the systems	As systems would be more automatic, training would focus on the upkeep and management of the systems	Training would focus on both manual handling and such

		systems. Outsourcing of such services would be mised.	with an emphasis on outsourcing such services by the owner.	with an emphasis on outsourcing such services by the owner.	services would be developed in-house.
	Real-time motitoring				

**TABLE A3: PROJECT MANAGEMENT COMPETENCIES UNDER DIFFERENT WORLDS**

<b>Nature of Skill</b>	<b>Skill</b>	<b>Self-Sufficient World</b>	<b>Progressive World</b>	<b>Consumerist World</b>	<b>Protective World</b>
<b>Management Skill</b>	<b>Stakeholder Management</b>	People's participation is important and stakeholder management would be an important skill.	People's participation is important and stakeholder management would be an important skill.	Important stakeholders are government and other sponsors. Hence, economics drives the stakeholders.	Stakeholders have rigid positions and vested interests may delay or may make the projects a non-starter.
	<b>Project Time &amp; Cost Management</b>	Controlling cost may be one of the most important priority but frequent shortages of funds affecting cash flow may affect on-time completion.	In the cost and time trade-off time is given a priority over cost.	In the cost and time trade-off time is given a priority over cost.	Cost and time overrun are more common.
	<b>Negotiation Skill</b>	Negotiation with suppliers, sub-contracts and client focuses on value for money.	Negotiation with suppliers, sub-contracts and client focuses on value, terms of contract, and project financing related.	Negotiation with suppliers, sub-contracts and client focuses on value, terms of contract, and project financing related.	Negotiation focuses on cost.
	<b>Contract Management and Administration</b>	Contract innovation is more focused on the terms of the contract rather than changing the basic structure of the contract.	Innovation contract formats are used. Incentive contracts are extensively used.	Wide range of contract formats are used. Incentive contracts are used.	More of EPC type of contracts are used.
	<b>Material Control &amp; Reconciliation</b>	Remain Important and focus would be on achieving efficiency.	Remain Important and would use automation.	Remain Important and would use automation.	Remain Important and challenging.

	<b>Project Leadership Skill</b>	Project Managers have to use their skills to liason with various stakeholders, networking for resource availability and lead his team are more empowered to take the project to successful completion.	Project Managers have to use their skills to liason with various stakeholders, networking for resource availability and lead his team are more empowered to take the project to successful completion.	Project Managers are more empowered to take the project to successful completion.	Project Managers face an adverse environment and taking project to completion is a challenge.
	<b>Team Skill</b>	Extremely important.	Extremely important.	Important but minor aberations would be taken care of by management control and exercise of authority.	Will always remain a challenge.
	<b>Project Costing and Accounting</b>	Remain Important and focus on would be on achieving efficiency.	Remain Important and would use automation.	Remain Important and would use automation.	Remain Important and challenging.
	<b>Project Financing</b>	Innovation will be observed.	Innovation will be observed.	Wide range of proved financing mechanism would be observed.	Would mostly use traditional method of financing.
	<b>Supplier and Sub-contractor Relationship</b>	Importantance of suppliers would be realized and partnerships would emerge.	Importantance of suppliers would be realized and partnerships would emerge.	Importantance of suppliers would be realized and partnerships would be guided by power.	Would remain traditional and transactional.
<b>Engineering &amp; Functional Skill</b>	<b>Engineering Drawing</b>	Engineering drawing capability is extremely important for achieving project objectives.	Engineering drawing capability is extremely important for achieving project objectives.	Drawings are mainly standards and are benchmarked to the best in the world.	Drawing drawings are pretty standard and is a formal requirement.



	<b>Architectural &amp; Structural Design</b>	Moderately important.	Extremely important.	Highly important.	Not emphasised much.
	<b>Operation of Equipments</b>	There would be more manual operations and hence, easy-to-use and cheaper forms of operations would be a requirement. Hence, skill would focus more on a mis knowledge of machines and supervisory skills.	Use of automation would require operations to be fault free. Hence, knowledge and problem-solving capabilities on machines, automation, IoT based control systems would be emphasised.	Use of automation would require operations to be fault free. Hence, knowledge on machines, automation, IoT based control systems would be emphasised.	There would be more manual operations and would be characterised by frequent disruptions. Hence, skills would be very basic technical and supervisory skills.
	<b>Repairs &amp; Maintenance</b>	Emphasis would be on cheaper maintenance free systems. Hence, skill would focus more on a mis knowledge of machines and supervisory skills.	Use of IoT based mechanisms would be used for making maintenance activities rodust. Hence, knowledge and problem-solving capabilities on machines, automation, IoT based control systems would be emphasised.	Use of IoT based mechanisms would be used for making maintenance activities rodust. Hence, knowledge on machines, automation, IoT based control systems would be emphasised.	There would be more manual operations and would be characterised by frequent maintenance issues. Hence, skills would be very basic technical and supervisory skills.

**TABLE A4: Emerging Technologies in Highway Construction**

Alternative Materials	Equipments Used	Design/Construction Methodology	Post-Construction Operations and Facilities Management
<ul style="list-style-type: none"> <li>• Recycled Aggregates</li> <li>• Cold-Mix Bituminous Emulsion</li> <li>• Recycled Asphalt &amp; Stone Chips</li> <li>• Composting Tank Bottom Sludge</li> <li>• Sewerage Sludge</li> <li>• Mine Overburdens</li> <li>• Self-healing Asphalt</li> <li>• Plastic Waste</li> <li>• Crumb Rubber (Scrap Tyres)</li> </ul>	<ul style="list-style-type: none"> <li>• Milling Equipments</li> <li>• Intelligent Compaction Measurement System</li> <li>• Tunnel Boring Machines</li> </ul>	<ul style="list-style-type: none"> <li>• Perpetual Pavement</li> <li>• New Australian Tunneling Method</li> <li>• Pre-cast Concrete Pavement</li> <li>• Project Monitoring Information System</li> <li>• GIS-based Real-time Project Tracking and Monitoring</li> <li>• </li> </ul>	<ul style="list-style-type: none"> <li>• Real-time vehicle tracking</li> <li>• Automated Fare Collection System</li> <li>• Passenger Information System</li> <li>• Transport Planning &amp; Scheduling System</li> <li>• Transport Depot Management System</li> <li>• Emergency Call and Response Services</li> <li>• Traffic Enforcement &amp; Highway Police</li> <li>• Real-time traffic monitoring</li> <li>• Command &amp; Control Center</li> <li>• Quickchange Movable Brriers</li> <li>• Vissible Message Signs</li> </ul>

**TABLE B1: PROJECT EXPECTATIONS IN DIFFERENT WORLDS**

<b>Dimensions</b>	<b>Self-Sufficient World</b>	<b>Progressive World</b>	<b>Consumerist World</b>	<b>Protective World</b>
Cost	Affordable innovation.	Is not a constraint for innovation, quality and value derived.	Is not a constraint for well-established systems.	Cost dominates everything else.
Floor Area	Small to moderate. Would be more guided by utility.	Moderate to large. The floor area would be more guided by a combination of utility and aesthetics.	Moderate to large and would be determined more by imitation and luxury.	People would prefer more independent houses. However, the affordability would be lower.
Community Space	As long as it is cost efficient. So there would be cost-focussed innovation.	Significant emphasis on community space. More emphasis on sports and recreational facilities, children activities, social gatherings and meeting places, community spaces like, library, activity rooms, seating areas etc.	Significant emphasis on community space following the trends in other developed worlds. There would also be more emphasis on luxury, spending on interiors, party halls, dining and restaurants etc.	It would not be much emphasised.
Luxury, ambience and aesthetics	Not essential.	A balance between utility, quality and aesthetics. Would emphasise more open and private spaces.	While utility is more of a standard requirement but luxury would be more emphasised specially on interiors and entertainment facilities.	Minimum
Design	There would be changes in designs to innovatively include convenience and comfort limited by affordability.	Highly innovative designs with new look and luxury, convenience and comfort. Designs would be more focussed on providing a	Designs would imitate best in the world and innovation would be limited to customizing look and luxury,	Standard specifications without much changes.

		superior quality of life experience.	convenience and comfort to the local taste.	
Basic Services	Quality and affordability of the services would be emphasised.	Extensiveness, convenience and robustness of the services are important.	Extensiveness, convenience and robustness of the services are important.	Frequent disruptions to basic services are a norm.
Facilities Management	Facilities management would be more controlled and managed by residents.	Facilities management would be outsourced and corporatized. Use of professional services would be the norm.	Facilities management would be outsourced and corporatized. Use of professional services would be the norm.	Facilities management is very traditional and not well organized.
Quality of Materials	Affordable quality.	Highly emphasised.	Highly emphasised.	Cost dominates everything else.
Substitute Materials	Emphasised if they are affordable.	Highly emphasised if they increased sustainability, quality and value to users.	Emphasised only if they are extensively used everywhere and has value for users.	Not in consideration.
Level of Integration	Mix of integrated and module-level projects depending on costs.	Emphasis on Integrated end-to-end solutions.	Always an emphasis on Integrated end-to-end solutions for well-established technologies.	Most projects are taken-up on a piece-meal basis and very rarely integration to provide end-to-end solutions are emphasised.
Quality of Workmanship	Highly Emphasised to the extent they are affordable. They require considerable efforts permitting a handful of organizations capable of doing so.	Highly Emphasised. They need to be acquired and developed due the innovative nature of the requirements and specifications.	Highly Emphasised. They are easy to achieve due to the use of proven technologies and availability of skills.	Emphasised but may be traded-off with other factors and the verification methods.
Level of Customization	Somewhat.	Very high.	Low.	Nil.

Time of Completion	Prioritised.	Must be completed on time.	Must be completed on time.	Frequent delays are observed.
Luxury	Not much emphasised.	Emphasised.	Focussed.	Not a requirement.
Post-completion Operations Cost	Will emphasise more on reducing facilities management costs and automation would be limited by affordability.	Will emphasise more on automation and hassle-free facilities management and operation.	Will emphasise more on automation and hassle-free facilities management and operation.	Operations would be more characterized by manual operations with very minimum use of automation.
Upkeep and Maintenance	Will emphasise lower maintenance overall costs or maintenance-free systems.	Will emphasise on Robustness of the systems making them fault proof. Automatic and autonomous systems would be encouraged.	Will emphasise on Robustness of the systems making them fault proof. Automatic and autonomous systems would be encouraged.	Maintenance is not a significant criterion for project award.
Sustainability	Sustainability would be emphasised as long as it doesn't adversely affect the economics. There would be more legal guarantee for social sustainability.	Both environmental and social sustainability would be a requirement over and above the legal requirements.	Both environmental and social sustainability would be benchmarked with others and would be legalized.	There would be frequent violations of global norms of sustainability.

**TABLE B2: Emerging Technologies in Real Estate Construction**

<b>Alternative Materials</b>	<b>Equipments Used</b>	<b>Design &amp; Construction Methodology</b>	<b>Post-Construction Operations and Facilities Management</b>
<ul style="list-style-type: none"><li>• Recycled Aggregates</li><li>• Natural Fibres</li><li>• Ferrocement (for internal walls)</li><li>• Mycelium (Self-healing Material)</li><li>• Ferroke</li><li>• Timberkate</li><li>• Fly Ash</li><li>• Natural material like, Bamboo, Straw Bale, Wood</li><li>• Rammed Earth</li></ul>	<ul style="list-style-type: none"><li>• Ready-mix concrete</li><li>• 3D Printing</li><li>• Cladding</li><li>•</li></ul>	<ul style="list-style-type: none"><li>• Pre-Fabricated structure</li><li>• Pre-cast concretes</li><li>• Time-phased modular construction</li><li>• Maintenance-free design</li><li>• Maintenance-proof design</li></ul>	<ul style="list-style-type: none"><li>• IoT based real-time fault diagnosis</li><li>• Automated and mechanized operations</li><li>•</li></ul>

Research Office  
Indian Institute of Management Kozhikode  
IIMK Campus P. O.,  
Kozhikode, Kerala, India,  
PIN - 673 570  
Phone: +91-495-2809238  
Email: [research@iimk.ac.in](mailto:research@iimk.ac.in)  
Web: <https://iimk.ac.in/faculty/publicationmenu.php>

