

SUMMER TRAINING REPORT

- Part A - Research Report on:
“Covid-19 In India: A Study on the 5 Highly Affected States.”
- Part B - Online Course Report on:
“Fundamentals Of Project Planning And Management.”

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I submit this report of mine with great humility and utmost regard.

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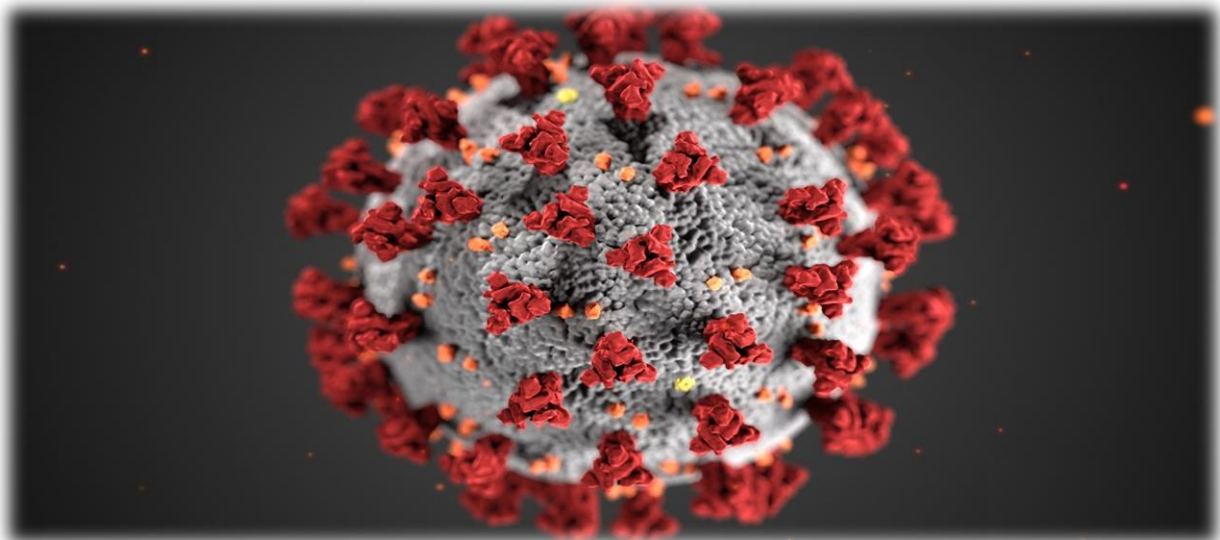
PART A – REPORT ON RESEARCH

COVID-19 IN INDIA: A STUDY ON THE 5 HIGHLY AFFECTED STATES

ABSTRACT:

The spread of COVID-19 has rapidly escalated out of control worldwide and must be tackled urgently. Though the matter is global, there are national specificities that need nuanced approaches. COVID-19 is spreading fast almost all over the world. The current study describes the outbreak of this disease in India and its 5 worst affected states (as on 30 May 2020), i.e., Maharashtra, Gujarat, Tamil Nadu, Delhi and Rajasthan. The study also discusses the regional analysis of 5 Indian states and presents the preparedness level of India in combating this outbreak. The study uses exploratory data analysis to report this situation. The data has been obtained from the Indian government live Covid-19 tracker and covers up the time period from 30th January 2020 when the first case occurred in India till 30th May 2020 (67th day of lockdown within the country). The data is obtained for the 5 parameters i.e Total testing, Confirmed cases, Active cases, Recovered cases and Deceased cases for the above mentioned 5 states. Comparison was done among the Confirmed cases per million population, active cases, recovery rate, mortality rate, average growth rate and tests per million population for these 5 states. The efficiency of the testing labs in these states was also considered. The treatment patterns and containment measures taken by the above-mentioned states were also studied.

INTRODUCTION:



Coronaviruses cause illness, which can vary from common cold and cough to sometimes more severe disease. Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV) were such severe cases which the world has already faced. SARS-CoV-2 (n-coronavirus) is the new virus of the coronavirus family, which was first discovered in 2019 that had not been identified in humans before. It is a contagious virus which started from Wuhan in December 2019 and later was declared as a 'pandemic' (on 11th March 2020) by World Health Organisation (WHO) due to its high rate spreads throughout the world. As of now, no vaccine or specific medicine against Covid-19 is available. Currently (on the date 30th May 2020), there are a total of 11M confirmed cases out of which 5.83M cases have recovered while 524K people have deceased across the globe. The Pandemic is spreading all over the world and therefore it becomes extremely

important to understand and prevent this spread. China's numbers had peaked in February; Iran and continental Europe were hit hard in March; US and UK numbers kept rising as we entered April. Covid-19 has begun to inflict itself on our large and susceptible population at a faster pace than before.

INDIAN SCENARIO:

In India the first case was reported on 30th Jan 2020 at Thrissur, (Kerala). Upto (30 May 2020)

Tests	Confirmed cases	Active Cases	Recovered Cases	Deceased
3737027 (2708 Per Million)	1,81,859 (1317.77 Per Million)	85,873 47.21%	86,934 47.80%	5,183 (Death rate: 2.85%)

In India to handle the present situation: Medical infrastructure and personnel at battlefront of fight against Covid 19 are as follows

- Hospital beds per 1000 population: 0.9
Source: International Bank for Reconstruction and Development (Beds/1000 Pop)
- Critical Care Hospital beds per 100000 population: 2.3
Source: International Bank for Reconstruction and Development (Beds/100000 Pop)
- Physicians per 1000 population: 0.8
Source: WB (Physicians/1000 pop)
- Nurses and midwives per 1000 population: 2.1
Source: WB (Nurses/1000 pop)

Lockdown in India:

To contain the spread of coronavirus outbreak in India, The Government of India imposed a nationwide lockdown on 24th March 2020 for 21 days from 25th March to 14th April 2020 which later got extended as per the requirements.

- Phase 1: 25th March 2020 – 14th April 2020 (21 days)
- Phase 2: 15th April 2020 – 3rd May 2020 (19 days)
- Phase 3: 4th May 2020 – 17th May 2020 (14 days)
- Phase 4: 18th May 2020 – 31st May 2020 (14 days)

The following were the main features of the Lockdown:

- Ban on people from stepping out of their homes
- Except pharmacies, hospitals, banks, grocery shops and other essential services all services and shops were closed
- Only work-from-home was allowed in commercial and private establishments.
- Suspension of all educational, training, research institutions
- Closure of all places of worship
- All non-essential public and private transports were suspended
- Prohibition of academic, sports, social, entertainment, political, religious & cultural activities.

In Phase 4 the Central Government gave certain relaxations to the people of the country and empowered the State government to take necessary steps for implementing the lockdown as required in the state.

A study by the University of Michigan, United States shows that even though the number of cases has been rising in India the lockdown has been very successful in containing the intensity of the spread. The intensity of the spread has been reduced to almost one third of what it was before the lockdown.

India went into a more relaxed Lockdown 4.0 on 18th May after 54 days of strict confinement. Many of the states have started resuming non-essential services gradually.

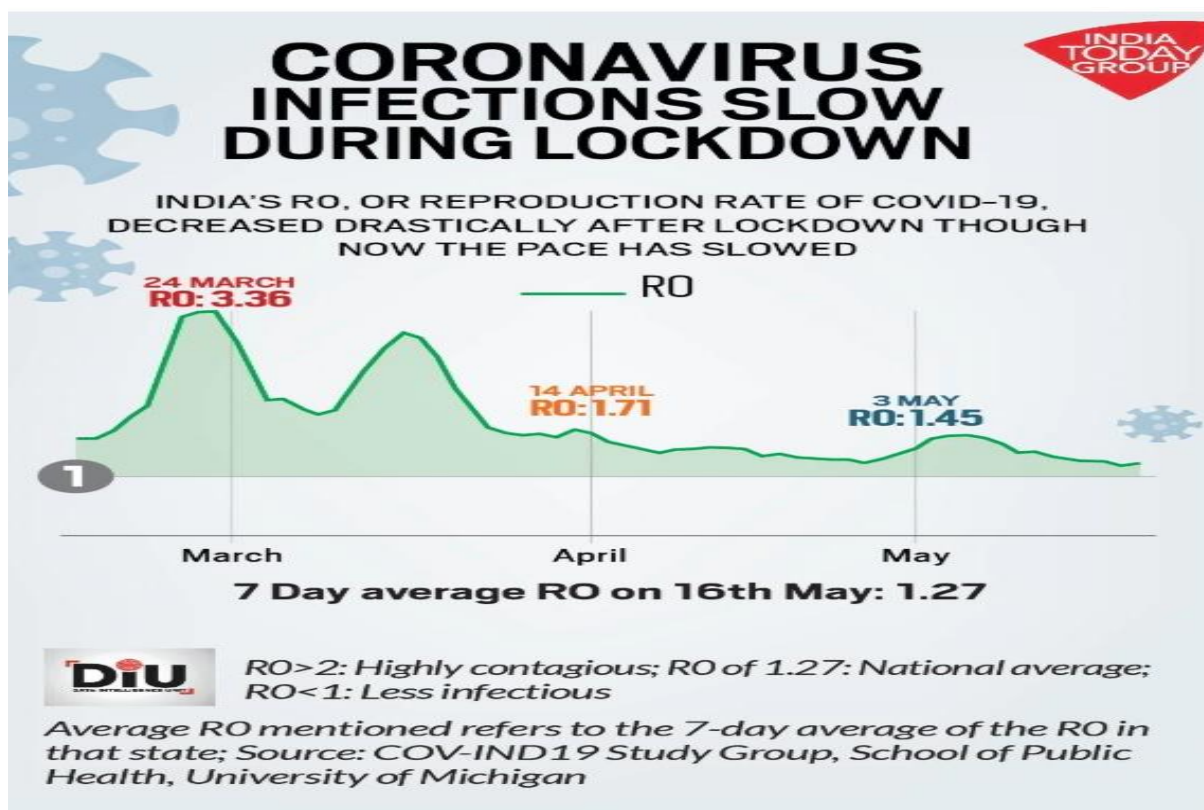
India recorded the highest single-day spike on May 30 recording more than 8364 new cases, taking the total count to 1,81,859, with almost 5,183 deaths and 86,934 recoveries. More than 3000 cases have been recorded everyday from 7th May 2020, for which the government decision to ease restrictions is being criticised.

However, an analysis of the Reproductive Rate (R_0) of the virus proves otherwise. The R_0 tells us how many persons can be infected by a carrier.

How has the lockdown helped India?

The figures of the reproduction rate 'R' of a virus (R_0) calculated by the COV-IND-19 Study Group, School of Public Health, University of Michigan were assessed by India Today Data Intelligence Unit (DIU). In the study it was found that on 24th March a day before India went under lockdown, R_0 was 3.36, which meant that one infected person was infecting more than three persons. By the end of Lockdown 1.0, i.e. on 14th April, it came down to 1.71. It reduced to 1.46 at the end of Lockdown 2.0 on 3rd May and then on 16th May it further dipped to 1.27. This means that the lockdown brought down the R_0 by almost three times. According to the Ministry of Statistics and programme implementation and Indian Statistical Institute have found that 20 lakh cases and 54,000 deaths have been avoided because of the lockdown in India. As the R_0 is above 1, which means the virus is still contagious. Bhramar Mukherjee a Professor of Epidemiology, School of Public Health in the University of Michigan, suggested that in India the "triple T" approach should be followed.

The '**triple-T**' approach of '**Test, Trace and Treat**' will have to be optimised with intelligent strategy of symptom tracking, random testing and targeted testing. Community engagement and protecting the most vulnerable from both economic and public health point of view will be the key.



(Source: <https://www.indiatoday.in/diu/story/lockdown-coronavirus-spread-study-india-1681034-2020-05-23>)

Personal Protective Equipment kits & N95 Respirators:

India has exponentially increased its production capacity of Personal Protective Equipment kits (PPE kits) and N95 respirators or masks with 3 lakh units each being manufactured every day and their quality is being ensured through stringent protocols.^[69] It is expected to be able to produce the required 2 crore PPE kits by the end of June 2020.^[68]

REVIEW OF LITERATURE:

Coronaviruses were brought to light in the 1930s when an acute respiratory infection of domesticated chickens was shown to be caused by infectious bronchitis virus (IBV)^[1]. Arthur Schalk and M.C. In 1931, a new respiratory infection of chickens in North Dakota was described by Hawn. The chicks' mortality rate was 40–90%^[2]. Fred Beaudette and Charles Hudson six years later successfully isolated and cultivated the IBV which caused the disease^[3]. In the 1940s, two more animal coronaviruses, mouse hepatitis virus (MHV) and transmissible gastroenteritis virus (TGEV), were isolated.^[4]

Human coronaviruses were discovered in the 1960s.^{[5][6]} In 1960, E.C. Kendall, Malcom Byone, and David Tyrrell isolated a novel common cold virus B814 from a boy working at the Common Cold Unit of the British Medical Research Council^{[7][8][9]}. By serially passing it through organ culture of human embryonic trachea, Tyrrell and Byone cultivated the novel virus in 1965.^[10] In the same year, at the University of Chicago, Dorothy Hamre^[11] and John Procknow isolated 229E - a novel cold virus from medical students. The novel virus 229E, like the virus strain B814, when inoculated into volunteers caused a cold and was inactivated by ether.^[12]

June Almeida - A Scottish virologist imaged the strains of both B814 and 229E by electron microscopy in 1967 at St. Thomas Hospital in London.^{[13][14]} He was able to show that both B814 and 229E were morphologically related by their distinctive club-like spikes. A research group at the National Institute of Health the same year isolated another member of this new group of viruses using organ culture and named the virus strain OC43 (OC = Organ Culture).^[15] Like B814, 229E, and IBV, the novel cold virus OC43 had distinctive club-like spikes when seen in electron microscope.^{[16][17]}

Other human coronaviruses have since been identified, including SARS-CoV in 2003, HCoV NL63 in 2004, HCoV HKU1 in 2005, MERS-CoV in 2012, and SARS-CoV-2 in 2019.^{[18][19]}

Genome : The genome size for coronaviruses ranges from 26.4 to 31.7 kilobases.^[20] The genome size is one of the largest among RNA viruses. The genome has a 5' methylated cap and a 3' polyadenylated tail.^[21]

Human Coronaviruses:

- *Alphacoronavirus*^[22]
Human coronavirus 229E, Human coronavirus NL63,
- *Betacoronavirus*^[23]
Human coronavirus OC43, Human coronavirus HKU1, Middle East respiratory syndrome-related coronavirus, Severe acute respiratory syndrome-related coronavirus (SARS-CoV, SARS-CoV-2)

Many human coronavirus have their origin in bats.^[24] Coronaviruses can cause pneumonia (either direct viral pneumonia or secondary bacterial pneumonia) and bronchitis (either direct viral bronchitis or secondary bacterial bronchitis).^[25] The human coronavirus discovered in 2003, SARS-CoV, which causes severe acute respiratory syndrome (SARS), has a unique pathogenesis because it causes both upper and lower respiratory tract infections.^[25]

Generally mild symptoms are produced by four human coronaviruses:

1. Human coronavirus OC43 (HCoV-OC43), β -CoV
2. Human coronavirus HKU1 (HCoV-HKU1), β -CoV
3. Human coronavirus 229E (HCoV-229E), α -CoV
4. Human coronavirus NL63 (HCoV-NL63), α -CoV

Three human coronavirus produce symptoms that are potentially severe:

1. Middle East Respiratory Syndrome related coronavirus (MERS-CoV), β -CoV
2. Severe Acute Respiratory Syndrome coronavirus (SARS-CoV), β -CoV
3. Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV), β -CoV

Outbreaks of Human coronavirus diseases:

- Severe Acute Respiratory Syndrome (SARS) in 2003
- Middle East Respiratory Syndrome (MERS) in 2012

Coronavirus	MERS-CoV	SARS-CoV
Disease	MERS	SARS
Confirmed Cases	2494	8096 ^[26]
Deaths	858	774 ^[26]
Case fatality rate	37%	9.2%

- Coronavirus disease 2019 (Covid-19): The pneumonia outbreak on 31st December 2019 in Wuhan, China was traced to a novel strain of coronavirus^{[27][28]} and was given the interim name 2019-nCoV by WHO and later renamed SARS-CoV-2 by the International Committee on Taxonomy of Viruses.^{[29][30][31]}

STUDY OBJECTIVES:

- To understand the prevalence of covid19 infection in 5 highly affected Indian states (Maharashtra, Tamil Nadu, Delhi, Gujarat and Rajasthan).
- To compare the Recovery & Death Rate in these states.
- To compare the confirmed cases per million population, number of active cases, average growth rate, tests performed per million population and efficiency of testing labs in these states.
- To suggest measures to prevent the pandemic.

METHODOLOGY:

In this study we have collected secondary data for 5 highly affected Indian states i.e., Maharashtra, Tamil Nadu, Delhi, Gujarat and Rajasthan. The information is collected for the total tested individuals, confirmed, recovered, active and deceased cases due to the COVID-19 outbreak (30th Jan. 2020) till 30th May 2020 from <https://www.covid19india.org/>

THE 5 HIGHLY AFFECTED STATES:

The table below shows the number of confirmed cases, active cases, recovered cases and deceased individuals.

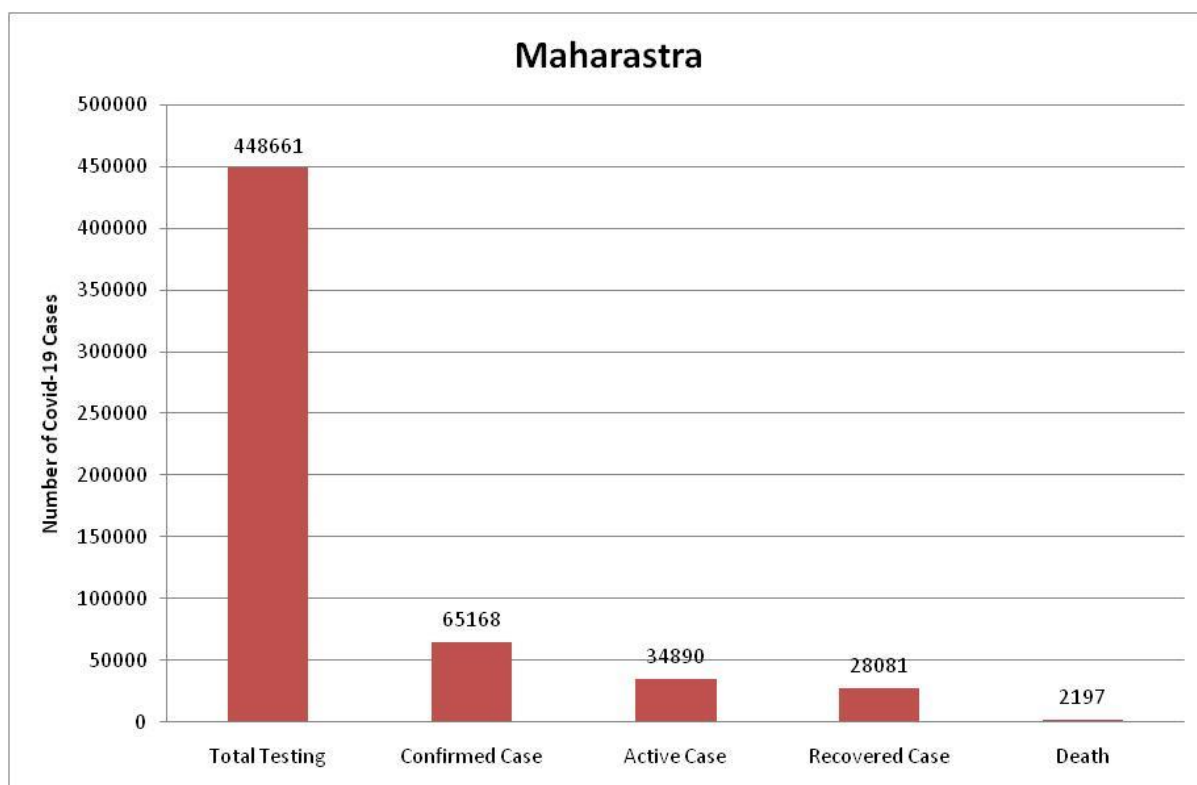
On 30th May 2020, the 5 highly affected states in India were:

State/UT	Total Tested	Confirmed	Active	Recovered	Deceased
Maharashtra	448661	65168	34890	28081	2197
Tamil Nadu	479155	21184	9021	12000	163
Delhi	206739	18549	10058	8075	416
Gujarat	205780	16356	6119	9230	1007
Rajasthan	395490	8617	2,685	5739	193

MAHARASHTRA STATE SCENARIO:

In Maharashtra, the first 2 confirmed cases Covid-19 came from Pune where a couple returning from Dubai tested positive on 9th March 2020. On the next day, three more people who had met the couple tested positive. All five of them were hospitalised. In Maharashtra, having a population of 12,21,53,000 (Based on 2019 population projection by NCP report) the total number of individuals tested for Covid-19 have been 4,48,661 and 65,168 were found positive.

In **Maharashtra**, the Government approved and supported Covid-19 Testing labs by ICMR have been setup in the following 12 organisations in 7 cities.



As on 30th May 2020, the Covid-19 related statistics of the state read as follows:

Total testing	Confirmed cases	Active cases	Recovered cases	Deceased cases
448661	65168	34890	28081	2197
Confirmed cases per Million	% Age of active cases	Recovery Rate	Mortality Rate	Tests Per Million
533.49	53.53%	43.09%	3.37%	3672.94

- 533 out of every 1 million people in Maharashtra have tested positive for the virus.
- For every 100 confirmed cases, 54 are currently infected.
- For every 100 confirmed cases, 43 have recovered from the virus infection.
- For every 100 confirmed cases, 3 have unfortunately passed away.
- For every 1 million people in Maharashtra, 3673 people were tested.

Average Growth Rate:

- From 3rd May to 9th May: 7.41% per day.
- From 10th May to 16th May: 6.15% per day.
- From 17th May to 23rd May: 6.33% per day.
- From 24th May to 30th May: 4.72% per day.

Containment measures:

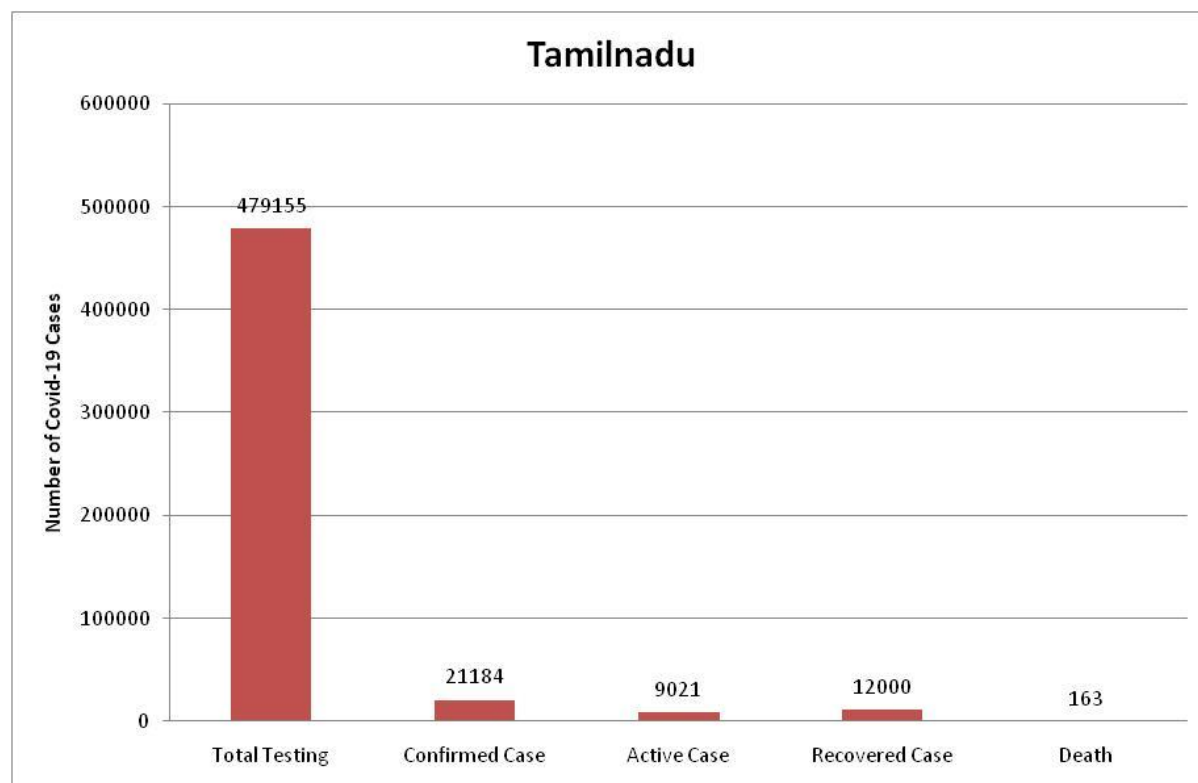
To prevent the spread of the infection many places in the state, where multiple confirmed cases were reported, were sealed off. These areas included Islampur in Sangli (on 28 March),^[32] Worli Kolivada in Mumbai (on 30 March),^[33] Peth area and parts of Kondhwa in Pune (on 6 April).^[34] By 9 April, BMC identified 381 containment zones within the city; several parts of the city including Dharavi were sealed off as the number of confirmed cases rose sharply in April.^[35]

The various districts in India were classified into different zones on the basis of the extent of the spread of virus by the Central Government of India. In Maharashtra 14 districts were identified as hotspots and labelled as red zones.^[36] The state government announced that it would relax the lockdown restrictions in districts with fewer than 15 confirmed cases.^[37]

TAMIL NADU STATE SCENARIO:

The first case of coronavirus in Tamil Nadu was confirmed on 7 March 2020 in a resident from Kanchipuram in Chennai who had returned from Oman. He was admitted to Rajiv Gandhi Government General Hospital and recovered on 10th March. Tamil Nadu, having a population of 7,56,95,000 (Based on 2019 population projection by NCP report) the total number of individuals tested for Covid-19 have been 479155 and 21184 were found positive.

In **Tamil Nadu**, the Government approved and supported Covid-19 Testing labs by ICMR have been setup in the following 22 organisations in 10 cities.



As on 30th May 2020, the Covid-19 related statistics of the state:

Total testing	Confirmed cases	Active cases	Recovered cases	Deceased cases
479155	21184	9021	12000	163
Confirmed cases Per Million	% of active cases	Recovery Rate	Mortality Rate	Tests Per Million
279.85	42.58%	56.64%	0.76%	6330

- 280 out of every 1 million people in Tamil Nadu have tested positive for the virus.
- For every 100 confirmed cases, 43 are still infected at present
- For every 100 confirmed cases, 57 have recovered from the virus infection.
- For every 100 confirmed cases, 1 has died unfortunately.
- For every 1 million people in Tamil Nadu, 6330 were tested.

Average Growth Rate:

- From 3rd May to 9th May: 13.18% per day.
- From 10th May to 16th May: 7.16% per day.
- From 17th May to 23rd May: 5.61% per day.
- From 24th May to 30th May: 4.54% per day.

Management of Covid-19 cases:

The state has 3,371 ventilators and 29,074 beds in isolation wards according to the Department of Health and Family Welfare as of April 2.^[39] It has ordered an additional 2,571 ventilators. The number of hospital beds available is 1.1 per 1000 population and 7.8 per 1000 for elderly population according to a Brookings report.^[40] As of 3 April, 21 government facilities, 25 private colleges and 110 private hospitals in the state are designated for treating COVID-19 illness.^{[41][42]}

The Chennai Trade Center in Nandambakkam was converted into a 550-bed COVID-19 quarantine ward on April 14.^[42] As many as 747 marriage halls and 50 schools were identified in Chennai to be converted as COVID-19 care centres.^[43] The Greater Chennai Corporation Commissioner said that the city plans to create 50,000 bed spaces to treat asymptomatic COVID-19 patients as there were more than 98% asymptomatic cases in Chennai. These milder cases will be sent to the care centres instead of a Government hospital with intensive care.^[45] As of 4 May 2020, there were 4,000 such beds in Chennai at care centres and the Communicable Diseases Hospital in Tondiarpet.^[44]

Containment measures:

Stickers announcing that "COVID-19/Do not Visit/Home under quarantine," were pasted on the doors of houses of foreign returnees to warn the public.^[46] Authorities had also marked their arms with home quarantine stamps.^[47] Government launched a mobile application to allow people under home quarantine to interact healthcare professionals for getting medical advice and counselling.^[48]

On 28 March, government announced plans for creating containment zones to stop the community spread. The 5km² containment zones were setup around the residences of infected individuals across 16 districts. It is ringed by an additional 3 km² buffer zone.^{[49][50][53]} Active surveillance inside these zones along with passive surveillance outside of it to trace the contacts of the infected has been initiated. People found infected are quarantined and the area where they lived is added into the containment plan.^{[49][51]} Houses inside the containment zones are surveyed and disinfected every day.^[55]

From 29 March 2020, as part of its containment plan, the government had screened 3,96,147 people in their houses inside containment zones of 16 affected districts for fever and other symptoms. It was carried out by over 2,000 personnel.^{[50][51]} It was in process of screening up to 7 lakh persons.^[49]

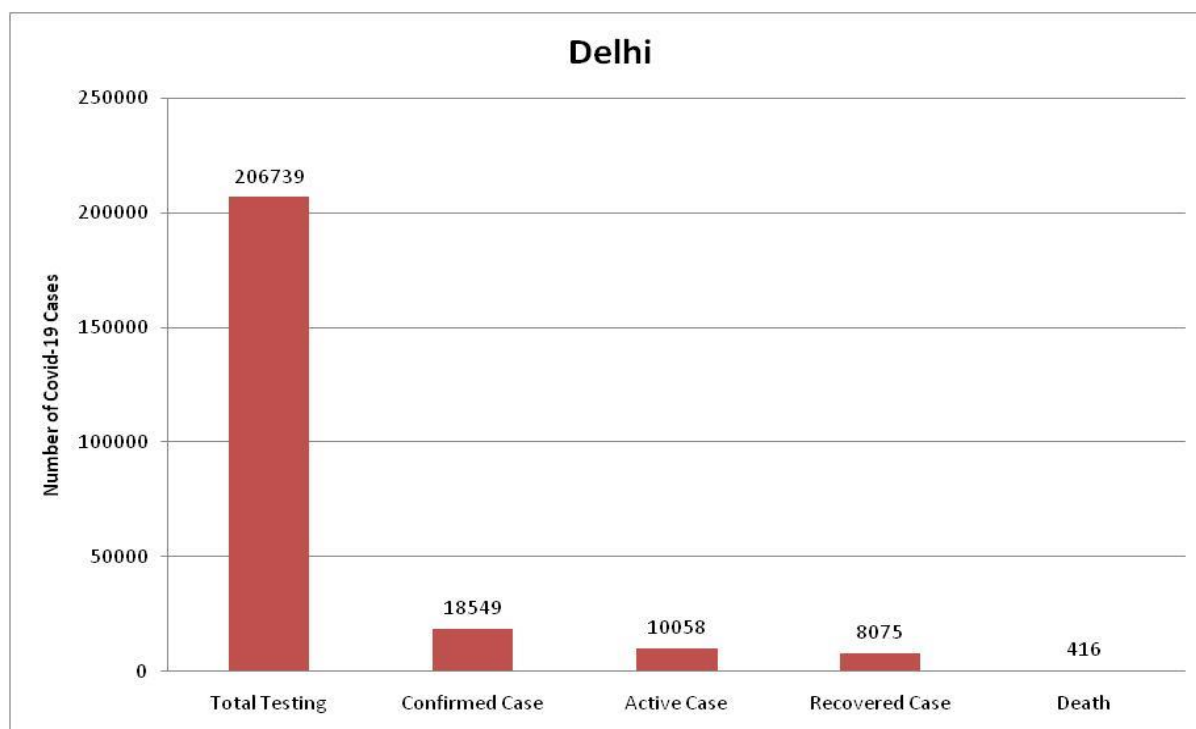
Till 31st March 2020, 74,533 people who had returned from affected countries were being monitored under 28-day home quarantine.^[54]

The state deployed 12 'Special Task Teams' comprising an IAS/IPS officers on 11th April 2020 to coordinate with the respective district collectors to manage the pandemic-affected districts. The teams monitor contact tracing and ensures quick sampling, testing and release of results.^[52]

DELHI STATE SCENARIO:

In Delhi, the first case was reported on 2nd March 2020. The state having a population of 1,98,14000 (Based on 2019 population projection by NCP report) the total number of individuals tested for Covid-19 have been 206739 and 18549 were found positive.

In **Delhi**, the Government approved and supported Covid-19 Testing labs by ICMR have been setup in the following 6 organisations.



As on 30th May 2020, the Covid-19 related statistics of the state read as follows:

Total testing	Confirmed cases	Active cases	Recovered cases	Deceased cases
206739	18549	10058	8075	416
Confirmed cases Per Million	% of active cases	Recovery Rate	Mortality Rate	Tests Per Million
936.10	54.22%	43.53	2.24	≈ 10433.98

- 936 out of every 1 million people in Delhi have tested positive for the virus.
- For every 100 confirmed cases, 54 are currently infected.
- For every 100 confirmed cases, 44 have recovered from the virus infection.
- For every 100 confirmed cases, 2 have unfortunately passed away.
- For every 1 million people in Delhi, 10434 people were tested.

Average Growth Rate:

- From 3rd May to 9th May: 6.84% per day.
- From 10th May to 16th May: 5.21% per day.
- From 17th May to 23rd May: 4.74% per day.
- From 24th May to 30th May: 5.31% per day.

Management/Treatment of Covid-19 cases:

- On 13 April, ICMR requested researcher to give clinical trial on critically ill patient of COVID-19 using convalescent plasma therapy.^[56]
- On 15 April, Lieutenant Governor of Delhi declared that in Delhi the plasma technique might be used. He mentioned that it will be on trial basis with proper guideline.^[56]
- On 20 April, After receiving Plasma therapy, a 49-year-old critically ill patient of COVID-19 on ventilator support was out from ventilator. This is the first successful trial of plasma therapy in India.^[57]
- On 24 April, The CM of Delhi informed that all the 4 patients on whom the plasma therapy was tried in LNJP hospital had responded positively. Delhi Government seeking permission from Central Government to apply same therapy to all serious patients.^[58]

Operation S.H.I.E.L.D.:

The Government of Delhi made an announcement regarding operation SHIELD to restrict the spread of the virus in the hotspots or the containment zones. It was a six layers plan,^[59] where -

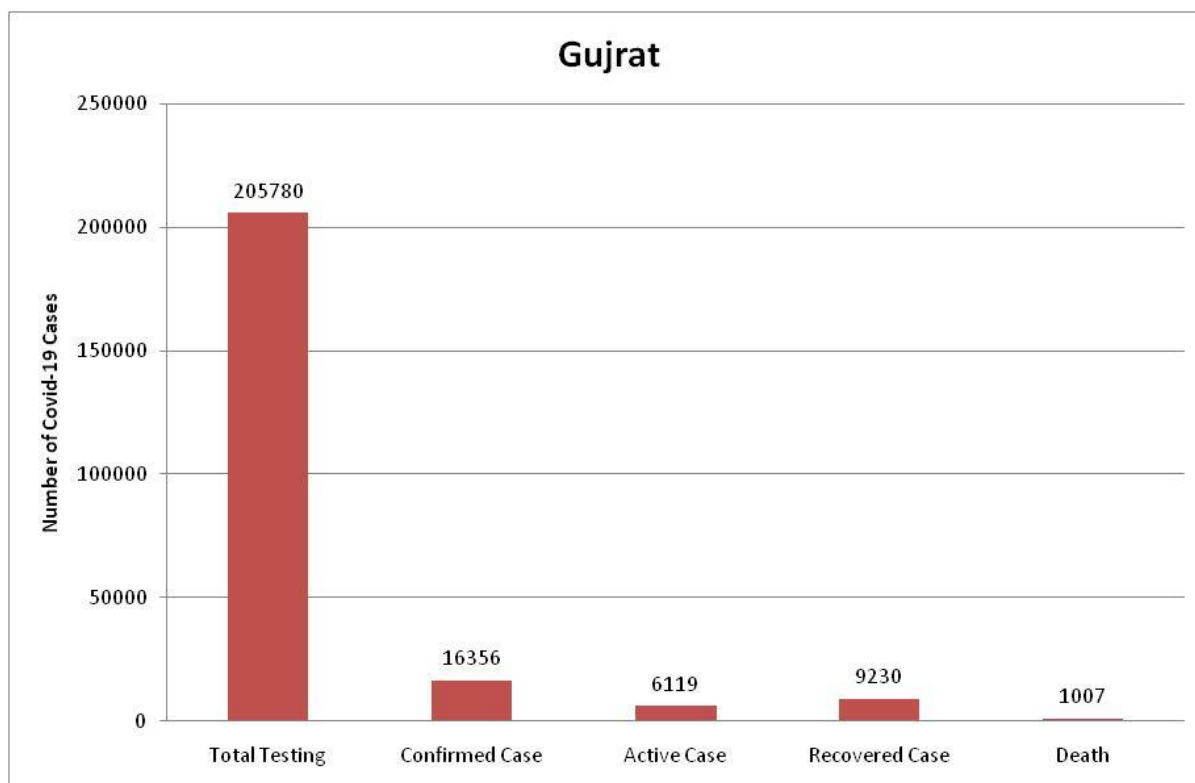
- **S** referred to Sealing the immediate area,
- **H** referred to Home quarantine to all people living in the area,
- **I** referred to Isolation and contact tracing of people,
- **E** referred to Essential supply of commodities,
- **L** referred to Local sanitization and

- **D** referred to Door to Door health check of people in the area.

Dilshad Garden, an area where the virus was widely spread was the first area where the success of the operation came from. On 10th April 2020, the Government of Delhi announced that the operation SHIELD was successful in this area. The state Health Minister said that the area was virus-free after the implementation of the six layer operation.^[60] On 17 April, Deputy CM of Delhi announced that the operation was also successful in two other hotspots, Vasundhara Enclave and Khichripur.^[61]

GUJARAT STATE SCENARIO:

Gujarat reported its first two cases of COVID-19 on 19th March 2020 - A man aged 32 years from Rajkot and a woman aged 21 years from Surat, who had returned from Saudi Arabia and United Kingdom respectively. Gujarat, having a population of 6,79,36,000 (Based on 2019 population projection by NCP report) the total number of individuals tested for Covid-19 have been 205780 and 16356 were found positive. In **Gujarat**, the Government approved and supported Covid-19 Testing labs by ICMR have been setup in the following 8 organisations in 6 cities



As on 30th May 2020, the Covid-19 related statistics of the state read as follows:

Total testing	Confirmed cases	Active cases	Recovered cases	Deceased cases
205780	16356	6,119	9230	1007
Confirmed cases Per Million	% of active cases	Recovery Rate	Mortality Rate	Tests Per Million
240.75	37.41	56.43	6.15	3029.02

- 241 out of every 1 million people in Gujarat have tested positive for the virus.
- For every 100 confirmed cases, 37 are currently infected.
- For every 100 confirmed cases, 56 have recovered from the virus infection.
- For every 100 confirmed cases, 6 have unfortunately passed away.
- For every 1 million people in Gujarat, 3029 people were tested.

Average Growth Rate:

- From 3rd May to 9th May: 6.39% per day.
- From 10th May to 16th May: 5.05% per day.
- From 17th May to 23rd May: 3.16% per day.
- From 24th May to 30th May: 2.59% per day.

Management /Treatment of Covid-19 case: [38]

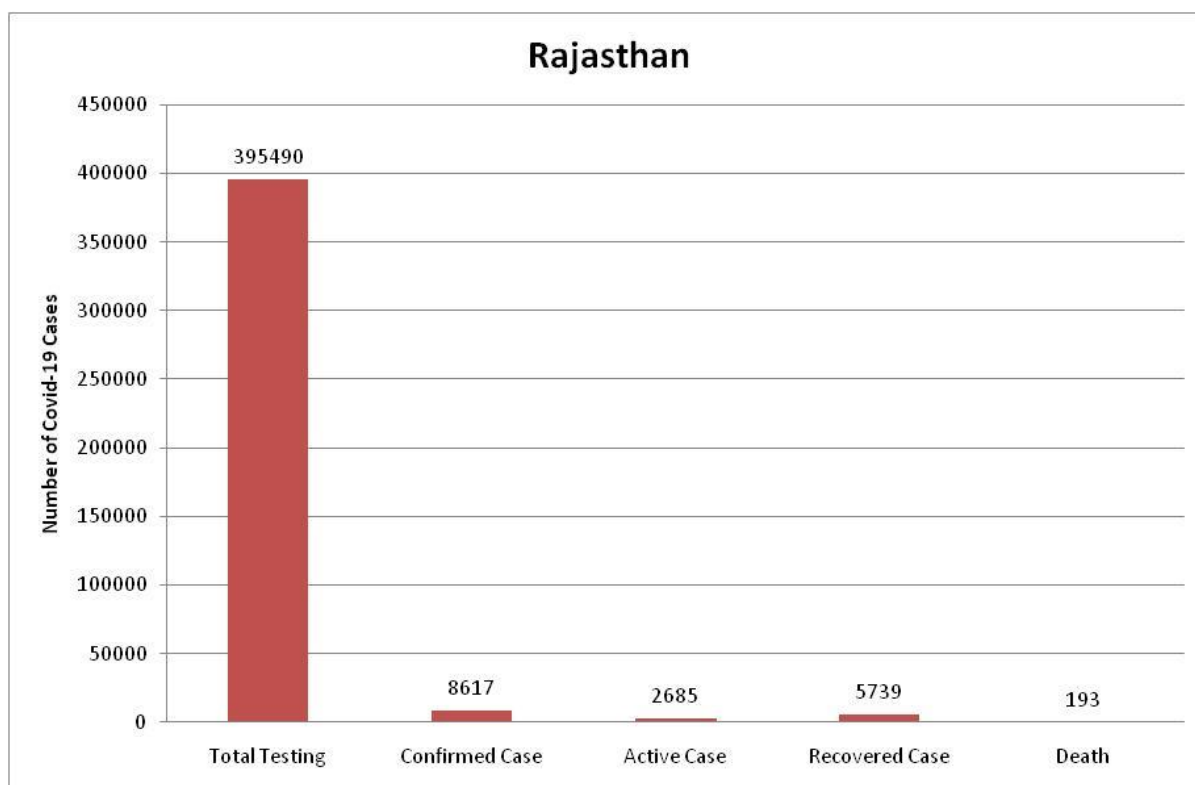
The plasma transfusion treatment on COVID-19 patients was decided to be carried out in the state by the government of Gujarat on 18th April 2020, particularly those in critical condition, to boost their immunity.

The civil hospital in Ahmedabad and the SVP Hospital prepared a proposal about the plasma transfusion treatment and submitted it to the Indian Council of Medical Research (ICMR) for approval. The ICMR had granted permission for such plasma transfusion treatment to Kerela Government earlier in April.

RAJASTHAN STATE SCENARIO:

The first case of coronavirus in Rajasthan was confirmed on 2nd March 2020, one member from a group of 23 Italian tourists tested positive for COVID-19. When tested Initially the report was negative, but after deterioration of his condition he was tested again and was found to be positive. After 2 days, his wife also tested positive which became a cause of worry for the health authorities as the group had travelled to several tourist destinations. Rajasthan, having a population of 7,72,64,000 (Based on 2019 population projection by NCP report) the total number of individuals tested for Covid-19 have been 395490 and 8617 were found positive.

In **Rajasthan**, the Government approved and supported Covid-19 Testing labs by ICMR have been setup in the following 8 organisations in 7 cities.



As on 30th May 2020, the Covid-19 related statistics of the state read as follows:

Total testing	Confirmed cases	Active cases	Recovered cases	Deceased cases
395490	8617	2685	5739	193
Confirmed cases Per Million	% of active cases	Recovery Rate	Mortality Rate	Tests Per Million
111.52	31.15	66.60	2.23	5118.68

- 112 out of every 1 million people in Rajasthan have tested positive for the virus.
- For every 100 confirmed cases, 31 are currently infected.
- For every 100 confirmed cases, 67 have recovered from the virus infection.
- For every 100 confirmed cases, 2 have unfortunately passed away.
- For every 1 million people in Rajasthan, 5119 people were tested.

Average Growth Rate:

- From 3rd May to 9th May: 6.39% per day.
- From 10th May to 16th May: 5.05% per day.
- From 17th May to 23rd May: 3.16% per day.
- From 24th May to 30th May: 2.59% per day.

Management/Treatment of Covid-19 cases:

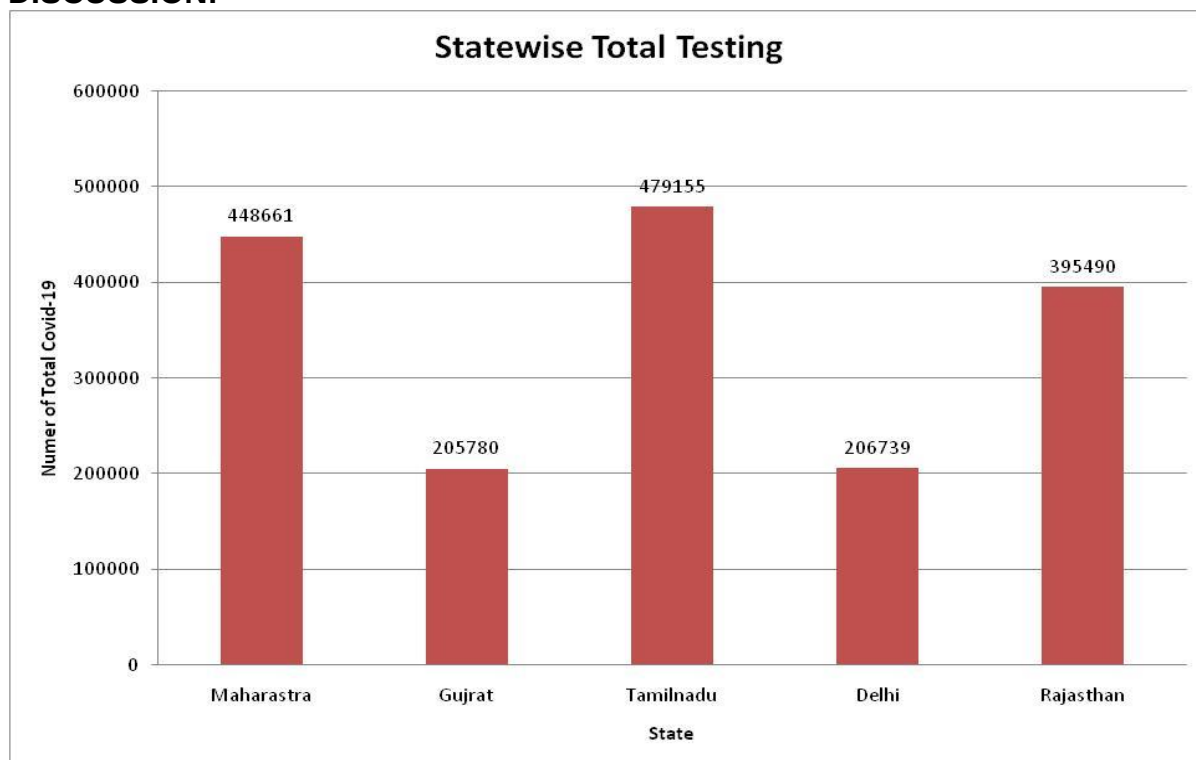
In Rajasthan, a combination of anti-malaria, anti-Swine flu and anti-HIV drugs resulted into recovery of three patients in March.^[62]

Rajasthan Government had sought permission from Indian Council for Medical Research (ICMR) for the clinical trials of the convalescent plasma therapy for treatment of severely ill patients at Sawai Man Singh Hospital (SMS Hospital) in Jaipur, as many other states across the country had started the clinical trials and had shown satisfying results,^[63] which ICMR approved.^[64] ICMR further listed SMS Medical college and Hospital for trial on 20 patients.^[65] Rajasthan government got approval from ICMR for the clinical trials at Government Medical College Jodhpur to treat COVID-19 patients from plasma therapy, with this two government hospitals and one private hospital could treat patients from plasma therapy in the state.^[66]

Understanding the ‘Bhilwara model’ of COVID-19 containment: ^[67]

From being one of the most affected COVID-19 districts in India to not reporting a new COVID-19 case in the last 10 days (1st April 2020 to 10th April 2020), Bhilwara has come a long way in its fight against the novel coronavirus pandemic. Bhilwara reported its first COVID-19 case on 19th March 2020 and later emerged as a hotspot becoming the worst-affected district in Rajasthan. When tested for covid19 virus a doctor in a private hospital was found infected and became the source of infection for others in the hospital. Soon after Rajasthan's border was sealed the district administration took over 1,541 rooms in 27 hotels and four private hospitals. In addition to these steps, disinfection drives were conducted all over the town. The central government was prompted to adopt the ‘Bhilwara model of containment’ on a nationwide scale

The ‘Bhilwara model’ involved uncompromising lockdown, followed by an even severe curfew aiming at cold heartedly containing the virus’ spread and a dedicated team of administrative and medical officials. Here more than 22 lakh people were screened. Out of these many were screened even more than once.

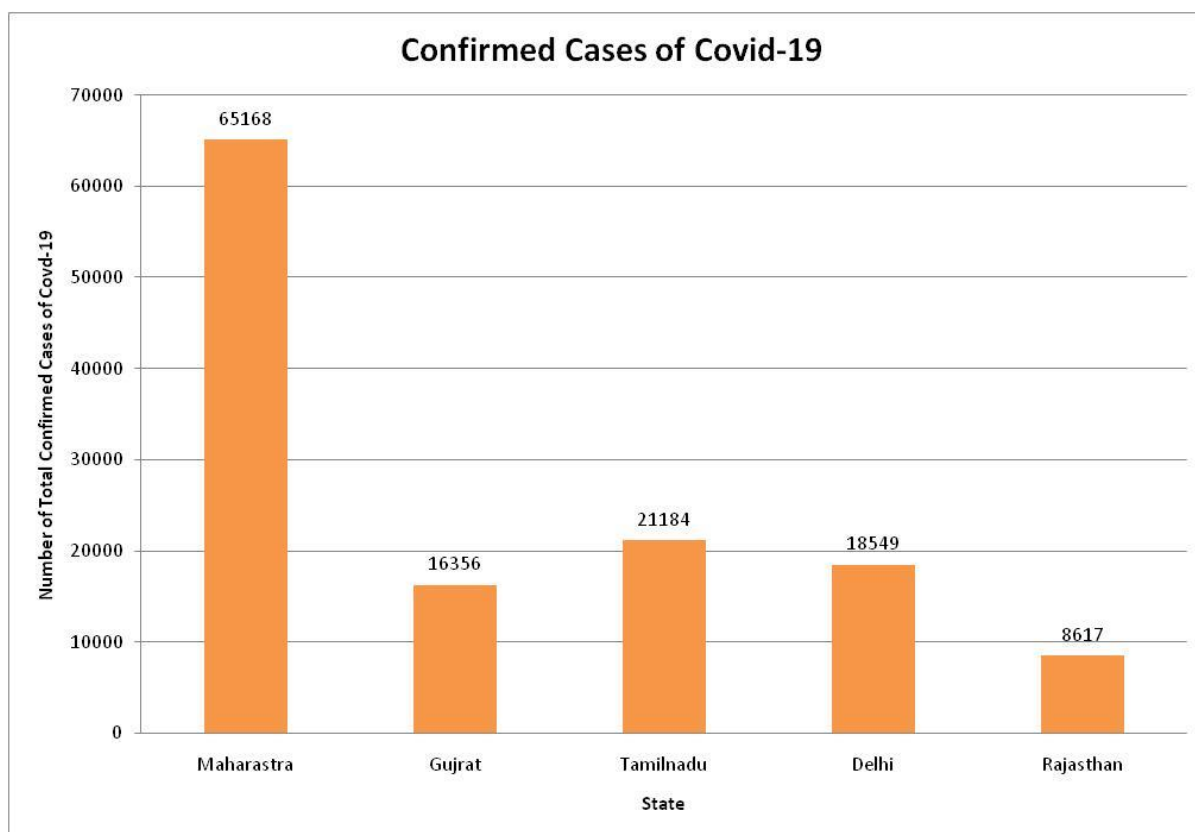
DISCUSSION:

More number of tests were carried out in Tamil Nadu (479155), Maharashtra (448661) and Rajasthan (395490) while lesser number of tests were carried out in Delhi (206739) and Gujarat (205780).

Comparison of the Testing Efficiency in the 5 States

State	Number of Testing Labs	Tests Per Million	Efficiency
Maharashtra	12	3672.94	306.07
Gujarat	8	3039	379.87
Tamil Nadu	22	6330	287.72
Delhi	6	10433.98	1738.99
Rajasthan	8	5118.69	639.83

- Despite having the least number of testing labs (6) among the 5 states, Delhi proved to be the most efficient in testing doubtful individuals while Tamil Nadu having the maximum number of testing labs (22) proved to be the least efficient in doing so.



The number of confirmed cases on 30th May:

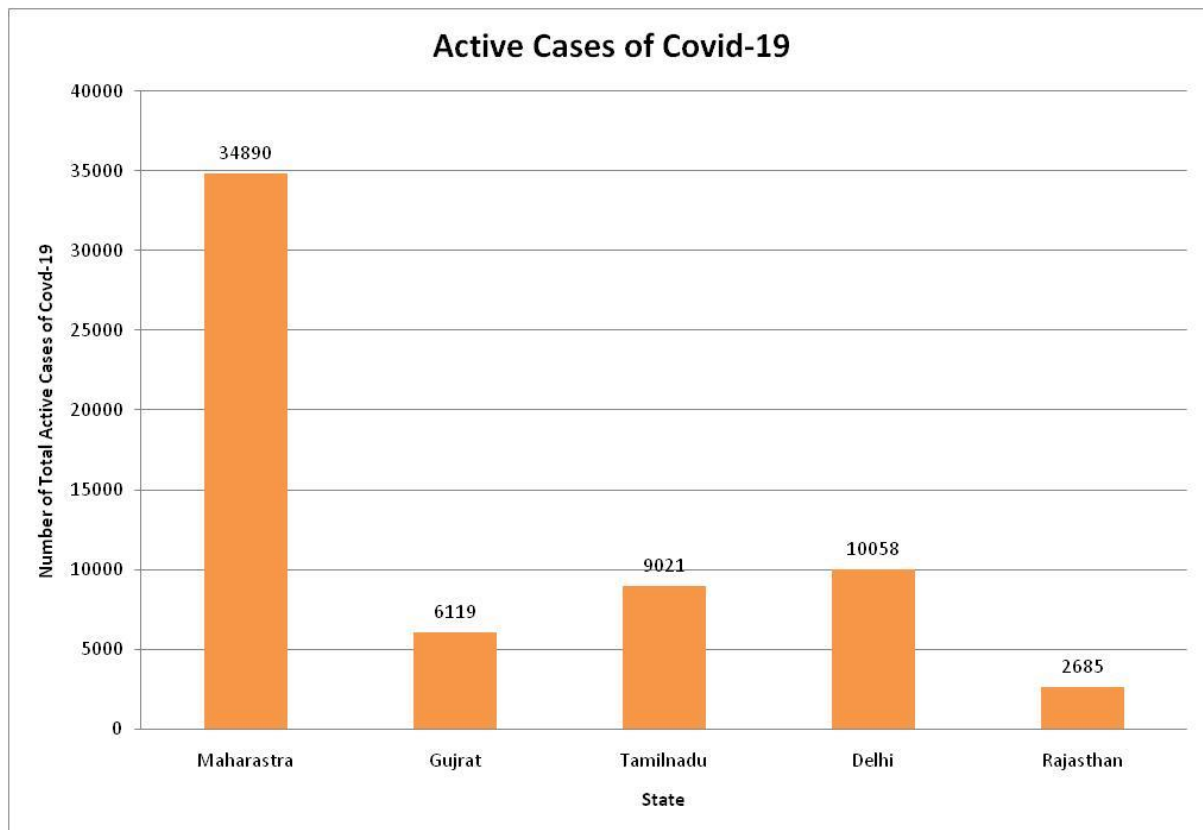
- Maharashtra: 65168(Maximum)
- Tamil Nadu: 21184
- Delhi: 18549
- Gujarat: 16356
- Rajasthan: 8617(Minimum)

Confirmed cases per million population:

- Delhi: 936.10 (Maximum)
- Maharashtra: 533.49
- Tamil Nadu: 279.85
- Gujarat: 240.75
- Rajasthan: 111.52 (Minimum)

Percentage of confirmed cases out of persons on whom tests were performed:

- Maharashtra: 14.52% (Maximum)
- Delhi: 8.97%
- Gujarat: 7.94%
- Tamil Nadu: 4.42%
- Rajasthan: 2.17% (Minimum)

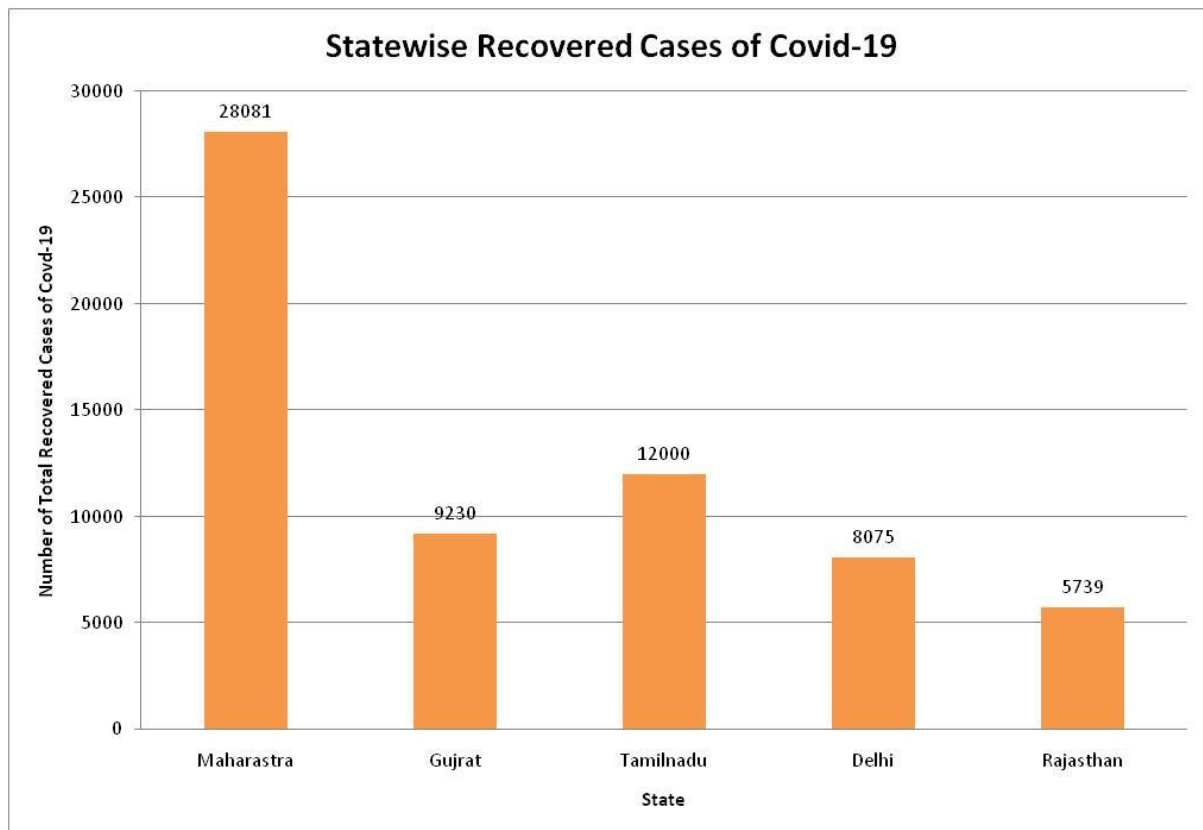


The number of active cases on 30th May:

- Maharashtra: 34890(Maximum)
- Delhi: 10058
- Tamil Nadu: 9021
- Gujarat: 6119
- Rajasthan: 2685(Minimum)

Percentage of Active cases:

- Delhi: 54.22% (Maximum)
- Maharashtra: 53.53%
- Tamil Nadu: 42.58%
- Gujarat: 37.41%
- Rajasthan: 31.15% (Minimum)

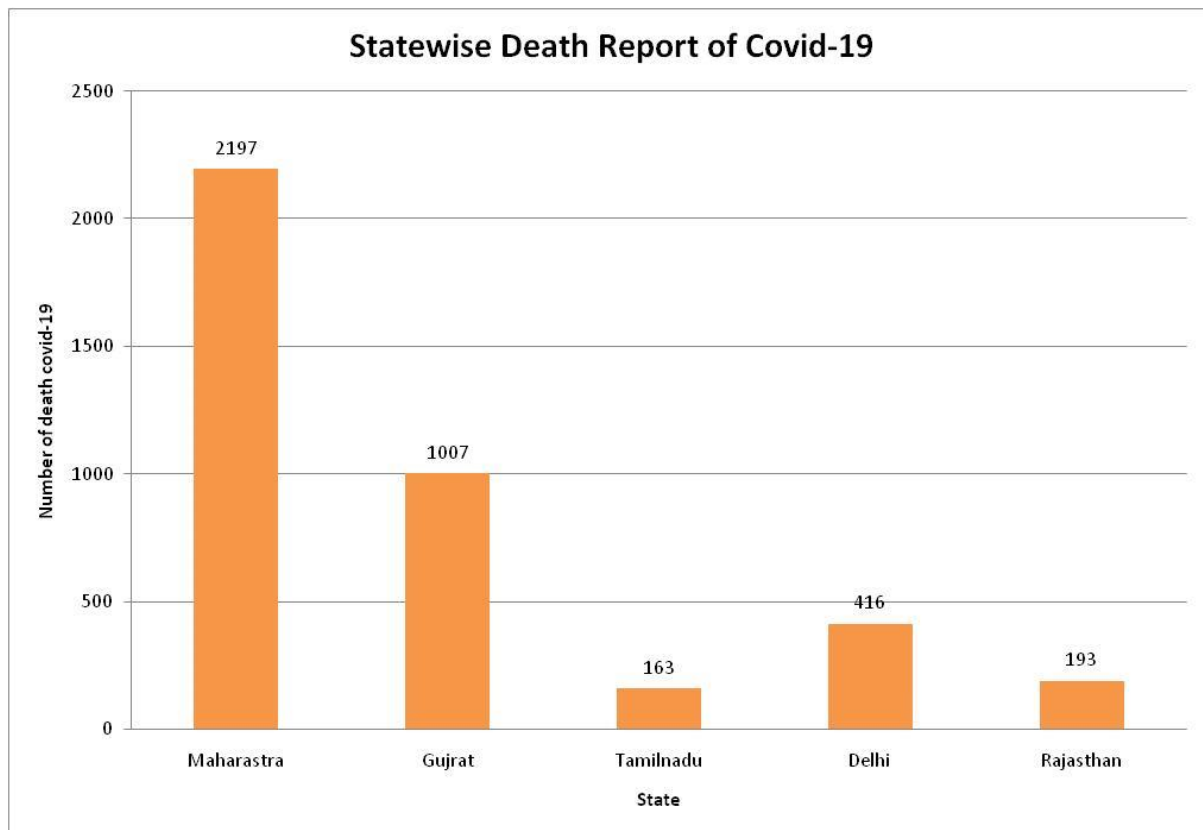


The number of Recovered cases on 30th May:

- Maharashtra: 28081 (Maximum)
- Tamil Nadu: 12000
- Gujarat: 9230
- Delhi: 8075
- Rajasthan: 5739 (Minimum)

Percentage of recovered cases:

- Rajasthan: 66.60% (Maximum)
- Tamil Nadu: 56.64%
- Gujarat: 56.43%
- Delhi: 43.53%
- Maharashtra: 43.09% (Minimum)

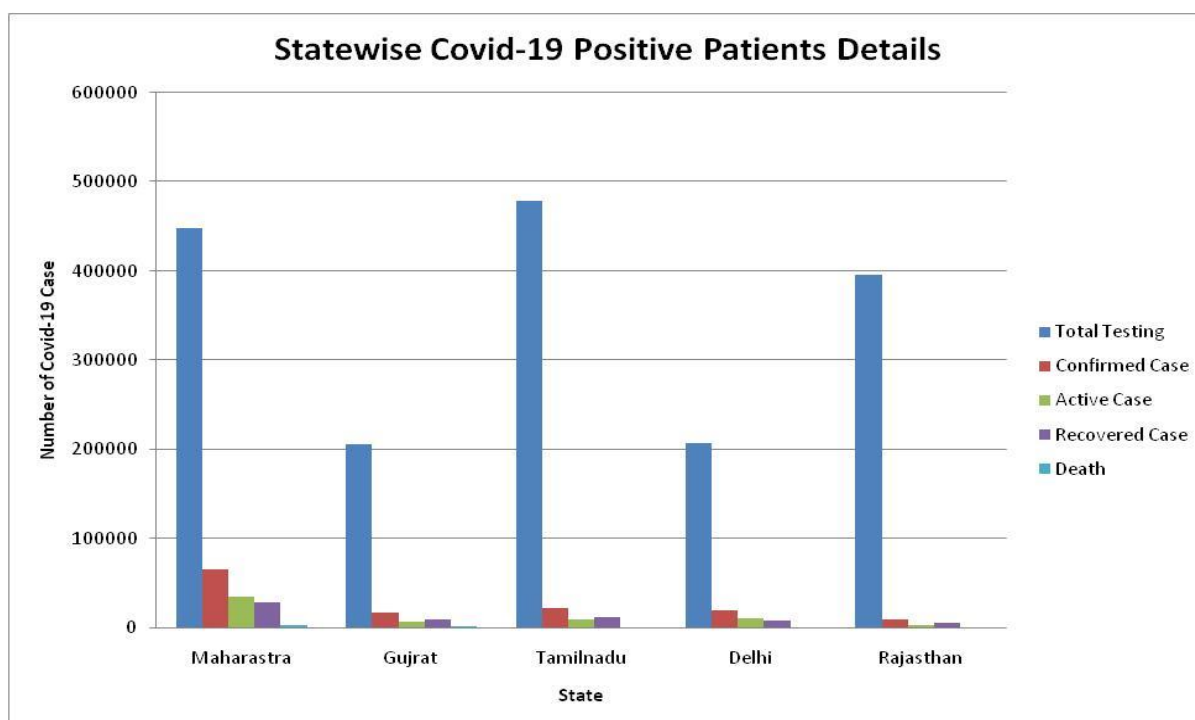
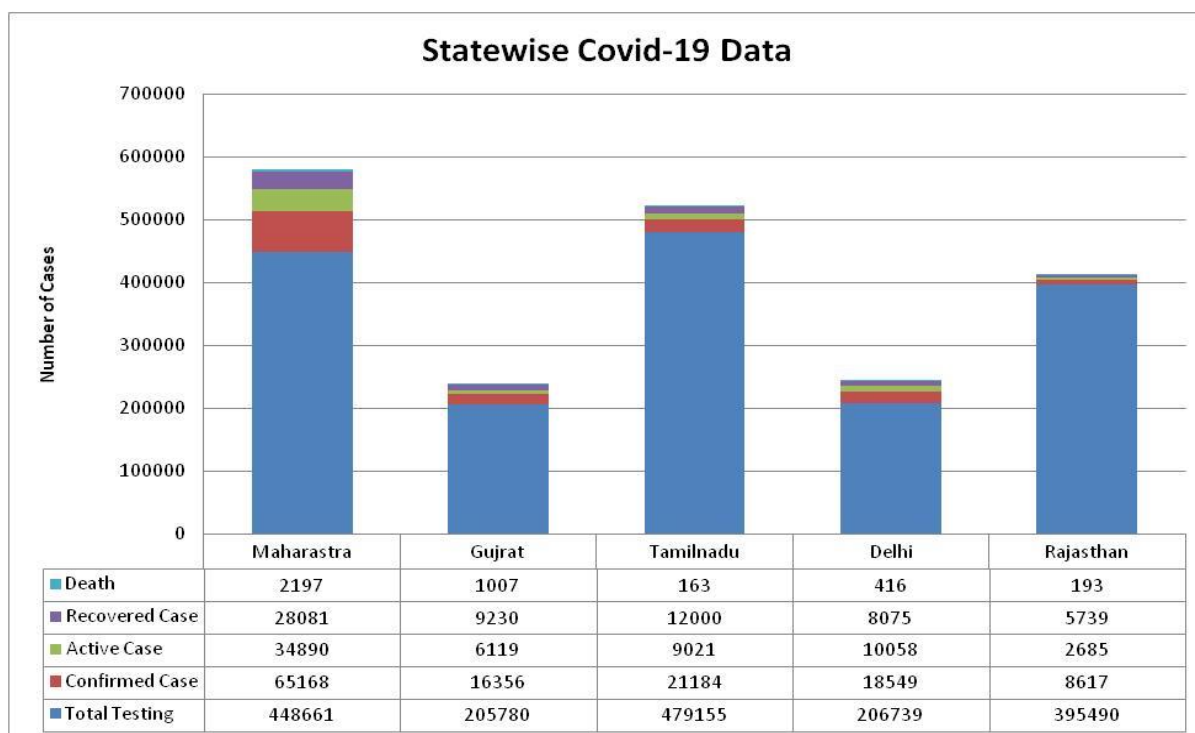


Upto 30th may the number of people who died due to this disease was:

- Maharashtra: 2197(Maximum)
- Gujarat: 1007
- Delhi: 416
- Rajasthan: 193
- Tamil Nadu: 163(Minimum)

Death rate:

- Gujarat: 6.15% (Maximum)
- Maharashtra: 3.37%
- Delhi: 2.24%
- Rajasthan: 2.23%
- Tamil Nadu: 0.76% (Minimum)



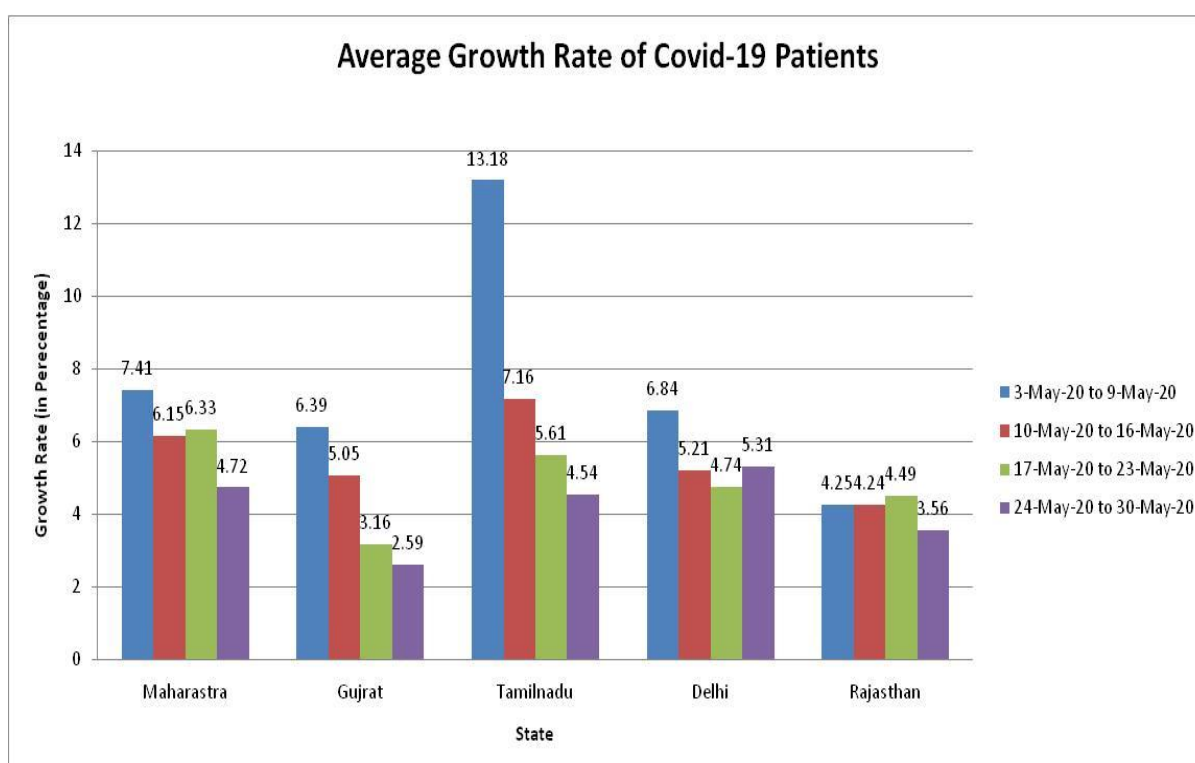
How did the 5 states fare in the war against Covid-19?

State	Confirmed Per Million	Active cases	Recovery Rate	Mortality Rate	Tests Per Million
Maharashtra	533.49	53.53%	43.09%	3.37%	3672.94
Gujarat	240.75	37.41%	56.43%	6.15%	3029
Tamil Nadu	279.85	42.58%	56.64%	0.76%	6330
Delhi	936.10	54.22%	43.53%	2.24%	10433.98
Rajasthan	111.52	31.15%	66.60%	2.23%	5118.68

- Confirmed cases per million were maximum in Delhi and minimum in Rajasthan
- The number of Active cases per hundred confirmed cases was maximum in Delhi and minimum in Rajasthan.
- The Recovery Rate was maximum in Rajasthan and minimum in Maharashtra.
- The Mortality Rate was maximum in Gujarat and minimum in Tamil Nadu.
- The maximum number of tests per million were conducted in Delhi and the least were conducted in Gujarat

Average Growth Rate of Covid-19 Patients:

Period	Maharashtra	Gujarat	Tamil Nadu	Delhi	Rajasthan
3 rd May – 9 th May	7.41%	6.39%	13.18%	6.84%	4.25%
10 th May – 16 th May	6.15%	5.05%	7.16%	5.21%	4.24%
17 th May – 23 rd May	6.33%	3.16%	5.61%	4.74%	4.49%
24 th May – 30 th May	4.72%	2.59%	4.54%	5.31%	3.56%



- During the period (3rd May – 9th May), the Average Growth rate was maximum in Tamil Nadu and minimum in Rajasthan.
- During the period (10th May – 16th May), the Average Growth rate was maximum in Tamil Nadu and minimum in Rajasthan.
- During the period (17th May – 23rd May), the Average Growth rate was maximum in Maharashtra and minimum in Gujarat.
- During the period (24th May – 30th May), the Average Growth rate was maximum in Delhi and minimum in Gujarat.

- *In all these states the Average Growth rate was less during the period (24th to 30th May) when compared with that during the period (3rd to 9th May).*

In Maharashtra, Dharavi proved to be the biggest stumbling block in the fight against Covid-19. Here the first confirmed case was reported on 1st April 2020. Being the most densely populated slum in Asia and possessing the widest range of pollutants that lead to respiratory problems like Bronchitis and Asthma^[70], it has been difficult for the officials to contain the spread of the virus and morbidity in Dharavi.

In the state of Rajasthan, the success of Bhilwara prompted the Central Government to adopt the 'Bhilwara model of containment' on a nationwide scale. It involves a strict lockdown, curfew aimed at ruthlessly containing the virus' spread to prevent Bhilwara from becoming another Wuhan or Lombardy.

In Delhi, operation SHIELD (a six-layer operation) was found extremely useful in the containment of the spread of the virus in several hotspots.

As on 7th May 2020, 3.3% patients were on Oxygen Support and 1.1% cases were on ventilators in India.^[71] On an average 1-2% require ventilator and 8-10% cases require Oxygen Support.

Plasma Transfusion Therapy has given encouraging results in the states of Delhi, Gujarat and Rajasthan. It has no side-effects. Earlier it has been used for SARS-2003, H1N1-2009 and eBola-2015.

CONCLUSION:

Both the Central and State Governments have done all that was possible to contain the spread of Covid-19. Now it depends upon the Public to take care of themselves as even though many trial studies are being carried out to make a vaccine and medicine, at present no definite treatment and vaccine is available for Covid-19 across the world. Prevention is the best way to keep oneself safe. Personal hygiene, Self-protection and Social distancing are a must and it is the only way forward in the fight against Covid-19.

REFERENCES:

1. Estola, T. (1970). "Coronaviruses, a New Group of Animal RNA Viruses". *Avian Diseases*. 14 (2): 330–336. doi:10.2307/1588476. ISSN 0005-2086. JSTOR 1588476.
2. Fabricant, J. (1998). "The Early History of Infectious Bronchitis". *Avian Diseases*. 42 (4): 648–650. doi:10.2307/1592697. ISSN 0005-2086. JSTOR 1592697.
3. Decaro, N. (2011). "Gammacoronavirus". In Tidona C, Darai G (eds.). *Gammacoronavirus†: Coronaviridae. The Springer Index of Viruses*. Springer. pp. 403–413. doi:10.1007/978-0-387-95919-1_58. ISBN 978-0-387-95919-1. PMC 7176155.
4. McIntosh, K. (1974). "Coronaviruses: A Comparative Review". In Arber W, Haas R, Henle W, Hofschneider PH, Jerne NK, Koldovsky P, Koprowski H, Maaløe O, Rott R (eds.). *Current Topics in Microbiology and Immunology / Ergebnisse der Mikrobiologie und Immunitätsforschung. Current Topics in Microbiology and Immunology / Ergebnisse der Mikrobiologie und*

- Immunitätsforschung*. Berlin, Heidelberg: Springer. p. 87. doi:10.1007/978-3-642-65775-7_3. ISBN 978-3-642-65775-7.
5. Kahn, J.S. & McIntosh, K. (November 2005). "History and recent advances in coronavirus discovery". *The Pediatric Infectious Disease Journal*. 24 (11 Suppl): S223–7, discussion S226. doi:10.1097/01.inf.0000188166.17324.60. PMID 16378050.
 6. Mahase, E. (April 2020). "The BMJ in 1965". *BMJ*. 369: m1547. doi:10.1136/bmj.m1547. PMID 32299810.
 7. Kendall, E.J., Bynoe, M.L. & Tyrrell DA, (July 1962). "Virus isolations from common colds occurring in a residential school". *British Medical Journal*. 2 (5297): 82–6. doi:10.1136/bmj.2.5297.82. PMC 1925312. PMID 14455113.
 8. Richmond, C. (18 June 2005). "David Tyrrell". *BMJ : British Medical Journal*. 330 (7505): 1451. doi:10.1136/bmj.330.7505.1451. PMC 558394.
 9. Byone, M.(1969-06-28) "Obituary Notices: Malcom Byone". *British Medical Journal*. 2(5660): 827–829.. doi:10.1136/bmj.2.5660.827.
 10. Tyrrell, D.A. & Bynoe, M.L. (June 1965). "Cultivation of a Novel Type of Common-Cold Virus in Organ Cultures". *British Medical Journal*. 1(5448): 1467–70. doi:10.1136/bmj.1.5448.1467. PMC 2166670. PMID 14288084.
 11. Knapp, A. (6 May 2020). "The Secret History Of The First Coronavirus". *Forbes*. Retrieved from <https://www.forbes.com/sites/alexknapp/2020/04/11/the-secret-history-of-the-first-coronavirus-229e/#6606cf8171d6>.
 12. Hamre, D. & Procknow, J.J. (January 1966). "A new virus isolated from the human respiratory tract". *Proceedings of the Society for Experimental Biology and Medicine*. Society for Experimental Biology and Medicine. 121 (1): 190–3. doi:10.3181/00379727-121-30734. PMID 4285768.
 13. Brocklehurst, S. (15 April 2020). "The woman who discovered the first coronavirus". *Scotland : BBC News*. Retrieved from <https://www.bbc.com/news/uk-scotland-52278716>
 14. Almeida, J. (26 June 2008). "June Almeida (née Hart)". *BMJ*. 336(7659): 1511.1–1511. doi:10.1136/bmj.a434. ISSN 0959-8138. PMC 2440895.
 15. McIntosh, K., Becker, W.B. & Chanock, R.M. (December 1967). "Growth in suckling-mouse brain of "IBV-like" viruses from patients with upper respiratory tract disease". *Proceedings of the National Academy of Sciences of the United States of America*. 58 (6): 2268–73. Bibcode:1967PNAS...58.2268M. doi:10.1073/pnas.58.6.2268. PMC 223830. PMID 4298953.
 16. McIntosh, K., Dees, J.H., Becker, W.B., Kapikian, A.Z. & Chanock, R.M. (April 1967). "Recovery in tracheal organ cultures of novel viruses from patients with respiratory disease". *Proceedings of the National Academy of Sciences of the United States of America*. 57(4): 933–40. Bibcode:1967PNAS...57..933M. doi:10.1073/pnas.57.4.933. PMC 224637. PMID 5231356.
 17. Schmeck, H.R. (5 May1967). "Six Newly Discovered Viruses May Explain Cold; Strains Are Similar to Germ That Causes a Bronchial Infection in Chickens Believed to Be New Group". *New York, NYC: The New York Times*. ISSN 0362-4331. Retrieved from

- <https://www.nytimes.com/1967/05/05/archives/six-newly-discovered-viruses-may-explain-cold-strains-are-similar.html>.
18. Su, S., Wong, G., Shi, W., Liu, J., Lai, A.C. & Zhou, J., et al. (June 2016). "Epidemiology, Genetic Recombination, and Pathogenesis of Coronaviruses". *Trends in Microbiology*. 24 (6): 490–502. doi:10.1016/j.tim.2016.03.003. PMC 7125511. PMID 27012512.
 19. Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B. & Song, J., et al. (February 2020). "A Novel Coronavirus from Patients with Pneumonia in China, 2019". *The New England Journal of Medicine*. 382 (8): 727–733. doi:10.1056/NEJMoa2001017. PMC 7092803. PMID 31978945.
 20. Woo, P.C., Huang, Y., Lau, S.K. & Yuen, K.Y. (August 2010). "Coronavirus genomics and bioinformatics analysis". *Viruses*. 2(8): 1804–20. doi:10.3390/v2081803. PMC 3185738. PMID 21994708. Coronaviruses possess the largest genomes [26.4 kb (ThCoV HKU12) to 31.7 kb (SW1)] among all known RNA viruses (Figure 1) [2,13,16].
 21. Fehr, A.R. & Perlman, S. (2015). "Coronaviruses: an overview of their replication and pathogenesis". In Maier HJ, Bickerton E, Britton P (eds.). *Coronaviruses. Methods in Molecular Biology*. 1282. Springer. pp. 1–23. doi:10.1007/978-1-4939-2438-7_1. ISBN 978-1-4939-2438-7. PMC 4369385. PMID 25720466. See section: Virion Structure.
 22. Decaro, N. Tidona, C. & Darai, G. (eds.).(2011). *Alphacoronavirus. The Springer Index of Viruses*. Springer. pp. 371–383. doi:10.1007/978-0-387-95919-1_56. ISBN 978-0-387-95919-1. PMC 7176201.
 23. Decaro, N. Tidona, C. & Darai, G. (eds.).(2011). *Betacoronavirus. The Springer Index of Viruses*. Springer. pp. 385–401. doi:10.1007/978-0-387-95919-1_57. ISBN 978-0-387-95919-1. PMC 7176184.
 24. Forni, D., Cagliani, R., Clerici, M. & Sironi, M.(January 2017). "Molecular Evolution of Human Coronavirus Genomes". *Trends in Microbiology*. 25 (1): 35–48. doi:10.1016/j.tim.2016.09.001. PMC 7111218. PMID 27743750. Specifically, all HCoVs are thought to have a bat origin, with the exception of lineage A beta-CoVs, which may have reservoirs in rodents [2].
 25. Forgie, S. & Marrie, T.J. (February 2009). "Healthcare-associated atypical pneumonia". *Seminars in Respiratory and Critical Care Medicine*. 30 (1): 67–85. doi:10.1055/s-0028-1119811. PMID 19199189.
 26. (April 2004). "Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003". World Health Organization. Retrieved from https://www.who.int/csr/sars/country/table2004_04_21/en/
 27. The Editorial Board. (29 Jan 2020). "Is the World Ready for the Coronavirus?—Distrust in science and institutions could be a major problem if the outbreak worsens". New York, NYC: The New York Times. Retrieved from <https://www.nytimes.com/2020/01/29/opinion/coronavirus-outbreak.html>
 28. (9 Jan 2020). "WHO Statement Regarding Cluster of Pneumonia Cases in Wuhan, China". World Health Organisation. Retrieved from <https://www.who.int/china/news/detail/09-01-2020-who-statement-regarding-cluster-of-pneumonia-cases-in-wuhan-china>
 29. (10 Jan 2020). "Laboratory testing of human suspected cases of novel coronavirus (nCoV) infection. Interim guidance, 10 January 2020"(PDF).

- World Health Organisation. Retrieved from <https://apps.who.int/iris/handle/10665/330374>
30. (23 Jan 2020) "Novel Coronavirus 2019, Wuhan, China". www.cdc.gov (CDC). Retrieved from <https://www.cdc.gov/csels/dls/locs/2020/outbreak-of-2019-novel-coronavirus-2019-ncov-in-wuhan-china.html>
 31. (21 Jan 2020). "2019 Novel Coronavirus infection (Wuhan, China): Outbreak update". Canada.ca. Retrieved from <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection.html>
 32. (29 March 2020). "Islampur town cut off to curb virus spread". Kolhapur: The Times of India. Retrieved from <https://timesofindia.indiatimes.com/city/kolhapur/islampur-town-cut-off-to-curb-virus-spread/articleshow/74868090.cms>
 33. (31 Mar 2020). "Worli Koliwada sealed fully as six test positive". Mumbai: The Times of India. Retrieved from <https://timesofindia.indiatimes.com/city/mumbai/worli-koliwada-sealed-fully-as-six-test-positive/articleshow/74903842.cms>.
 34. (7 April 2020). "Covid-19 lockdown: Pune Central, Kondhwa areas sealed in emergency move". Mumbai: Livemint. Retrieved from <https://www.livemint.com/news/india/covid-19-lockdown-pune-central-kondhwa-areas-sealed-in-emergency-move-11586261149641.html>
 35. (10 April 2020) "Maharashtra govt seals all hotspots, including Dharavi". Mumbai: Livemint. Retrieved from <https://www.livemint.com/news/india/mumbai-seals-parts-of-dharavi-11586437129347.html>
 36. (16 April 2020). "Most Coronavirus Hotspots in Tamil Nadu, Maharashtra, Delhi as Govt Identifies Red, White and Green Zones". New Delhi: News18. Retrieved from <https://www.news18.com/news/india/most-coronavirus-hotspots-in-tamil-nadu-maharashtra-delhi-as-govt-identifies-red-white-and-green-zones-2579033.html>
 37. Pathak, K. & Laskar, A. (16 April 2020) "Maharashtra prepares to relax lockdown in green, orange zones". Mumbai: Livemint. Retrieved from <https://www.livemint.com/news/india/maharashtra-prepares-to-ease-lockdown-in-green-and-orange-zones-11586951275300.html>
 38. PTI. (18 April 2020). "Gujarat Plans Plasma Treatment as Ahmedabad Records 143 New Coronavirus Cases in 24 Hours". New Delhi: News18. Retrieved from <https://www.news18.com/news/india/gujarat-govt-plans-plasma-transfusion-treatment-for-coronavirus-patients-in-critical-condition-2582511.html>
 39. (3 April 2020). "Health & Family Welfare Department Government of Tamil Nadu: Stop Corona Home". Health and Family Welfare Department Govt. of Tamil Nadu. Retrieved from <http://www.stopcoronatn.in/>
 40. Chakraborty S., Singh, P. & Shamika R. (24 March 2020). "COVID-19 | Is India's health infrastructure equipped to handle an epidemic?". Brookings. Retrieved from <https://www.brookings.edu/blog/up-front/2020/03/24/is-indias-health-infrastructure-equipped-to-handle-an-epidemic/>
 41. (7 April 2020). "Private-Hospital-List.pdf" (PDF). Retrieved (PDF) from <https://stopcorona.tn.gov.in/wp-content/uploads/2020/03/Private-Hospital-List.pdf>

42. (7 April 2020). "Government-Hospital-treating-COVID-19.pdf" (PDF). Retrieved (PDF) from <https://stopcorona.tn.gov.in/wp-content/uploads/2020/03/Government-Hospital-treating-COVID-19.pdf>
43. (14 April 2020). "More isolation wards get ready". Chennai: The New Indian Express. Retrieved from <http://cms.newindianexpress.com/cities/chennai/2020/apr/14/more-isolation-wards-get-ready-2129795.html>
44. (4 May 2020). "Corporation to convert marriage halls to COVID care centres". Chennai: dtNext.in. Retrieved from <https://www.dtnext.in/News/City/2020/05/04030348/1228180/Corporation-to-convert-marriage-halls-to-COVID-care-.vpf>
45. Prabhakar S., TNN. (1 May 2020). "Chennai Corona Update: Milder cases to be sent to 'care centres' in Chennai. Chennai: The Times of India. Retrieved from <https://timesofindia.indiatimes.com/city/chennai/milder-cases-to-be-sent-to-care-centres-in-chennai/articleshow/75482628.cms>.
46. (27 March 2020). "54,000 people who landed from overseas to be home quarantined". Chennai: The New Indian Express. Retrieved from <https://www.newindianexpress.com/states/tamil-nadu/2020/mar/27/54000-people-who-landed-from-overseas-to-be-home-quarantined-2122007.html>
47. PTI. (24 march 2020). "Tamil Nadu goes under lockdown; home quarantine stickers pasted on doors of foreign returnees". Chennai: The New Indian Express. Retrieved from <https://www.newindianexpress.com/states/tamil-nadu/2020/mar/24/tamil-nadu-goes-under-lockdown-home-quarantine-stickers-pasted-on-doors-of-foreign-returnees-2121106.html>
48. Sivapriyan, E.T.B. (30 March 2020). "Coronavirus: Tamil Nadu launches app to provide advice to those under home quarantine". Chennai: Deccan Herald. Retrieved from <https://www.deccanherald.com/national/south/coronavirus-tamil-nadu-launches-app-to-provide-advice-to-those-under-home-quarantine-816562.html>
49. Sivapriyan, E.T.B. (1 April 2020). "Tamil Nadu screens households in vulnerable areas to prevent coronavirus spread". Chennai: Deccan Herald. Retrieved from <https://www.deccanherald.com/national/south/tamil-nadu-screens-households-in-vulnerable-areas-to-prevent-coronavirus-spread-819999.html>
50. PTI. (1 April 2020). "Tamil Nadu coronavirus cases rises to 74, Nizamuddin link to a chunk of it surfaces". Chennai: Deccan Herald. Retrieved from <https://www.deccanherald.com/national/south/tamil-nadu-coronavirus-cases-rises-to-74-nizamuddin-link-to-a-chunk-of-it-surfaces-819633.html>
51. Murali, P. (1 April 2020). " 'Over 2 Lakh Passengers Screened, 43,000 in Home Quarantine': Tamil Nadu CM Assures State Ready to Battle Covid-19". Chennai: News18. Retrieved from <https://www.news18.com/news/politics/over-2-lakh-passengers-screened-43000-in-home-quarantine-tamil-nadu-cm-assures-state-ready-to-battle-covid-19-2559869.html>
52. Kumar, S. V. (11 April 2020). "Coronavirus | Tamil Nadu deploys senior bureaucrats to manage pandemic in districts". Chennai: The Hindu. ISSN 0971-751X. Retrieved from <https://www.thehindu.com/news/national/tamil-nadu/coronavirus-tamil-nadu->

- deploys-senior-bureaucrats-to-manage-pandemic-in-districts/article31317820.ece
53. "Murali, P. (31 March 2020). Coimbatore, Erode Stare at Crisis as Tamil Nadu Govt Races to Trace Scores Back from Nizamuddin Event". Chennai: News18. Retrieved from <https://www.news18.com/news/india/coimbatore-erode-stare-at-crisis-as-tamil-nadu-govt-races-to-trace-scores-back-from-nizamuddin-event-2558131.html>
 54. (14 April 2020). "Media Bulletin 30 March 2020" (PDF). Health & Family Welfare Department Government of Tamil Nadu. Retrieved PDF from https://stopcorona.tn.gov.in/wp-content/uploads/2020/03/Media_Bulletin_30_03_2020_5_Pages_English_26_KB-1.pdf
 55. Vivek, T.R. (7 April 2020). "5 lessons from Tamil Nadu's book: How the state is fighting Covid-19". Hindustan Times. Retrieved from <https://www.hindustantimes.com/india-news/5-lessons-from-tamil-nadu-s-book-how-the-state-is-fighting-covid-19/story-SI4kD5HZksOluOTRDm2OeM.html>
 56. (15 April 2020). "Delhi to use plasma technique for covid treatment on trial basis". Economic Times. Retrieved from <https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/delhi-to-use-plasma-technique-for-covid-treatment-on-trial-basis/articleshow/75161985.cms?from=mdr>
 57. Dwivedi, S. (20 April 2020). "Plasma Therapy For COVID-19 Works In Delhi, 49-year-old Recovers". NDTV. Retrieved from <https://www.ndtv.com/india-news/plasma-therapy-for-covid-19-works-in-delhi-49-year-old-recovers-2215191>
 58. Jeelani, G. (25 April 2020). "Coronavirus: Why Delhi pins its hopes on plasma therapy". New Delhi: India Today. Retrieved from <https://www.indiatoday.in/mail-today/story/coronavirus-why-delhi-pins-its-hopes-on-plasma-therapy-1670848-2020-04-25>
 59. (10 April 2020). "Coronavirus: Delhi govt announces Operation SHIELD to take on COVID-19". New Delhi: The Business Today. Retrieved from <https://www.businesstoday.in/latest/trends/coronavirus-delhi-govt-announces-operation-shield-to-take-on-covid-19/story/400648.html>
 60. PTI. (10 April 2020). "Operation SHIELD successful in containing COVID-19 spread in Dilshad Garden: Delhi health minister". New Delhi: The Economic Times. Retrieved from <https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/operation-shield-successful-in-containing-covid-19-spread-in-dilshad-garden-delhi-health-minister/articleshow/75082473.cms?from=mdr>
 61. ANI. (17 April 2020). "Manish Sisodia lauds locals for making 'Operation SHIELD' successful". New Delhi: The Times of India. Retrieved from <https://timesofindia.indiatimes.com/city/delhi/manish-sisodia-lauds-locals-for-making-operation-shield-successful/articleshow/75200268.cms>
 62. PTI. (16 March 2020). "Combination of two anti-HIV drugs proved crucial in Coronavirus treatment, Rajasthan official". Jaipur: The Economic Times. Retrieved from <https://economictimes.indiatimes.com/news/politics->

- and-nation/combination-of-two-anti-hiv-drugs-proved-crucial-in-coronavirus-treatment-rajasthan-official/articleshow/74653762.cms
63. Rawal, U.D. (26 April 2020). "Rajasthan seeks ICMR approval to begin trials for plasma therapy". Jaipur: Hindustan Times. Retrieved from <https://www.hindustantimes.com/india-news/rajasthan-seeks-icmr-approval-to-begin-trials-for-plasma-therapy/story-LEubXbm1JE4KH6S23YcfDI.html>
 64. PTI. (3 May 2020). "Rajasthan gets ICMR nod to use plasma therapy on COVID-19 patients: CM Ashok Gehlot". Jaipur: The Hindu. ISSN 0971-751X. Retrieved from <https://www.thehindu.com/news/national/other-states/rajasthan-gets-icmr-nod-to-use-plasma-therapy-on-covid-19-patients-cm-ashok-gehlot/article31494877.ece>
 65. Parihar, R. (7 May 2020). "Rajasthan launches plasma therapy, claims highest recovery rate of coronavirus patients in India". Jaipur: India Today. Retrieved from <https://www.indiatoday.in/india/story/rajasthan-launches-plasma-therapy-claims-highest-recovery-rate-of-coronavirus-patients-in-india-1675175-2020-05-07>
 66. PTI. (8 May 2020). "Top Medical Body ICMR Allows Plasma Trials At Jodhpur COVID Hospital". Jaipur: NDTV. Retrieved from <https://www.ndtv.com/india-news/top-medical-body-icmr-allows-plasma-trials-at-jodhpur-covid-hospital-2225663>
 67. Chawla, D. (10 April 2020). "Understanding the 'Bhilwara model' of COVID-19 containment" New Delhi: Invest India. Retrieved from <https://www.investindia.gov.in/team-india-blogs/understanding-bhilwara-model-Covid-19-containment>.
 68. Pandit, A. (16 May 2020). "Covid-19: India likely to produce 2 crore PPE by June-end". New Delhi: The Times of India. Retrieved from <https://timesofindia.indiatimes.com/india/Covid-19-india-likely-to-produce-2-crore-ppe-by-june-end/articleshow/75769392.cms>
 69. PTI. (25 May 2020). "India manufacturing of 3 lakh PPEs, N95 masks per day! Provides around 111.08 lakh N95 masks and 74.48 lakh PPEs so far". New Delhi: Financial Express. Retrieved from <https://www.financialexpress.com/lifestyle/health/india-manufacturing-of-3-lakh-ppes-n95-masks-per-day-provides-around-111-08-lakh-n95-masks-and-74-48-lakh-ppes-so-far/1969911/>
 70. Freak, K. (23 Nov 2017). "Problems in Dharavi". Prezi. Retrieved from <https://prezi.com/2d32q5hn2uen/problems-in-dharavi/>
 71. Dutta S.S. (7 May 2020). "As COVID-9 cases surge, India sees big rise in patients requiring ICU, ventilator". New Delhi: The New Indian Express. Retrieved from <https://www.newindianexpress.com/nation/2020/may/07/as-covid-9-cases-surge-india-sees-big-rise-in-patients-requiring-icu-ventilator-2140460.html>

PART B – REPORT ON ONLINE COURSE

FUNDAMENTALS OF PROJECT PLANNING AND MANAGEMENT

Teacher: Yael Grushka-Cockayne,
Assistant Professor, Darden School of Business, University of Virginia
Duration: 18 hours (4 weeks)

COURSE FORMAT:

Week 1	Course Overview and Objectives	What is a Project?	Define the project and objectives	Organization and stakeholders	Project Success and Failure	Project Life-Cycle
Week 2	Purpose and Misuse of a project plan	Detailed Scoping	What are Dependencies?	What is the Critical Path?	How do we Schedule?	What if I don't like the plan? Making changes
Week 3	What is Risky about projects?	Identifying and Assessing Project Risks	Schedule Risk Analysis 1	Schedule Risk Analysis 2	Cost Risk Analysis	Planning for Ambiguity
Week 4	From Plan to Action	Earned Value	Those who execute	Agile, Scrum and Kanban	Course Wrap Up	

COURSE DESCRIPTION:

This course provides the knowledge for scoping projects, sequencing activities, minimizing risks and utilizing resources. It introduces basic concepts from project planning, critical path method, network analysis and simulation for project risk analysis and Agile project management. Some behavioural biases and their impact on planning and execution have been described.

In this course the different Software tools, things concerned with Project planning and management were covered.

OBJECTIVES OF THE COURSE:

To learn the details about Fundamental aspects of Project Planning and Management.

It is an introductory course on the key concepts of planning and executing projects. It trains the learner to identify the factors that lead to the success of a project. It also equips the learner to plan, analyse, and manage projects. Learners are exposed to state-of-the-art methodologies and to the challenges of various types of projects.

COURSE CONTENT:

WHAT IS A PROJECT?

There are different kinds of projects:

1. Personnel projects: School assignment or any research project.
2. New product development projects: development of Airbus 380 or development of a new Tesla car.
3. Drug development project: development of a new personnel device like iPhone
4. Putting up a website: service online as healthcare.gov.
5. Megaprojects: Construction projects such as Sydney Opera House or Pyramids in Egypt.
London Heathrow's Terminal 5 construction, The New York City's new transportation hub at World Trade Centre
6. Events or Festivals: Organising FIFA World cup or shooting film from script to cinema. Organising a festival. For instance, Cannes Film Festival, Production of a Broadway show.

All projects:

- Have a specific and unique aim to create a specific and unique product or service
- Are temporary
- Have a specific start and finish
- Have a temporary organization
- Require multi-disciplinary coordination: Individuals with different set of expertise from different locations coming together
- Are constrained by time, cost or resources

DEFINITION:

According to Harvard Business Review, "A project is a unique set of activities, meant to produce a defined outcome within an established time frame, using specific allocation of resources."

According to Project Management Institute "A project is a temporary endeavour undertaken to create a unique product or service."

What is not a project?

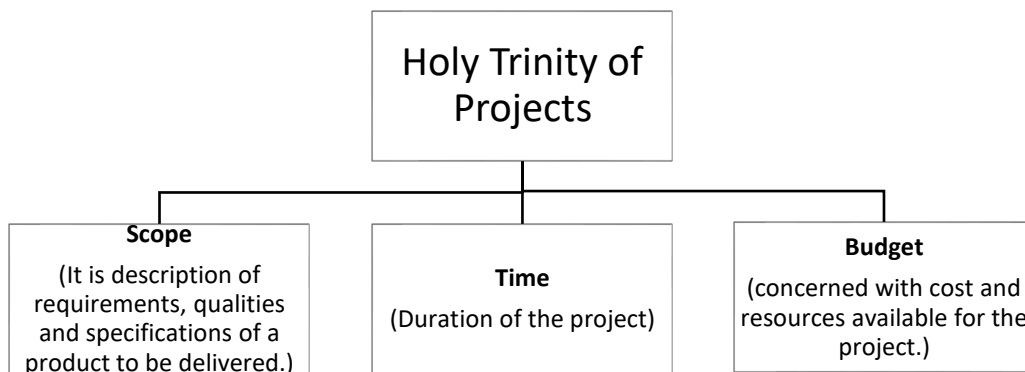
Manufacture of some type of clothing item, a new car and routine processing of certain job or insurance applications are not projects, as they are not temporary, and do not have unique set of individuals coming together.

Project should be defined properly to find correct tools to be used during planning and execution. At first the goals and then 3 objectives Scope, Time and Budget are defined. Lastly the organization needed is thought about.

GOAL OF PROJECT:

We must consider goal as higher level objective - what is the unique product or service which is to be provided, why are we bringing the temporary organisation together and why are we even engaging in this activity?

OBJECTIVES OF A PROJECT:



We must map out 3 objectives and find which one we are going to be constrained by; which one could be optimised and which one could be compromised upon. We must define which objective is constrained, is limited and we are unable to exceed.

If we are limited by time, we might have to reduce scope or decide to spend more money. We must be thoughtful about trade-offs and the priorities among the three.

If any objective is not constrained, we might like to optimise it.

At times we might think of making a compromise for instance, the time could be compromised and things could be delayed.

Examples:

1. healthcare.gov.in had limited scope - compromise was made on time and budget had to be optimised to be kept minimum.
2. In Wedding, date is fixed so that time is constraint, budget is compromised upon to optimise scope.
3. Juice products: New product development, build a new facility to deliver product. Constrained by scope – time can be optimised and budget can be compromised.
Find additional investors and ways to support ourselves.

So, when the project is initiated firstly goal, secondly objectives and trade-offs among them are identified and lastly, we have to think about organisation and stakeholders.

Whether our employees would do the work and when? Or Will we rely on external contractors?

When they get involved who will be a Project Manager, who will pay for the Project. Who is funding the Project and when fund would be available to us? Think about consumption of product of project or the service. Who is final costumer?

STAKEHOLDER CYCLE:



The strengths and weaknesses of the stakeholders influence our project and its success.

STAKEHOLDER POWER INTEREST GRID:



For instance, in case of Cold press organic juice: Lumi juice plant project and in case of Whole foods supermarkets are stakeholders. Working and cooperating with Whole foods and chain of supermarket will be key to our success. In this project apply to U.S. Department of Agriculture Organic Certificate to comply with stakeholder's mission.

Power interest grid was developed by Ed Freeman at Darden, University of Virginia. According to him we must identify the stakeholder's power (high or low) and interests (high or low).

If stakeholders have:

- Low power + Low interest - We only have to monitor.
- High power + Low interest - We must try to keep them satisfied because if they are not satisfied it is critical
- High power + Low power not satisfied they become high power + high interest stakeholder when it is a signal that the project is not going well.

Key large-scale projects in the past were not successful because they failed in identifying stakeholders and their innovations properly.

For instance, US 1995

Opening of Denver International Airport had opened 16 months late and it went 2 billion dollars over budget because of the following mistakes:

- There was a lack of proper plan for different stakeholders involved
- There were multiple parties of different nature
- Project manager was not able to succeed.
- By not identifying the different interest they have and their different power.

PARADOX OF PROJECT MANAGEMENT:

It means that at the same time management techniques are developing and improving yet failures are becoming more and more apparent.

For instance,

1. Boeing's shares plummet because Dreamliner is delayed again for the 5th time.
2. Products routinely pull out and cancel their new developments because their project is unsuccessful.
3. Websites and services are launched and face a string of failures.
4. Various IT projects are known to exceed their budget and take too long.

Main reasons for failure:

1. No clear goal, no planning at all, no identification of scope and no estimated timeline.
2. Lack of leadership and commitment by stakeholders. If we lack to consider them and they are not committed to our project our project cannot succeed.
3. Lack of training on new technology.
4. No lesson learned from historical projects.
5. Lack of proper project management training: Project manager without taking a course having no certificate and having no knowledge about project management.
6. There are certain individual biases being sanguine and overconfident about capabilities. At times, the cost is ignored and timely decisions are not taken.

For successfully carrying out the project Aaron Shenhar and Dvir introduced 4 dimensions.

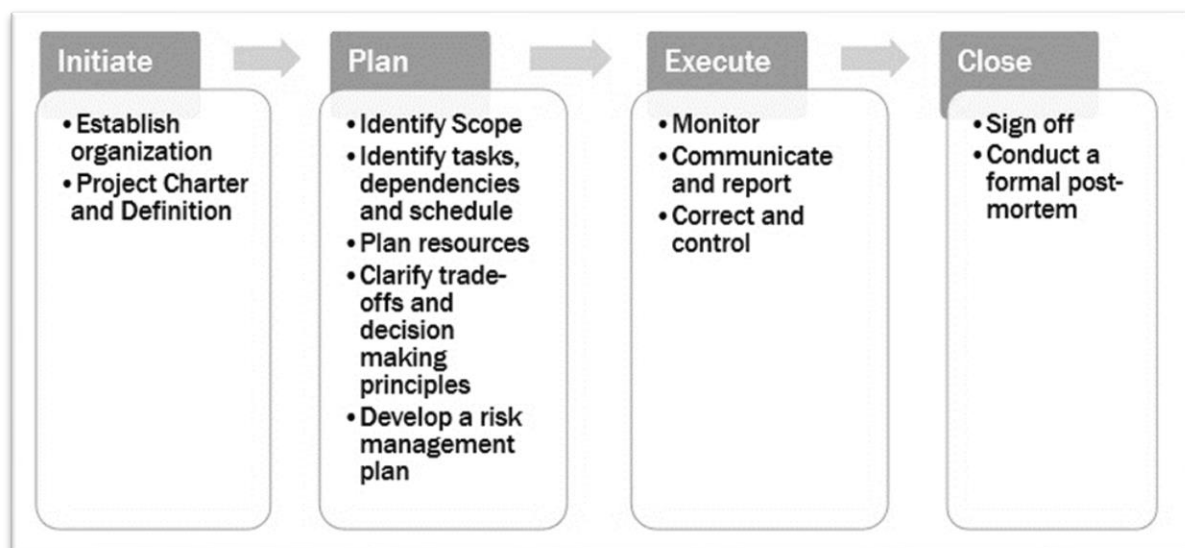
1. **Technology** identify proper tools and techniques of management of projects.
2. It is a derivative in terms of its **Novelity**
3. **Pace** in which it is required to hit market it is neither regular or blitz.
4. Dimension of **Complexity** rate it as moderately complex.

SUCCESS OF PROJECT:

The success of a Project is defined with respect to its objectives.

A successful project will be ***a project that delivers the scope and is on time and within the budget.***

PROJECT LIFE CYCLE:



These stages are of different length in different projects and balance between them depends on nature of project.

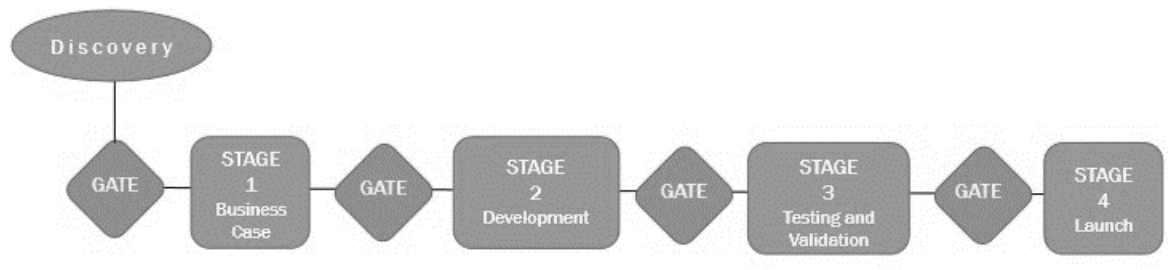
For instance,

1. New project development - implies a certain time spent on planning and different extent of time spent on its execution.
2. In Routine construction project - putting down a new rail line -less time needed for planning but execution is lengthy.
3. Wedding - Planning is lengthy but execution is date of wedding.

During execution it is realised that an unanticipated uncertainty has been faced then we must make corrections to our plan. Hence life cycle of the project could be iterative.

New product developmental companies like to take a broader look and stand back and think about execution of project in context of Stage gate process which allows for reflections during the progress through lifecycle.

STAGE GATE PROCESS (COOPER AND EDGEII 2011):



Identifying life cycle and acknowledging the fact that it could be needed to iterate between the different stages of it regardless of use of stage-gate or other process.

It allows us to reflect upon each part of the production as we progress through life cycle in the development of our product.

PLANNING:

According to Peter Ducker, a management guru, an action plan is a statement of intention but is not a commitment. Plan must be revised often and continuously. Plan must become basis of executive time management. It includes:

- Identifying scope,
- Identifying all the tasks and dependencies among them &
- Schedule

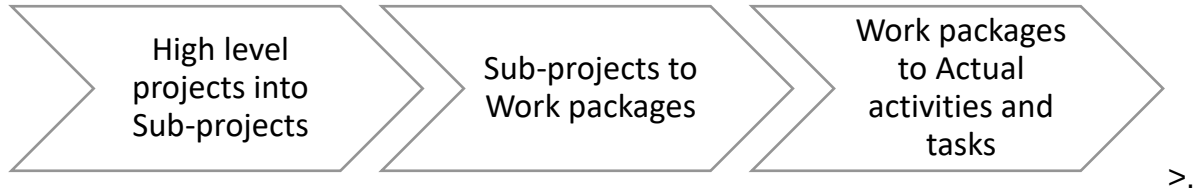
As a part of plan think about resources and clarify trade-offs that we are going to make in term of cost, resources versus time and finally develop useful risk management plan.

Project management office is needed. Types of meeting and held how often. Be aware of pressure points and milestones that must be hit. During the execution you might have to make amendments in plan.

Planning a Project (WORK BREAKDOWN STRUCTURE):

Scoping project properly - it is probably the most neglected step.

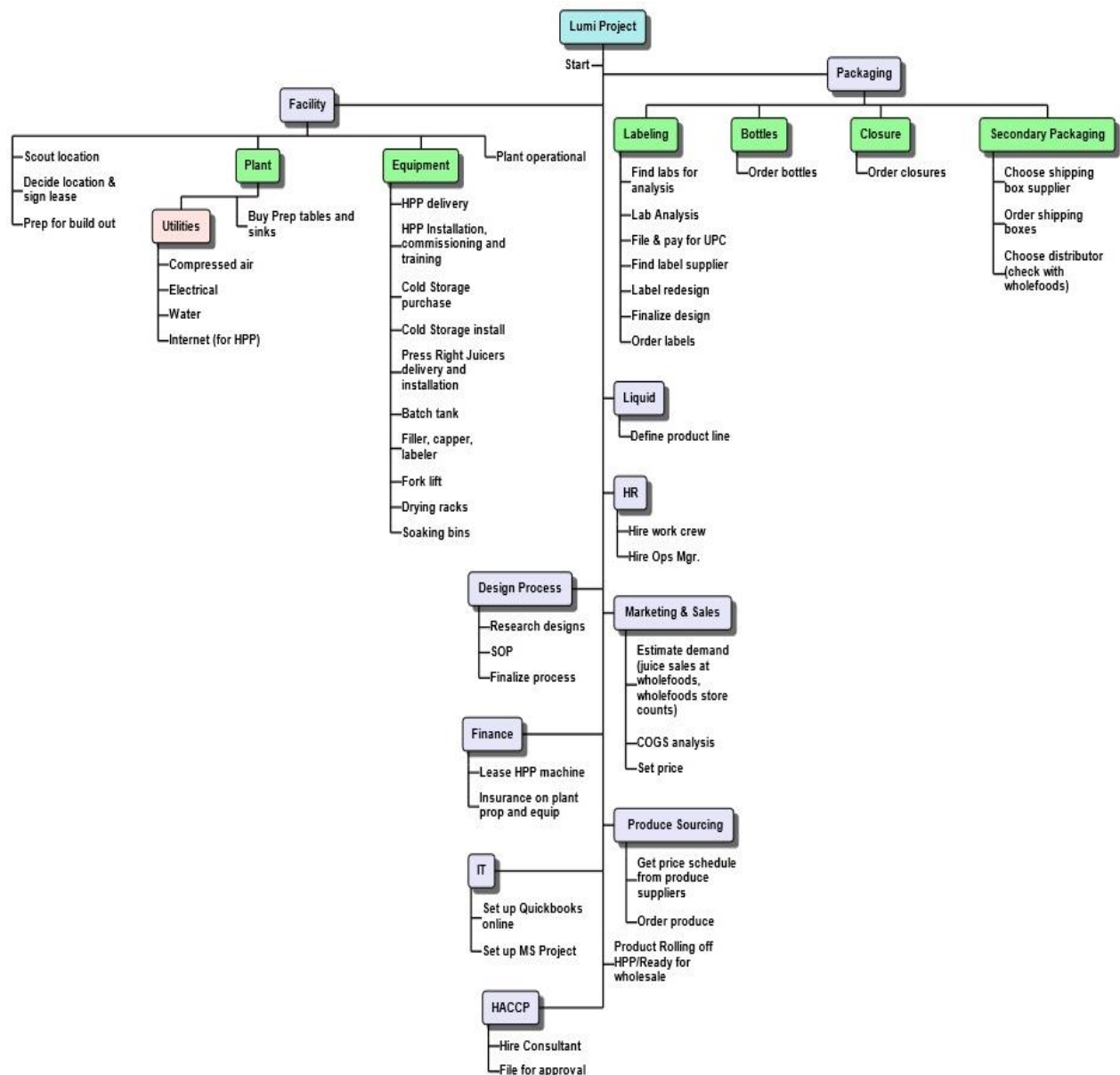
Use a tool called **work breakdown structure** (visually breaks down Project Scope).



For instance, Manufacturing of a new cold press organic juice.

Think about facility, manufacturing process, recipe that goes into product and getting it certified.

For instance, **Work Breakdown Structure for Lumi juice plant:**



We might have to think about cutting down some of our scope or add certain activities if a project has many different components and a very large number of tasks.

Resources needed in different domains. Certain activities might not have been realised to be part of scope and included in the planning.

Work breakdown structure visually breakdowns project scope.

Start with something which can be amended.

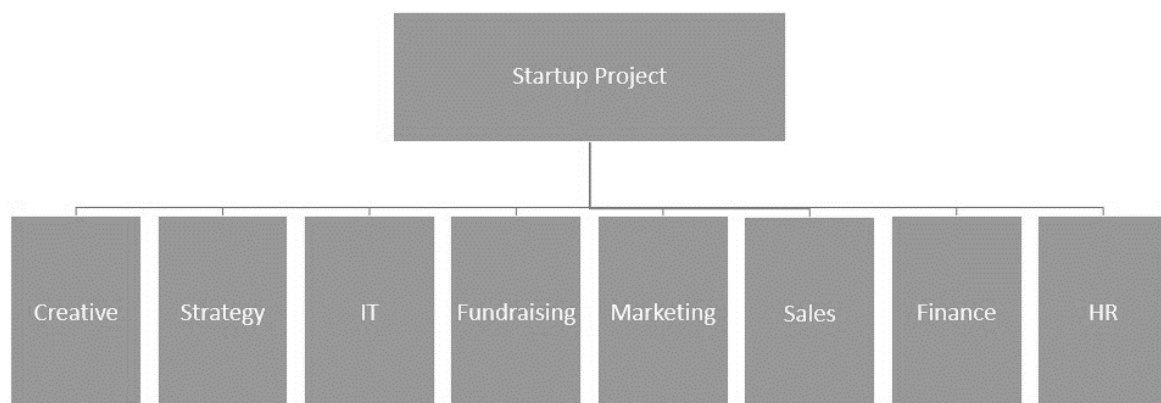
A team of persons from your side and clients will carry out this.

Microsoft Project has a WBS ability in it.

Each task in tree must be executed by a specific resource and it should be somewhere between 5 to 10% of the work.

The dependencies among activities must be thought about. These will give us the logical flow of project and will allow us to find the duration of project.

Work Breakdown Structure of Startup project:



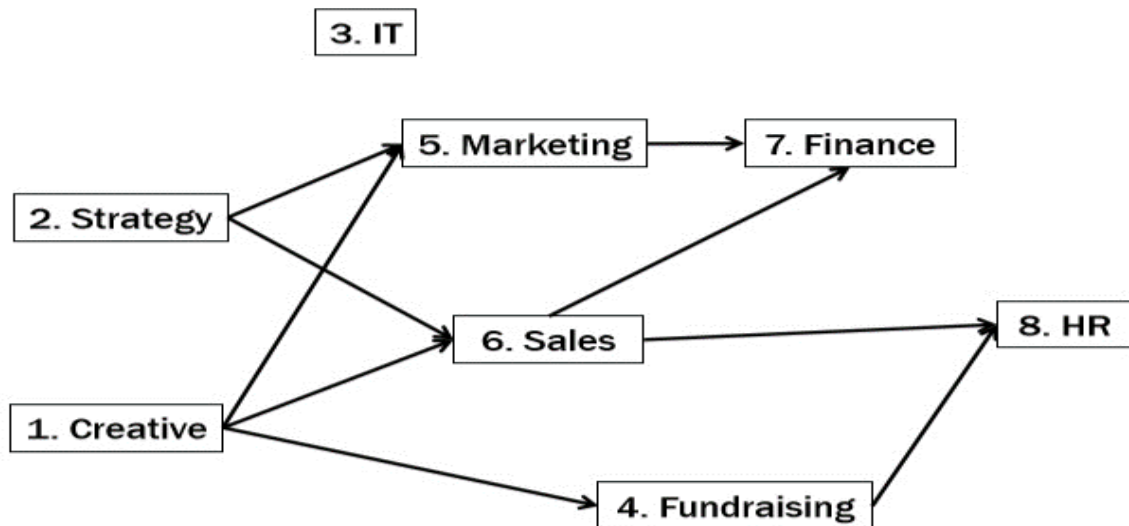
Startup project example:

1. Using Design Matrix, we can find the dependencies.
2. Similar information can be represented in a tabular format.

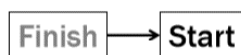
Activity #	Description	Predecessors
1	Creative	-
2	Strategy	-
3	IT	-
4	Fundraising	1
5	Marketing	1,2
6	Sales	1,2
7	Finance	5,6
8	HR	4,6

In this case Fundraising depends on Creative; Marketing and Sales depend on Creative and Strategy; Finance depends on Marketing and Sales and HR depends on Fundraising and Sales.

3. Network diagram which is visual representation of our project - flow of information and the physical aspect of the tasks and the materials required. But technically it is not correct because IT is not installed here. Use of network diagram is advised to ensure that there are no hanging tasks at the end of the day.



TYPES OF DEPENDENCIES:



1. Finish to start relationship: Task B could be started only after the completion of Task A.
2. Finish to finish relationship: When 2 tasks need to finish together. For instance, in wedding bride and minister or rabbi arrive together.
3. More complex relation exists where we have a start, a start implying a finish.

In our start up example now let us consider about duration estimations in weeks for each one of our tasks.

Activity #	Description	Predecessors	Duration (Weeks)
1	Creative	-	5
2	Strategy	-	2
3	IT	-	4
4	Fundraising	1	4
5	Marketing	1,2	2
6	Sales	1,2	5
7	Finance	5,6	2
8	HR	4,6	1

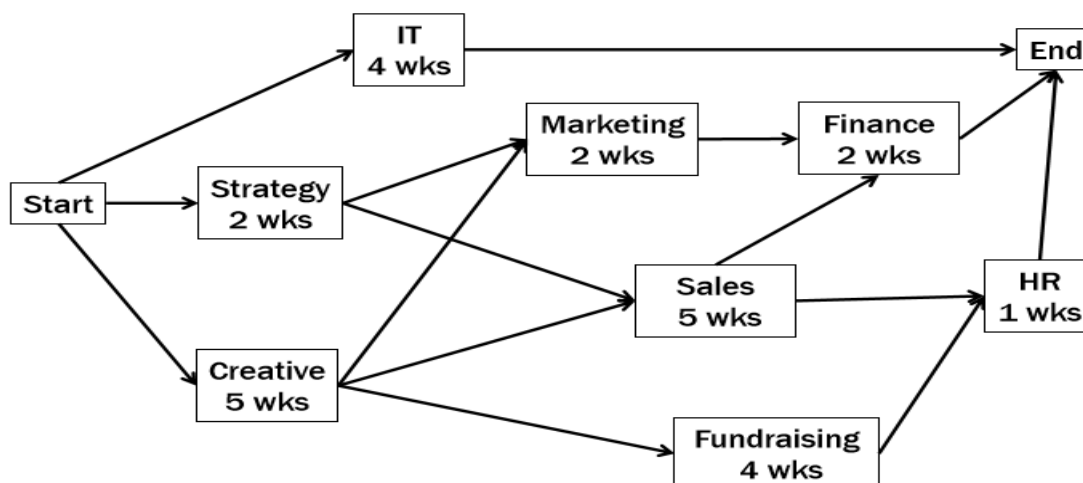
Parkinson's law (Cyril Parkinson in 1950s) tells that if we plan for an activity to take a certain amount of weeks, be sure that work will fill up entire duration.

Students syndrome says that I give you 4 weeks to complete a task you are not likely to start working on that task until very last minute

Like students if we procrastinate and postpone our work and only work towards the end of duration. So even if we know that a task is going to take 2 days, we shall give 2 weeks.

PROJECT DURATION:

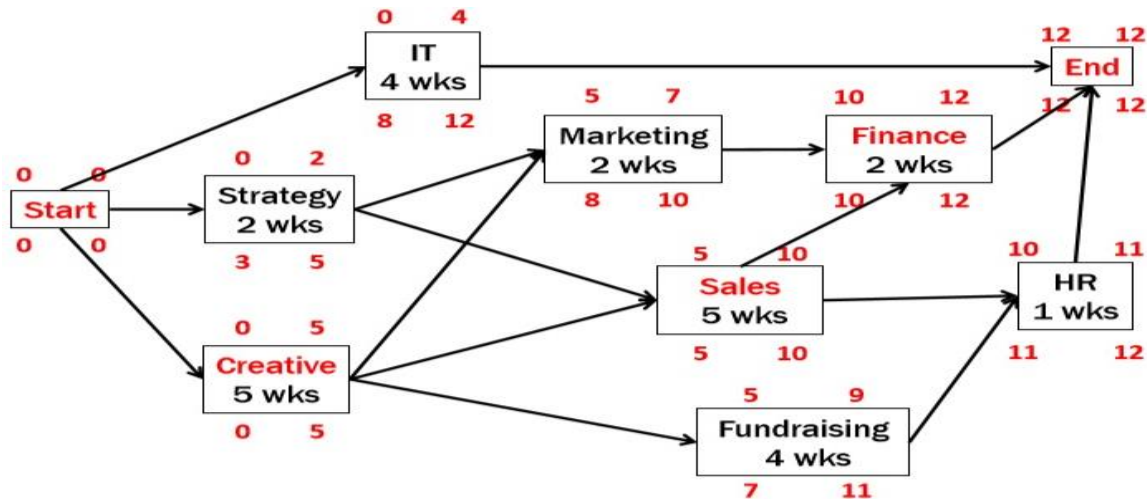
A systematic way was developed in 1950's allowing identification of completion date.



At time 0 we could start IT, Strategy and Creative tasks. They will be completed in 4, 2 and 5 weeks respectively. After completing Strategy and Creative tasks my Marketing task can begin in the 5th week. It will be finished at 7 weeks. My sales activity can start at 5 weeks taking 5 weeks and finished at 10 weeks. My FR depends on Creative and can start at 5 weeks and will be finished by 9 weeks. Finance can start at 10 weeks and completed at 12 weeks. HR activities depend on

sales and fundraising could start at 10 weeks to be completed at 11 weeks. So, completion time estimated being 12 weeks in our network diagram.

CRITICAL PATH ANALYSIS:



(Critical path analysis)

Creative 0 week as it feeds marketing, sales and FR, must be completed by 5 weeks.

Strategy latest at 3 weeks. It feeds into sales and marketing must be completed by 5 weeks.

Sales latest at 5 weeks because it feeds HR and Finance therefore must be completed at 10 weeks.

Marketing task at 8 weeks as it must be finished at 10 weeks.

IT task latest at 8 weeks.

FR latest at time 10 weeks.

HR latest at time 11.

The critical path happens to be the longest path of activities. Any delay in any of those activities will cause delay in completion time.

Plenty of good, well programmed tools for calculation of critical path are available. One of them is Microsoft project. In Gantt chart the critical activities and the critical path is visible.

Critical path analysis for duration estimate and identify the activities that are critical and they must be started as early as possible and need to be finished in time.

Non-critical task have some slack associated with them

IT 0-4 we can start as late as 8 weeks.

AS SOON AS POSSIBLE (ASAP) VS. AS LATE AS POSSIBLE (ALAP) SCHEDULE

Benefits of an as soon as possible schedule versus as late as possible schedule.

Are we constrained by cost or time?

	Cost	Time
As Soon as Possible	✗	✓
As Late as Possible	✓	✗

If we are constrained by time we are going to compromise on our costs and if we are constrained by costs having a limited budget we can compromise on time. If the cost is our priority the schedule could be as late as possible.

We must focus our attention on the critical path in order to shorten the project duration.

Identify tasks on the critical path that can be shortened or crashed reduce project duration. Do we need additional resources and need to spend more money? When we have identified the least expensive task that we can shorten. Now a new critical path, new longest path might emerge when other activities may have to be crashed.

All tasks in the critical path even if many, will need to be shortened to reduce overall project duration.

If it is not possible to invest additional resources so as to reduce some of the critical tasks, we should think about eliminating some unnecessary tasks. We could think of outsourcing some work.

We can reduce the duration of the project by reducing scope.

Bertha Wright from university college London have compiled a list of the mistakes committed by different firms.

1. Many firms neglect to come up with a proper work breakdown structure. Without proper scope, proper project estimation - the duration estimation and proper network diagram or critical path and cost estimates will be incorrect.
2. Task durations are specified in terms of work and not in terms of actual duration.
3. Without network diagram spotting of critical path is difficult.
4. Other common mistakes must do a lot with the precedence relationships predecessors and successors. If tasks in project are scheduled in right sequence but do not have relationship, future cannot be realised.

Checklist:

- Is work breakdown structure available and complete?
- Have enough individuals in organization seen and agreed to it?
- Have we seen network diagram?
- Do we have one start and one finish?
- Do we have successors and predecessors to all tasks?
- Are there natural points in our project that have important deliverables or many different paths meet and come together?
- Did we look at Gantt chart?
- Are dependencies properly presented?
- Are we making use of dates in a correct way?
- Do we have a clear path from start to finish?

For instance, The Virginia festival of the Book takes place for 5 days with over 200 events, every year at Charlottesville in March. The 21st annual festival was held from 18th March 2015. It was a huge project and had hundreds of tasks. The project took 10.5 to 11 months in planning identifying a correct critical path knowing milestones with the festival which lead to the success of the festival.

RISKS ASSOCIATED WITH THE PROJECT:

Christoph Loch and his colleagues working at INSEAD defined some terminology which we will be using. At first, we will think about foreseeable uncertainty. What risks shall be faced by the project? Natural variations in task duration, conditions associated in change in weather might impact duration and execution of project. Alternative paths might have to be taken. Uncertainties could be positive or negative and we can conceptualize how to deal with them. Another source of uncertainty comes with complexity of project. When multiple tasks interact with each other or we have stakeholders that might interact with each other and might lead to unknown outcomes. We cannot plan a mitigation plan. But we know that the project is complex and so we must think in that context. And finally, we have unforeseeable uncertainties. We are dealing with a very novel technology or a brand-new market that we have never experienced before. We call them unknown unknowns (Ambiguity).

Sources of uncertainty (Loch, DeMeyer, Pich 2006)



Where you fall in terms of demand uncertainty and technology uncertainty?

1. Identify the technology of your project and demand identifies your clients and your revenue stream. The companies that operate in the base of pharma, computer and software industries consider their projects being typically high uncertainty or high degree of uncertainty both in terms of technology and demand.
2. Projects that have to do with wholesale, utility, banking or construction might sometimes be considered lower risk. There is a low level of uncertainty associated with both technology and demand.

Mapping risks on 2 axis of ambiguity and complexity will help to identify the best way forward. If there are a few interactions the project is not highly complex. Tasks are very sequential or not many stakeholders are involved at the same time. When there is low uncertainty, low variation and few interactions straightforward planning will suffice but when high degree of risk is introduced from the complexity of project then additional avenues will have to be added to planning and execution.

3. If ambiguity goes up, we must come up with a risk management plan which allows us to plan mitigation, contingencies and reactions to uncertainties in life cycle of the project.
4. If the project is highly complex and highly ambiguous with unknown unknowns then an opportunity for trial and error, for parallel exploration must be included. The tools used upto now will not be useful. Scoping will require different mindset parallel experimentation, mistakes to be made and information to be gained.

RISK MANAGEMENT PLAN:

Identification	Assessment	Response Planning	Monitoring and Control
- Brainstorming, checklists, previous projects, experts - Risk Register	- Impact - Likelihood - Prioritized Risk Register	- Identify response strategy to each risk - Assign responsibilities	- Update risk probabilities - Execute planned strategy if events occur

Risk Assessment Table:

Almost Certain (>75%)					
Likely (50-75%)					
Moderate (25-50%)					
Unlikely (10-25%)					
Rare (<10%)					
	Insignificant	Minor	Moderate	Major	Catastrophic

Impact

Probability Impact Matrix:

Risk Score = Probability X Impact

	0.05	0.1	0.2	0.4	0.8
0.8	0.04	0.08	0.16	0.32	0.64
0.6	0.03	0.06	0.12	0.24	0.48
0.4	0.02	0.04	0.08	0.16	0.32
0.2	0.01	0.02	0.04	0.08	0.16
	0.05	0.1	0.2	0.4	0.8

Impact

For instance,

- If we are shooting a film in December, January and February we anticipate harsh weather likelihood of which is moderate and impact is minor. The delay will not be extreme.
- Constructing and opening an International airport -
 1. Denver International Airport
 2. London Heathrow Terminal 5

A new baggage handling system was put in place. We identified a risk that it might not operate properly. We may want a mitigation plan because if it occurs it would hugely upset the passengers and airline. Or we may have to develop a backup system asking other firms to develop parallel attempts to come up with a new baggage system ie. a Contingency plan.

We might think about redundancy—having 2 parallel plans to ensure if 1 goes wrong we have a backup in place. We might think about hedging if risks are financial in nature and have cost implication.

More importantly we identify an individual who has to track the progress and has to alert us if anything goes wrong.

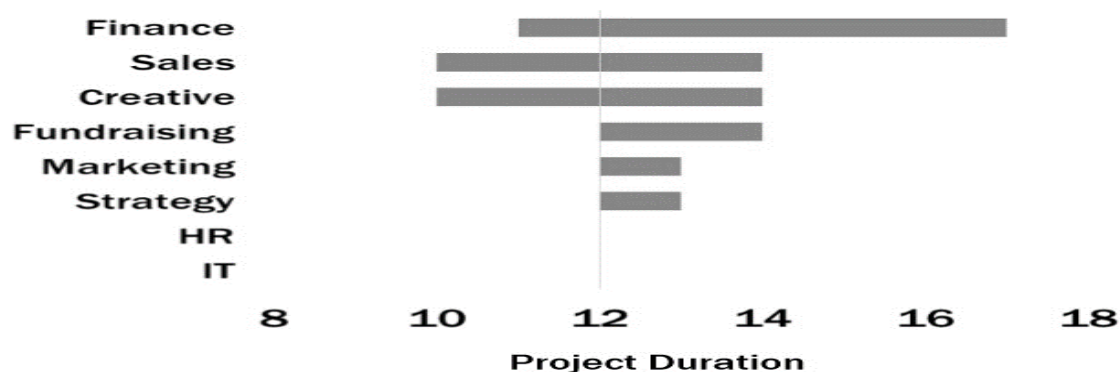
The risk registers are crucial for the success of our project.

We have come up with Work Breakdown Structure and identified 8 tasks in our project. We are aware of the duration and sequence of these tasks. With the help of network diagram and critical path analysis we have identified the duration of the project. What happens if creative task takes longer? What's actual impact on overall project duration (12 weeks) if it takes 7 weeks or 3 weeks? There could be variability in the other tasks also. They could go sooner or later and have impact on the duration of the project.

So, we should develop a list of minimum and maximum durations for each of the tasks.

Activity #	Description	Predecessors	Min Duration	Likely Duration	Max Duration
1	Creative	-	3	5	7
2	Strategy	-	1	2	6
3	IT	-	3	4	5
4	Fundraising	1	2	4	8
5	Marketing	1,2	1	2	6
6	Sales	1,2	1	5	7
7	Finance	5,6	1	2	7
8	HR	4,6	1	1	1

The swing in project duration can be made out by seeing the tornado diagram or chart which is visual representation of variability in overall project duration. HR and IT tasks have no impact on project duration.



Our project duration ranges from 11-17 weeks.

CONDUCTION OF RISK ANALYSIS:

Taking into consideration our Start-up project: We shall use Crystal Ball Or @ RISK or any other alternative tool. We shall use Triangular distribution. I could assign this distribution to each task separately. Upon pressing a button in the tool may be a million times a million patterns of my project will emerge. I will be able to conclude about the duration of my project.

Now I assign a distribution for each of my tasks, I run it a million times and get a million potential futures.

Earlier we have calculated using critical path analysis that project duration is 12 weeks.

Here I find that there are close to 75% chances that it will take longer.

95% chances are that it will be completed in 16 weeks

If I use the tool to come up with confidence ranges. I am 90% certain to finish between 10.5 to just over 16 weeks.

After this by varying each task at a time and to think about its impact on project duration.

Then all of them were allowed to vary simultaneously to estimate project duration. We might find different critical path. We find that 93% of creative and 70% of Sales activity are on critical path. Schedule variability & uncertainty exists in project completion time and similarly certain uncertainty is also related to cost. External effects for instance, Weather or regulation that imply that we must pay more when extra resources will be needed. We must ensure that we do not exceed budget.

Simulation Analysis: for uncertainty that exists in our budget. Do not put contingencies on each task even though they could be variable in terms of duration. The project manager must be allowed to control that contingency associated with budget. Similar steps that were taken for the schedule will enable us to forecast the cost of project. Suppose a project is going to cost between \$346000-\$354000 with many unknown unknowns to us, contingencies to be sure that we meet this project budget set it at \$350000.

If we are having highly ambiguous projects with many unknowns to us, new technology, new customers, new market and new opportunities. We may not be able to come up with a plan.

We will allow our employees, developers and engineers to conduct work themselves to find more information that will help us adjust our plans for project. We will empower individual teams to take decisions and do short iterations and report successes or failures. However critical path is important. Communication between teams on the field and quick information gain on each sublevel task, to communicate to higher level management is necessary.

For instance, Lumi Juice (founded : April 2013, by Hillary Lewis an MBA student with limited budget with only 2 resource, 2 people). She kept on referring to the Gantt chart which helped her set critical path bringing success.

How to Conduct Risk Analysis:

Start with Excel to determine what uncertainty or variability exists in individual tasks. We set spreadsheet, Enter the list of 8 tasks; calculate early start - early finish and late start - late finish. I would also calculate it in a network diagram. Now I will look at the impact of variability of each task on project duration.

For instance, Creative task takes 3 weeks instead of 5 resulting in completion of project in 10 weeks instead of 12 weeks.

On the other hand, it takes 7 weeks making the duration 14 weeks.

Strategy task might take 1 week and the project duration is 12 weeks.

But if it takes 6 weeks the project duration will be 13 weeks.

I can execute on this analysis for each one of the tasks and come up with my list of minimum and maximum durations changing each one at a time and keeping the others at their most likely estimate. Try to find variability of which task has most impact on overall project variability.

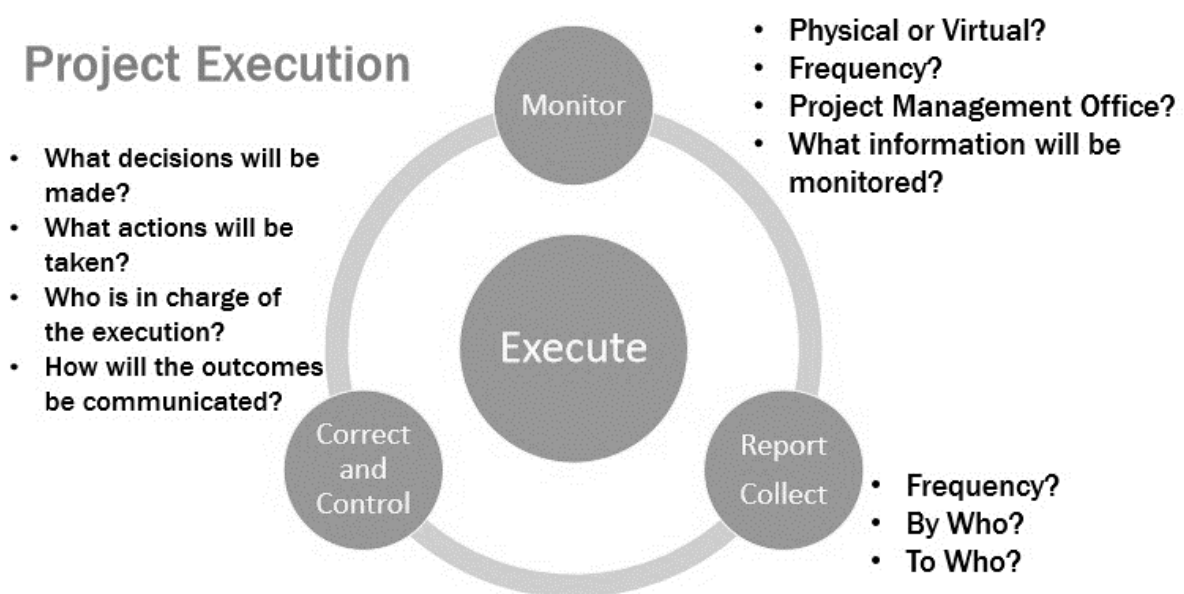
I will come up with tornado chart. I will select the bar chart. In the tornado chart we see the swing and which task has the most impact on the project duration.

We find that finance gives me the biggest swing from 11 to 17 weeks.

I want to see what happens when all my tasks vary simultaneously what is the impact on duration of project. We shall carry out Monte Carlo simulation by using Crystal ball.

We find assumption in crystal ball and get the Triangular distribution. The only task that is not variable is HR and takes 1 week. The project duration can be forecasted. We can test a million futures for the project. If I am trying to finish the project in 16 weeks. I can find that there is certainty in the region of 95% that the project will take 16 weeks. I ask Crystal ball to plot on the chart for instance 95 percentile with all values upto 16 weeks. So, I have just 5% chance of exceeding that and that might be a good comfort zone for me.

PROJECT EXECUTION:



Are we scheduling weekly meetings and who is in-charge of meetings and who are going to attend them? Are individuals associated with the tasks / are all stakeholders or related parties going to show up? How do we correct if something has gone wrong.? If we are behind time what do we do? Do we have some flexibility in scope and who can decide to reduce the scope? Who can hire additional personnel or outsource and seek an expert to come for help?

How will we communicate to the rest of the team? How will updates be communicated in terms of change of directions and alternative path to be followed from now onwards?

For instance,

Startup Project: 12 Weeks, \$8500

Activity #	Description	Predecessors	Duration (Weeks)	Cost
1	Creative	-	5	\$1000
2	Strategy	-	2	\$500
3	IT	-	4	\$3000
4	Fundraising	1	4	\$500
5	Marketing	1,2	2	\$2000
6	Sales	1,2	5	\$500
7	Finance	5,6	2	\$750
8	HR	4,6	1	\$250

We have information about Fundraising, Marketing, Sales, Finance and HR. We are aware that the critical tasks include Creative, Sales and Finance. Let us assume that we started and 2 weeks have passed.

Activity #	Description	Duration (Weeks)	Cost	Work Completed	Money Spent
1	Creative	5	\$1000	25%	\$500
2	Strategy	2	\$500	75%	\$300
3	IT	4	\$3000	25%	\$1000

Creative, Strategy and IT tasks have started, they are 25%, 75% and 25% complete costing \$500, \$300 and \$1000 respectively. We must update our Gantt chart. We see that we are behind on Creative(critical task), Strategy and IT (not critical tasks).

The software tools give us the following:

- **Creative: 25% completed, actual cost \$ 500**

- Scheduled work = 40% (2w/5w)
- Actual work = 25% (1.25w/5w)
- Budgeted Cost = \$ 1,000
- Planned Value = 40% x 1,000 = \$400
- Earned Value = 25% x 1,000 = \$250
- Actual Cost = \$500

- Schedule Performance Index (SPI) = Earned Value / Planned = 63%
- Cost Performance Index (CPI) = Earned Value / Actual = 50%

Here we are over budget and behind time in terms of our schedule. Alternatively, if we are ahead of schedule and under budget, it would indicate that either we have neglected some component of scope or missed some crucial task(s).

WHY DO PROJECTS FAIL:

Most projects fail being

1. Delayed
2. Over budget
3. Delayed and Over budget

Why does it happen?

- **Technical Factors:**
 - Internal Complexity
 - External Complexity
- **Human Factors:**
 - Multitasking
 - Parkinson's Law
 - Student's Syndrome

We should think about working in smaller teams, breaking the work into smaller components and allowing them to work independently and efficiently. We should think about a buffer on project level. All of us will try to complete a work as soon as we can and report that we are done and go ahead and help our team work towards for completion of project in time.

AGILE PROJECT MANAGEMENT popular especially in software development firms in year 2000 Many firms were growing. The release schedule of product was slowed down and there was a decline in the quality of product. The morale of engineers working on the product became low.

A group of 17 visionaries came together in 2001 and signed Agile Manifesto.

Agile Principles and Manifesto

We follow these Twelve Principles of Agile Software:

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Business people and developers must work together daily throughout the project.
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- Working software is the primary measure of progress.
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity--the art of maximizing the amount of work not done--is essential.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

They came up with a few mechanisms. Two of those are considered here.

1. **Scrum Sprints:** The work is done in an iterative fashion, to limit the amount of working small iterations in a very collaborative fashion to ultimately deliver to the customer the working product.
2. **Kanban Approach:** It has to do with working continuously, limiting the amount of work in progress at any given time in the system but constantly delivering output.

In both, work is done in small units in small cohesive teams, putting the customer's needs and delivery of working software as the top priority.

Scrum Approach: We need a group of developers. A trained scrum master is required. A product owner is required who serves as a liaser between the scrum master and the team and the customer. We need a customer involved throughout in the process. The group of developers must be cross functional. We need a coder and we need somebody to do Quality assurance. Together they work as a scrum team. This team is self-organizing. Scrum master is in-charge of blocking or tackling anything that gets in the way. He coordinates different individuals, allowing them to help each other and to have a constant flow of information. The product owner sets priorities after getting knowledge from the customer.

The scrum team works together during a sprint. They work on many sprints in a year, each sprint being of 1 to 4 weeks. In each sprint they work intensely on a set of ideas

or a set of features that were defined at beginning of sprint and deliver product at the end.

During the sprint go through a daily standing up meeting for about 15 minutes to share experiences about any problems. We talk and communicate about plan for that day and what did we achieve the day before. At the end of sprint, we review it in which the customers help us. To find what went well and what did not and how can it be improved in next sprint.

BENEFITS OF AGILE PROJECT MANAGEMENT:

It empowers development of teams which can work together at pace. They feel quick turnaround in satisfaction and working closely with the client in developing something that the client wants in a specific time and there is no ambiguity. It helps us have a collaborative atmosphere and a transparency with the client and everybody is satisfied.

CONTENTIONS OF AGILE PROJECT MANAGEMENT:

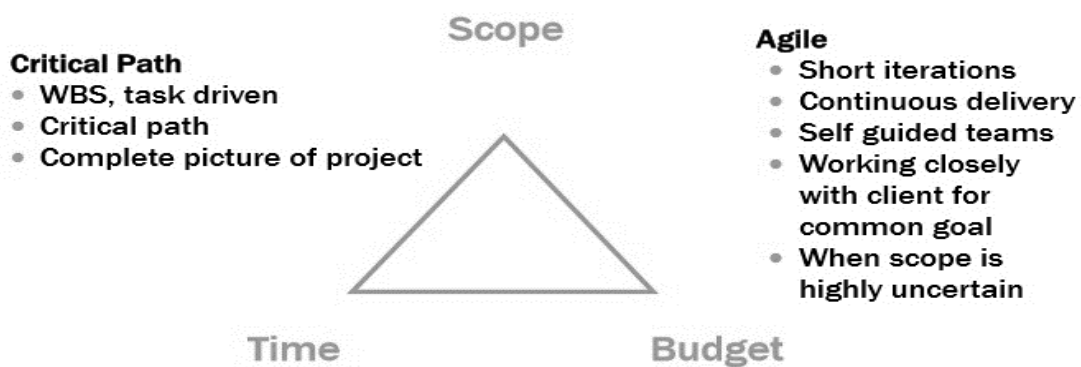
Development of the features are determined perhaps a week or two ahead of time. We are going to have less documentation. We may not know what exact feature or products we will work on in a year or 2. We work on smaller features quickly. We do not write every single feature spending as much time as in case of a traditional product. There is some resistance to estimation at all in agile domain. In agile approach they do not want to estimate the time which will be taken to develop a feature which is sometimes a struggle to fit in context of a larger organization. We need to set the tone right by having meetings throughout the sprint. Everybody and every environment is not suitable for this type of work perhaps work cannot be divided into smaller channels and we cannot work in a modular way. Helping each other out on the tasks might not actually physically be possible if we have many distributed teams across the globe in finding time for daily stand ups or working collaboratively. So, it is not always ideal to work in Agile way.

So, then we might do proper planning following a critical path and come up with Gantt chart and then execute project using earned value analysis.

We may choose a specific subgroup within our larger project to work in a more agile way. If customer will collaborate and interact with us we have small enough team devoted to the project and can work together to deliver small units of work and during quick iterations.

Having tools for each methodology to work successfully is vital part of being successful as a project manager. We use MS project to report on status of project. We report on update of tasks and expenditure and compare with original plan whether we are behind schedule or over budget and when do we anticipate completing our project.

Framework for selecting PM Method



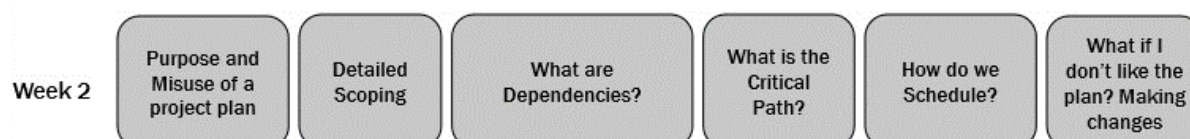
LEARNING METHODOLOGY:

Lectures, Presentation, videos, cases and four weekly tests.



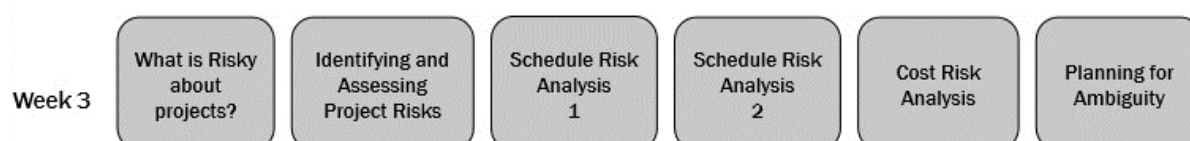
[16 Slides, 8 videos (Total 34 min), 4 readings, 1 quiz- 10 questions]

[Case Study: Heathcare.gov]



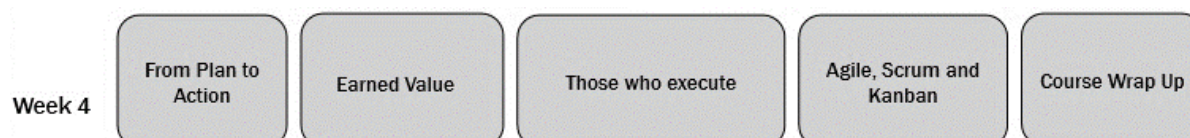
[19 Slides, 9 videos (Total 57 min), 1 reading, 1 quiz- 10 questions]

[Case Study: Virginia Festival of the Book]



[14 Slides, 9 videos (Total 60 min), 1 reading, 1 quiz- 10 questions]

[Case Study: Lumi Juice]



[17 Slides, 9 videos (Total 65 min), 2 readings, 2 quizzes- 10 questions each]

[Case Study: Salesforce.com]

KEY LEARNINGS:

After completing the course, the learner possesses the art of properly setting the goals and objectives and capability to prioritize amongst the objectives in the planning and management of project. Learners will be more cognizant of considering project stakeholder's opinions, recognise the need and benefits from proper project planning. They will also be capable of selecting the most appropriate Project Management Methodology - given the project objectives, the degree of uncertainty and constraints of project.

- How to define, organise and initiate a project.
- How to develop a project plan, including scoping, sequencing tasks, and determining a critical path.
- How to assess, prioritize and manage project risk.
- How to execute projects and using earned value approach for controlling progress and monitoring.