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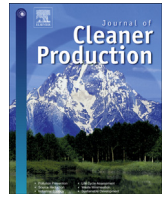
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Now is the time to press the reset button: Helping India's companies to become more resilient and effective in overcoming the impacts of COVID-19, climate changes and other crises



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ABSTRACT

COVID-19 is the pandemic caused by one of the coronaviruses. This virus was not known before the outbreak in Wuhan, China, in December 2019. By January of 2020 it was declared to be a global human health crisis. The deaths and illnesses caused by the virus caused extensive fear and anxiety among people in all societies. The pandemic slowed economic activities nearly to a halt. The challenges of how companies should respond to the disruptions in their supply chains and how they can build more resilient systems, must be systematically addressed. The authors of this paper highlighted essential factors which can help companies to overcome this crisis and other types of crises, by learning from the approaches taken in India, which has a unique and diverse economic system. The Analytical Hierarchy Process (AHP) technique was used to identify the essential factors which can help companies to improve their resilience so they can recover during and after the COVID-19 pandemic era and potentially in other similar complex crises. The results of the AHP evaluation were prioritized by performing a sensitivity analysis to prioritise the essential factors. The "Role of governance" was found to be the most important factor that can be used to help in rebuilding industries and societies and in helping them to become more resilient to future severe shocks. The results of this research were used to develop recommendations for company managers, practitioners and policy-makers. The authors hope that this advice will help India to become a stronger nation with more resilient companies, which are better prepared to anticipate and to respond to future crises. We hope people in other nations will also benefit from the finding presented in this paper.

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1. Introduction

It is widely known that the COVID-19 pandemic does not differentiate between nationality, gender, religion, wealth or the economies and markets it affects. Dramatic challenges have impacted businesses in every country. In this context, India was not spared. In recent years, Micro, Small and Medium-scale Enterprises (MSMEs) were recognised by the Indian Government as the

backbone of the economy, as, they provide about 30% of India's economy (Ministry of MSME website, 2013). The MSME sector is a highly dynamic sector of the Indian economy. It provides extensive employment opportunities and contributes socially and economically to India's stability. Approximately 110 million workers were employed by MSMEs in India in 2013 (Ministry of MSME website, 2013). With the importance MSMEs have in India, revision in the definition of MSMEs has been needed for a long time. This revision came at the time of the pandemic when the industries were in dire need of the help from the Government. The revised categorisation of MSMEs can help them to grow in size as they derive benefits from being MSMEs. This is an important step as their survival has been dramatically challenged by the COVID-19 virus that was first detected in Wuhan, China in November 2019. It has people in the

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entire world in the first half of 2020 because of which, the COVID-19 virus outbreak was declared a pandemic and a public health emergency of International Concern on January 30, 2020 (Euro surveillance Editorial Team, 2020). Till July 2020, there has been 11.4 million cases of COVID-19 and more than 535,000 people have lost their lives (World Health Organization, 2020). Fig. 1 depicts the global deaths due to COVID-19. The data is till 22nd May 2020 and the graph shown in Fig. 1 does not constitute deaths from cardiovascular diseases or cancer, which according to World Economic Forum, are the top causes of deaths in the world.

The COVID-19 pandemic hangs over societies' futures, like a spectre. This pandemic has brought economic activity to a standstill, and has resulted in dramatic declines in global trade and growth (Haleem et al., 2020). The International Labour Organisation (ILO) described the pandemic as the most serious challenge since Second World War; it has forecasted that the pandemic will infect 2.7 billion workers, or 81% of the world's workforce (Livemint, 2020).

The loss of livelihood, social isolation, and fear of contracting the virus have created fear and anxiety among the people which has led to mental illnesses and other types of severe illnesses. Even though, COVID-19 was, at first considered to be a physical health crisis, it has given rise to mental health risks as well as it expands globally into a severe pandemic (United Nations Organisation, 2020). The physical and mental health illnesses have caused increased risks of the survival to millions of people. Therefore, focus should be on incorporating the approaches which would be able to restore the environment and to improve the health of humans which are vital for sustainable development of society (Song et al., 2015). The impacts evolving from COVID-19 pandemic are documenting that this pandemic is causing extensive social, psychological and economic damage. (Laing et al., 2020). The estimation by the ILO stated that in India, more than 90% of the workers work in the informal sector and they are at risk of moving deep into poverty because of the pandemic, which will adversely affect overall societal development (L.L.O., 2020).

This pandemic has increased the urgency to incorporate all three aspects of sustainability, social, environmental, and economic goals into all dimensions of supply chain management including coordinating inter-organisational business practices to ensure improvement in performances of all of the firms in all supply chains (Hussain et al., 2018; Khurana et al., 2019). Moreover, in the current

economic scenario, the success of any firm should be based, not only on profitability, but also on its capacity to contribute to the future of people and planet (Bubicz et al., 2019). This pandemic has disrupted millions of supply chains, filled hospitals with millions of sick and dying people, closed schools; and highlighted the urgency to consider the social aspects of sustainability along with ways to increase productivity of companies, i.e. to make them COVID-19 resilient (P.I.B, 2020a). Although the "Human Dimension" is urgent, it must be balanced with the ecological and economic dimensions of all countries. The United Nations Secretary General António Guterres made an announcement in mid-march 2020 that overcoming COVID-19 would be the main focus of the world and climate change has to take a backseat. Many international policy-making conferences on environmental issues have been postponed till 2021. But, unless improvement stimulus support also includes policies focussing on climate change mitigation, there is a high probability that firms will return to their high polluting practices when the pandemic fades (Spratt and Armistead, 2020). Adversities bring opportunities for making holistic improvements. Thus, this time must be utilized by companies to modify their business models, policies, procedures and practices in the short and long-term so that they become more sustainable, equitable and resilient (Ivanov and Dolgui, 2020). The pressures from stakeholders for equity should act as a catalyst for company leaders to transition their companies to have sustainable performance at all levels. Therefore, it is urgent to recognise and bring to the forefront the factors, which can help companies to reduce their losses, incorporate sustainable practices and to increase their resilience to this crisis and to future crises (Amankwah-Amoah, 2020).

The COVID-19 has given every country many new lessons, which if implemented will help the countries to reduce the negative impact of this crisis and of future pandemics. The lesson to be learnt is that economic development of the country is more important than economic growth of the country. As societal reactions to this pandemic have shown, many businesses have been closed leading to loss of livelihood. Many people who have lost their jobs are suffering from mental illnesses and others have developed fear because of uncertainties for their future (Nicola et al., 2020). Therefore, the challenge which needs to be addressed is how to save the lives of people from being killed by the virus or dying due to lack of work, money and food.

This can be done by upgrading the healthcare system of the

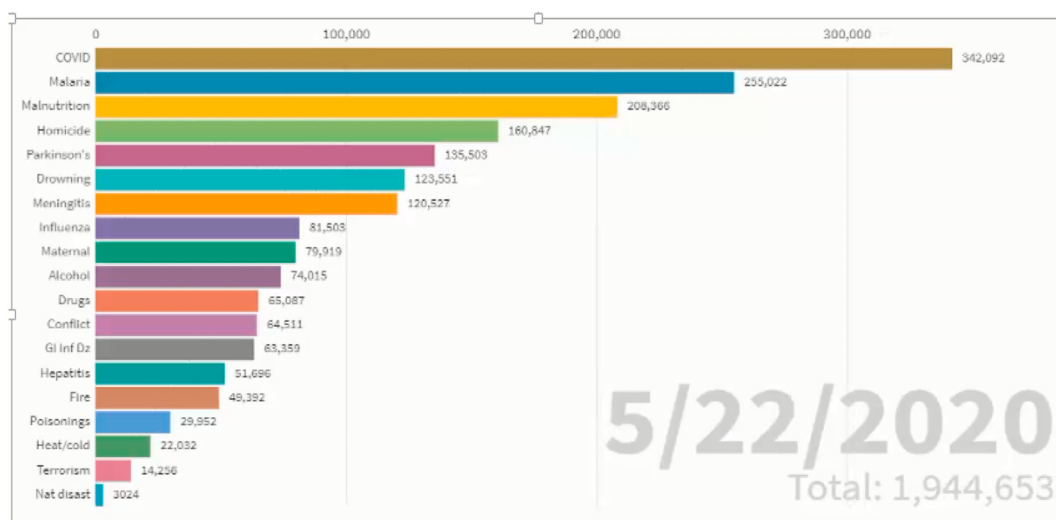


Fig. 1. Global deaths due to COVID-19 (Source: <https://www.cochranetoday.ca/beyond-local/bar-chart-race-shows-rapid-rise-of-global-covid-19-deaths-2412222>, accessed on 26th August 2020).

country. For this, one of the obstacles to overcome lies in improving the numerous supply chains of the country (Farooque et al., 2019). All aspects of supply chains are interlinked. Disruption of supply chains cause businesses to close which in return lead to loss of livelihood which affects the mental and physical health of individuals and of society, overall. As people switch to drugs and alcohol, the abuse at home increases. Therefore, how companies cope with the problems associated with supply chain disruptions due to this and other pandemics needs to be addressed. Previous research on COVID-19 has been performed in the context of medical science. But, a production and operations management perspective of the pandemic is missing (Kumar et al., 2020). Therefore, to proceed on this journey and address these issues, the authors of paper had the objective to identify the factors, which would help to rebuild resilient industries and societies in the post COVID-19 era. Consequently, the objectives of the research were:

- To identify the factors which are important in helping India's companies to become more resilient and effective in overcoming the impacts of COVID-19, climate changes and other crises;
- To rank the priorities of the identified factors, which are important in helping companies to recover from such shocks; and
- To perform sensitivity, analyses to test the strength of the identified factors under different weighting categories.

The main objective of the authors of this paper was to develop a holistic view of sustainable supply chains. Because, as this pandemic has made us realise, that a holistic, resilient plan for protection, followed by revival and growth are urgently required otherwise many companies will fail (P.I.B, 2020b). Survival of companies in the post pandemic era would depend on their commitment towards the various aspects of sustainability. Failure of the company would lead to the loss in the economy of the country. The remaining parts of the paper consist of the following sections:

- Section 1 contains the introduction;
- Section 2 contains the literature review to identify the factors which are important in helping to rebuild companies and societies during and in the post-COVID-19 pandemic era. It depicts the gaps observed in the existing literature;
- Section 3 sketches out the research methodology used in the paper;
- Section 4 outlines the results of the analysis performed by AHP process;
- Section 5 discusses the technique to test the strength of the rank of factors obtained by the above process;
- Section 6 compiles the findings of this research;
- Section 7 highlights implications of the findings of this paper, for company leaders and for researchers; and
- Section 8 summarises the conclusions and highlights urgently needed future research.

The authors of this paper hope that the recommendations will help India's and other societies and they will make speedy, equitable, sustainable recoveries during the pandemic and in the post pandemic era.

2. Literature Review

The 1st occurrence of COVID-19 in India was documented on January 30, 2020 (Mohfw, 2020). Like the time when the disease is spreading at a faster rate, it has become essential to save the lives

and livelihood of people. Therefore, the systematic literature review was performed to review relevant literature that can provide guidance in making urgently needed corporate and societal changes and which can help in building a theoretical foundation for future research on socio-economic vulnerability to pandemics and other crises such as climate changes, which are integral to the pandemic. During the period of January–July 2020, the COVID-19 pandemic has evolved; it has changed the world, it has dramatically affected human society, which underscores the urgent need to build resilient industries and societies that are able to withstand such shocks in the future.

2.1. COVID-19 and its impacts on India and all other countries of the world

Coronavirus has brought the economy to a halt and has changed the lives of societies globally. Devastating the operation of businesses, COVID-19 has affected almost all supply chains; be it manufacturing, service, healthcare or agriculture. It will take a long time for the industries to recover the losses incurred by them by supply chain disruptions and societies to recover from the loss of family members who died from the virus due, in part to due weaknesses or fissures in the healthcare supply chains (Govindan et al., 2020). The prioritisation of economic growth at costs to human health and environmental impacts are among the short and long-term consequences of COVID-19.

However, the main priority in today's scenario has been to save the lives of individuals. This can be accomplished, in-part by creating awareness amongst them to follow social distancing measures and maintaining proper hygiene (Haleem et al., 2020). But, the pandemic should be used as an opportunity to improve the health care system of the country. Improving the health care system would provide benefits now and in the future since the future is dependent on the health of the country which is the new wealth of the country. The present time should be used in investing in cleaner production and sustainable consumption methods and improving in labour intensive sectors which currently often puts the health of workers at risk (Song et al., 2015). Investing in such approaches will help in improving the sustainability of the society which will help to ensure that the needs of the present and future generations are secured.

A fiscal stimulus is required to restart the engine of the economy. According to the Federation of Indian Chambers of Commerce and Industry (FICCI) "Bharat Self Sufficiency Fund" should be constituted for promoting research and innovation to build a strong and resilient nation and to constitute self-sufficient industry clusters with completely developed value chains inside the country (P.I.B, 2020a). The extensive spread of the pandemic has created psychological suffering and increased frequencies of severe mental illnesses (Bao et al., 2020). Strategies should be formulated that address the food and other needs of the people, and measures for preventing spreading of the disease (Rajkumar, 2020).

A roadmap reassuring the people for meeting the needs of the vulnerable must be prepared because India has a very large informal economy in the workforce. Those at the bottom must be at the top in the order of priority. India also stands low in the list of the countries which have the proper equipment in public hospitals (Paital et al., 2020). Therefore, it is difficult for a country like India to contain the spread of the disease.

Therefore, it becomes more important to work on building a stronger resilient nation and the industries which are capable of withstanding such shocks. Reorientation of development models and consumerism driven lifestyles is required in the wake of COVID-19 pandemic so that economic development is attained post COVID-19 pandemic (P.I.B, 2020b). Therefore, the measures taken

by the Government to prevent the spreading of the disease should become a part of life for every individual in order to stay healthy in the post COVID world. The silver lining to the crisis for the country like India is that it comes at a time when there is disruption happening in technology. Technologies are going through an enormous amount of change. Moreover, the survival of the businesses will depend on their digital transformation (Javaid et al., 2020). Adoption of sustainable technologies will become an increasingly important ingredient, among others, to support business recoveries, now and when confronted with future pandemics. Company leaders must also be part of the holistic plans to ensure human, ecological and economic health of cities and communities (Amankwah-Amoah, 2020).

2.2. Identification of potential factors for industry to sustain in post COVID-19 pandemic

The initial variables which influence the preparedness of companies to recover during the post-COVID-19 pandemic period was identified based upon: a. The literature review, b. Obtaining the opinion of academed experts, c. Reviewing newspaper articles and reports of reputed organisations, d. Obtaining advice from scientists working in eminent organisations, e. Building upon information from governmental policy-makers.

That phase was followed by conducting a brainstorming session amongst the experts and the authors via videoconferencing. The experts were selected based on their research expertise in related fields. The experts, who were a part of the brainstorming process, later helped in prioritizing the variables. The details of the expert's responses are included in subsection 3.1.2. Better recommendations usually come later with the brainstorming sessions (Danes et al., 2020). The experts' expertise and the second and third author's previous research on related issues under the guidance of the fourth author helped in identifying the appropriate variables and their respective groupings. This was followed by another brainstorming session amongst the experts and the authors to select and group the variables. The brainstorming session helped the authors to finalise the analytical framework. During the process of proposing and discussing the variables, the expertise of the experts and authors practical experience and in-depth understanding of the field of operations and supply chain were very beneficial. A total of forty-two variables were included in the final list. These variables were grouped into nine key factors and related sub-factors. Table 1 lists identified key factors, which were selected as essential for helping industries to rebuild in the post COVID-19 pandemic period and hopefully contribute to more sustainable societies, globally in the context of the likelihood of more pandemics in the near future due to climate changes. These factors can help business leaders to take concrete solutions that can improve their business' capacity to comply with the 'new norms' that respond to present and future pandemics, in the context of climate changes and other challenges. Climate changes are also evidencing the very serious risks to sustainable societal futures, globally. Climate changes will not only affect agriculture, fisheries and forestry but also industries such as transportation upon which all societies in developing and developed countries are totally dependent (Song et al., 2015).

These factors can be used to challenge us to make dramatic changes in business models, corporate social responsibilities, designs for improved produce-services, improved life-long educational systems, and dramatically improved political systems and health-care systems from the local to the global levels. All of these changes must be envisioned and implemented from holistic, integrative, preventative perspectives.

2.3. Current limitations and gaps in the knowledge of COVID-19 and its impacts

The Indian Government's priorities are: a. Preventing the disease from spreading, b. Ensuring provision of food and basic amenities for the poor and c. Restarting the engine of the economy. Lockdown and social distancing are being used as a means to break the chain of transmission of the disease and simultaneously improve the health infrastructure of the country (Haleem et al., 2020). The challenge that the Government is facing today is of unimaginable magnitude as India has the second-largest population in the world (Paital et al., 2020). Timely, governmental interventions have contained the spread of the disease. Nevertheless, the focus should be on rebuilding a more robust, resilient, equitable, sustainable nation which can prevent, anticipate or reduce the impacts of such shocks without affecting the economy (Alicke et al., 2020).

The source of the Coronavirus has not been identified as yet, and scientists are in the process of developing a vaccine to cure the same (Vieira et al., 2020). It is still not known whether this disease will be completely wiped off or it will re-emerge on a seasonal basis, and if it does, will it lead to the same kind of destruction as it has caused during the present time (Haleem et al., 2020).

However, the need of the hour is to help to make industries more resilient, sustainable and equitable so that they are able to face such kind of pandemic in the future.

3. The solution methodology

The steps followed in the present study are shown in the research flowchart, as depicted in Fig. 2.

Initial variables have been identified by studying the literature, newspaper articles, the reports of reputed organisations and taking the opinion of the experts.

3.1. Recognition of important factors

Recognition of important factors to rebuild the industry post-COVID-19 was performed using the AHP approach. After the preliminary survey, forty-two variables were selected as highly relevant for seeking to make needed changes in industry and society. This method is built upon four hierarchy decision process levels (see Fig. 3) which are explained below.

- Level I The objective(s)
- Level II It depicts the categories of factors
- Level III This level consists of specific factors, i.e. indicators of the respective construct
- Level IV Preferences of vital factors were identified (Govindan et al., 2014)

After developing the hierarchical structure, pair-wise comparisons of the elements of the hierarchy were performed. In all comparisons, the comparative significance of a pair of elements in relation to a higher-level criterion was calculated, considering the decision-making objective. Viewpoints from the experts were taken through a scientifically designed questionnaire and specified in terms of clear numeric values. In spite of the carefully designed system, the evaluation scale of AHP was not able to quantify the ambiguity due to human judgement.

It is certain that there is a high degree of uncertainty in making decisions on matters related to COVID-19, and thus was difficult to quantify the suggestions for the company experts and from other stakeholders. But, a solution has to be provided to help the industries in restarting their work and in building resilient societies.

Table 1

Key factors for industries to overcome the impacts of COVID-19 and to make positive contributions to more sustainable, equitable, post-COVID-19, post fossil carbon societies.

S No.	Factors	Discussion	Sub factors
1.	Economics, trade and commerce	Efforts to revive the industries can be made through banks and special financial aid packages provided by Government	<ul style="list-style-type: none"> • Support to industries & customers extended through banks • Additional loans are required for enabling MSMEs and stressed sectors for overcoming the loss of businesses • National economic and investment policies are to be favoured • Emphasis should be on the creation of supply-chains integrated within geographical boundaries
2.	IT preparedness	Advanced IT infrastructure commensurate to new needs	<ul style="list-style-type: none"> • IT infrastructure and its reach • Capacity-building for updating industrial technologies • Improved training of the workforce and ensuring its availability • The customised facility, latest technologies & cyber security tools for MSMEs
3.	Roles of governance	Roles of governance is paramount for the revival of industries in post-COVID-19	<ul style="list-style-type: none"> • Provide Economic stimulus packages to provide low-cost money to industries to help them to restart • Targeted social security programmes for those below the poverty line • Close cooperation of Government and industry to improve efficiency and resilience of production and supply chain management issues • Measures are to be adopted to ensure demand for locally produced products, i.e. produced in India • Strong and quick decision-making and effective implementation of the selected approaches • New norms for personal Hygiene and sanitation • New healthcare norms
4.	Supply chain and logistics	Facilitate the barrier-free movements of goods and services so that timely delivery can be accomplished within the country. The focus should be to overcome intra-country barriers.	<ul style="list-style-type: none"> • Smooth movement of goods and services across all supply chains • Smooth movement of workers should be a priority • Smooth movement of essential goods • Comprehensive and excellent quality healthcare facility to be provided • The safe return of workers to the workplace
5.	Industry protocol	New norms which have to be followed by industries to facilitate the restart and resilience in the likelihood of similar or far worse crises.	<ul style="list-style-type: none"> • Organise standard operating procedures on modes to commute that will allow social distancing • Shift management • Flexible production size • Workers safety and health to be the paramount agenda • Transparency • Welfare scheme and its effective implementation
6.	Environmental issues	Drastic reduction in pollution level is observed, i.e. the planet revives with no humans into play	<ul style="list-style-type: none"> • New environmental assessment models and norms • Pollution is made from industrial production and mankind consumption level has been reduced. • Newer energy sources, renewable sources of energy • Energy-efficient devices to be used
7.	Capacity building	Capacity building helps in easy incorporation of the technology	<ul style="list-style-type: none"> • Industries must focus on realignment, retraining and re-skilling of their employees • Digitisation, automation and artificial intelligence will have to be accelerated in every stream. Hands-on training on automation and artificial intelligence is required so that the future of societies is secured. Jobs under MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) should be increased so that the workers who have returned to their home towns can also obtain employment.
8.	Change management	Stakeholders to be prepared mentally and trained to take the new normal	<ul style="list-style-type: none"> • The morale of the workers should be boosted by giving them assurance that their health is the priority of the company; by removing the fear of the disease and by providing them a liveable wage, even when the company is temporarily 'closed.' • Training for the "new normal" • Psychological issues and management • Awareness to be created amongst individuals on the importance of maintaining hygiene • Safety of the consumers is to be ensured
9.	Organisational culture	Change management facilitates effective implementation of the efforts taken by the government	<ul style="list-style-type: none"> • Organisational should coalesce as a team for sailing through this complex environment • Wearing the masks has to be made compulsory inside the premises • Proper hygiene in the toilet area and near the work area is to be ensured • The regular medical check-up should be conducted inside the premises of the industries • The commitment of the top management to ensure the safety & well-being of the workforce which includes all of the workers in reverse and forward supply chains.

Even though there are weaknesses with AHP analyses, they are helpful when the objective is to rank the elements and the alternatives. In such cases, AHP is the most reliable method for determining the relative significance of criteria and alternatives. Methods involving pair-wise comparisons can be rigid when

criteria and alternatives are very closely interrelated (Such as in the present case). Therefore, it was important to consider all of the relevant elements of the decision problem. On the other side, MCDM methods that depend upon on the direct rating of criteria and alternatives, require less effort on the part of the decision-

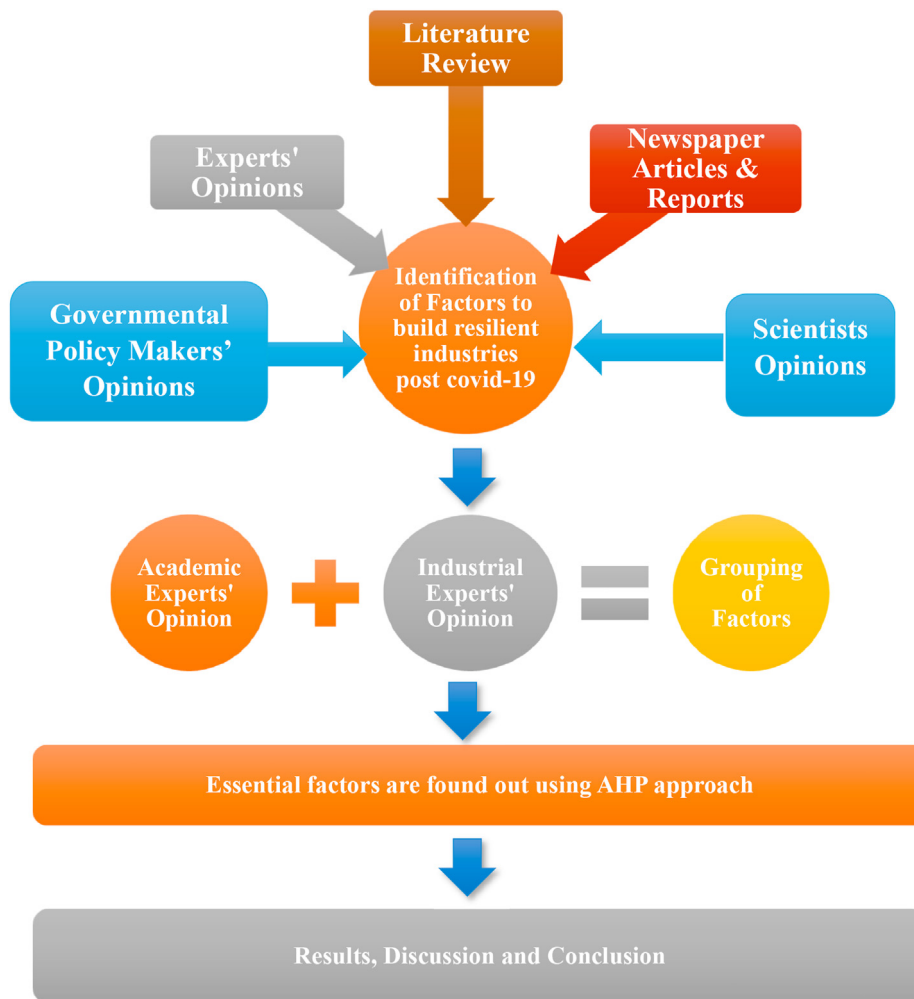


Fig. 2. The research flowchart of this paper.

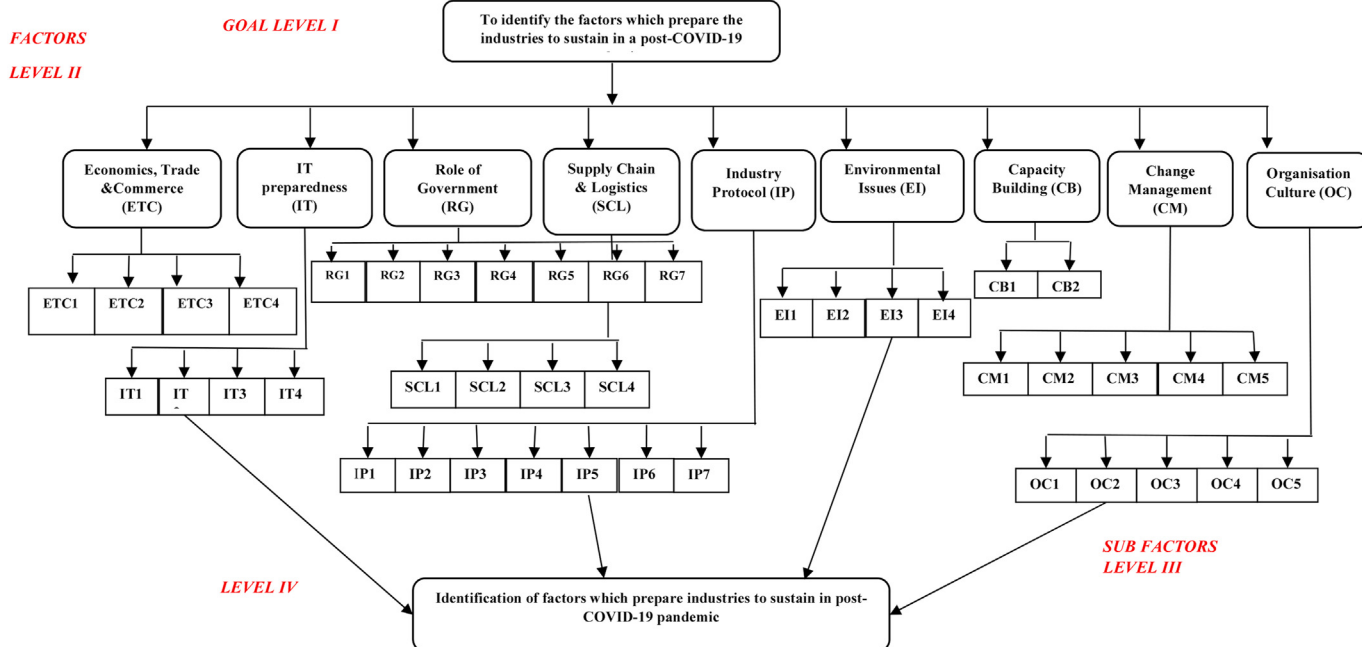


Fig. 3. AHP framework for identifying essential factors for rebuilding the industries in the post COVID-19 pandemic era.

Table 2
Average random consistency index (RI) based on matrix size (Thanki et al., 2016).

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49

makers, but determining the weight coefficients for interactions is less precise (Calabrese et al., 2019).

In comparing these methods, AHP is more appropriate to determine weight coefficients as it helps the decision-makers to obtain a better understanding the relative importance of interactive alternatives and criteria. In the AHP technique, attention is on two elements at a time and therefore, it provides a more accurate evaluation (Konidari and Mavrakis, 2006). Since the research for this paper pertained to a complex problem that had the risk of inconsistency, AHP provided the flexibility of its consistency thresholds compared to other methods that require perfect consistency for calculating weights. The threshold of AHP can be reduced or increased based on the decision-makers (Ishizaka and Siraj, 2018).

3.1.1. The hierarchical structure

The challenge to select relevant factors, which can help in rebuilding industries and societies in the post-pandemic era was structured in different hierarchies. The method starts with calculating the global weight (relative significance of every factor, considering the goal in mind), and maximum Eigenvalue (λ_{max}) for each matrix. The weights depicting the global priority of every level of a hierarchy can be computed through the multiplication of normalised vector so that validation can be done if the matrix showing pairwise comparisons provides a consistent decision (Govindan et al., 2014). The check of consistency for the pairwise comparison matrix was done by computing the Consistency Ratio (CR). The CR was computed using the following steps (Govindan et al., 2014):

- (1) Calculating Eigenvector (λ_{max}) for every matrix of the order n
- (2) CR can be computed with the help of the following formula:

$$CR = \frac{CI}{RI} \tag{1}$$

Where “n” is the order of the matrix and “RI” is known as the random consistency index.

Table 2 gives the RI values for matrices of the order 1–10.

3.1.2. Data collection

The experts involved in the AHP survey were selected based on their expertise in the related field. The questionnaire was mailed to the experts to ask about their opinion. A reminder mail was sent to the experts after one week. Ten experts of the related field, with a minimum of ten years of experience were chosen for the study. Six professionals from the industry, two academic experts and two medical doctors were invited to participate in filling the questionnaire to provide their assessment of the comparative significance of factors and sub-factors. The industrial experts were either managers or owners of MSMEs who had experience in running their enterprises. One of the experts had experience in managing workers and in taking care of their welfare for more than 12 years. Two of the experts were heads of parts supply departments. Two experts dealt with managing inventory of parts. The final expert was the owner of an enterprise. Two academic leaders who had more than twenty years of experience in research and in teaching supply chain management at their institutes and in providing

training to the employees of MSMEs were also involved in the analytical process. One of the experts from academia was a member of the COVID-19 committee of the Government. One medical doctor was heading the CGHS dispensary of north Delhi and the other medical doctor was a very experienced doctor at the Apollo hospital. The questionnaire was mailed to each of the experts. They were asked to make pair-wise evaluations of the critical factors which would help in restarting the businesses and in building resilient industries, which can face future shocks in the Indian context.

The experts were selected based on their work and experience in the related field. Due to the current unprecedented situation of the COVID-19 pandemic, the questionnaire was mailed to the respective experts to obtain their responses safely. Table 3 shows a brief description of the experts who participated in the analyses.

4. Data analyses and results

After scrutinising data obtained from the questionnaires and applying the AHP approach, the key factors were identified. Table 4 presents information about ranking the significance of various factors based on the weight obtained by applying the AHP technique.

ETC: Economics, Trade & Commerce; IT: Information Technology Preparedness; RG: Role of governance; SCL: Supply Chain & Logistics; IP: Industry Protocol; EI: Environmental Issues; CB: Capacity Building; CM: Change Management; OC: Organisation Culture.

The weights of individual factors are represented on the radar graph in Fig. 4.

It can be seen from Fig. 4 that the “Role of governance” factor received the highest weight amongst all the factors. Appendix A (Tables A1 to A9) depicts the local priority weights of varied factors that were produced to determine the relative significance of these factors and their sub-factors for helping to successfully rebuild the industries in the post COVID-19 pandemic era in India.

The rank of specific factors presented in Table 5, depicts that global rank based upon on the value of global weights obtained by using the AHP methodology.

5. Sensitivity analysis

Table 4 suggests that the ‘Role of governance’ has more weightage and thus influences the other factors. Govindan et al. (2014) have referred in their paper that slight variations in relative weights leads to significant variations in final rankings. These weights were given from an individual perspective; thus, the sensitivity analysis was used to test the strength of the rankings obtained under the different weight categories. The ‘Role of Governance (RG)’ factor received the top priority with the AHP methodology.

In order to determine the stability of the priority given to the factor ‘Role of Governance (RG)’ this factor’s value was changed by 0.1 increments from 0.1 to 0.9. This helped the researchers to ascertain the robustness of the results obtained by the AHP methodology (Thanki et al., 2016). Table 6 reflects the changes in the relative values of the other categories of factors when the value of the factor, “Role of Governance” was changed from 0.1 to 0.9.

Fig. 5 shows that the changes in the weights of the other factors when the weight of the factor, “Role of governance” was incrementally changed from 0.1 to 0.9. It can be seen from Table 6 and Fig. 5 that weighting of the other factors were minimally influenced by the changes of the weight of the “Role of Governance”, thereby indicating robustness of the ranking obtained. This permitted the authors to generalize the results obtained. Numbers on the

Table 3
Description of the experts who took part in the analyses.

Experts	Description	Industry Type	Experience
Expert 1	Professor and subject expert	Academic	More than 12 years
Expert 2	Professor and subject expert	Academic	More than 15 years
Expert 3	CEO	Manufacturing	More than 20 years
Expert 4	CEO	Manufacturing	More than 20 years
Expert 5	Manager	Automotive	More than 10 years
Expert 6	Senior Manager	Manufacturing	More than 15 years
Expert 7	Assistant General Manager, Quality	Manufacturing	More than 10 years
Expert 8	Mechanical Engineer	Manufacturing	More than 12 years
Expert 9	Medical Doctor	CGHS Dispensary	More than 20 years
Expert 10	Medical Doctor	Apollo Hospital	More than 15 years

Table 4
Pairwise comparison matrix of CFs.

Factors	ETC	IT	RG	SCL	IP	EI	CB	CM	OC	WEIGHT	RANK
ETC	1	1/4	1/5	1/3	3	2	1/3	¼	1/3	0.0450359	7
IT	—	1	1/4	1/3	4	4	3	2	3	0.144461	3
RG	—	—	1	3	6	5	4	3	4	0.301093	1
SCL	—	—	—	1	4	3	3	2	2	0.171616	2
IP	—	—	—	—	1	1/2	1/3	1/3	1/3	0.0289235	9
EI	—	—	—	—	—	1	1/2	¼	1/3	0.0370584	8
CB	—	—	—	—	—	—	1	1/3	½	0.0638748	6
CM	—	—	—	—	—	—	—	1	3	0.126623	4
OC	—	—	—	—	—	—	—	—	1	0.081314	5

Maximum Eigen Value = 9.7592; C.I. = 0.0949.

horizontal axis in Fig. 5 present the factors obtained by the procedure reviewed in section 2.2.

Table 7 presents the ranking of the sub factors when the weight of the factor “RG” value was changed by 0.1 increments from 0.1 to 0.9.

At 0.1 of the factors “Role of governance”, factor SCL3 holds the first rank and IP6 holds the last rank. From 0.2 to 0.9; RG2 attains the first rank and the ranks of other critical factors vary. Fig. 6 illustrates the rank changes.

Therefore, it is clear that the ‘Role of governance’ Factor has more influence on the successful rebuilding of industries post COVID-19 pandemic, thus demanding more considerable attention. All the factors identified are essential for rebuilding sustainable industries and vibrant societies but for a developing country like India, the factor, “Role of governance” demands more attention because policies formulated and implemented by the Government should encompass the dynamics of all the other factors. Policies formulated by the Government should encourage all stakeholders involved with the companies to move in the direction of building resilient industries and sustainable societies which can withstand the impacts of the present and future pandemics.

6. Discussion of the findings of this research

According to the UN Department of Economic and Social Affairs (DESA), the COVID-19 pandemic, has disrupted global supply chains and international trade. This is likely to decrease the economy, globally by almost 1% in 2020 (Kumar et al., 2020).

The current research was designed to identify and to rank the essential factors which would help industries to rebuild in the post-COVID-19 pandemic era in India. The AHP approach removes any unbalanced scale of judgment, doubt, and inaccuracy amongst the pair-wise comparisons performed (Borade et al., 2013; Thanki et al., 2016). Appendix A (A1 to A9) shows the results obtained by the AHP approach. It has been documented from Table 4 that the “Role of Governance” has the highest weight amongst all the factors. This factor is important as policies formulated by the Government can

Weights of the Individual Factors

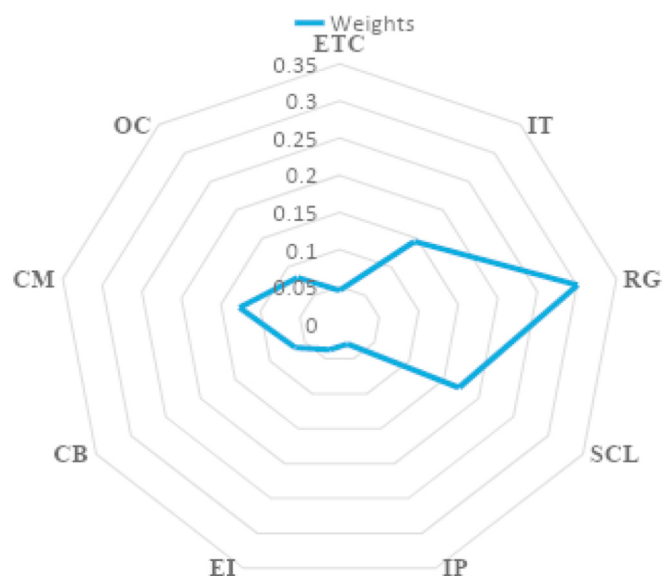


Fig. 4. Weight of individual factors.

help to kick-start the economy and can motivate the stakeholders involved with the company to draft and implement guidelines to achieve truly sustainable and equitable companies in post fossil-carbon societies. Sarkar et al. (2020) reported on the positive impacts that the decision of the Government on restraining social gatherings had on reducing the spread of the pandemic. Their study highlighted the positive effects that the reduced gatherings had on air pollution. Shaw et al. (2020) reported that some governance decisions in countries of East Asia, along with community support made significant differences in the management of the pandemic. South Korea’s ‘trace, test and treat’ model has received recognition globally. Using this model has made it possible to reduce the spread of the disease so well that the South Korean Government has not implemented any lockdown in their country. New Zealand implemented the earliest and the strictest self-isolation measures in the world due to which there was a rapid decline in the number of cases. Its leadership has been respected and applauded worldwide (The Hindu, 2020). These examples show that the decision taken by the Government or the Governmental policies in these countries helped to curb the spread of the infection. These countries set an example of the importance that Governmental decisions can have on any country.

Therefore, the ‘Role(s) of Governance’ in India become(s) very important to rebuild the industries for the present and in the post COVID-19 era. Proactive consultation of Government with the

Table 5

Local and global weights of CFs categories and specific factors. Global weights are attained by multiplication of the relative weight of factor category values with the relative weights of each specific factor.

Factors	Weight	Sub Factors	Local Weight	Local Rank	Global Weight	Global Rank
Economic Trade & Commerce (ETC)	0.0450	Support to industry & customer extended through banks (ETC1)	0.447	1	0.020	19
		Additional Loans required (ETC2)	0.282	2	0.013	27
		Nationalistic economic and investment policies favoured (ETC3)	0.164	3	0.0074	33
		Creation of supply chains integrated within geographical boundaries (ETC4)	0.106	4	0.005	36
IT Preparedness (IT)	0.144	IT infrastructure and its reach (IT1)	0.443	1	0.064	4
		Capacity building (IT2)	0.183	3	0.026	15
		Trained manpower (IT3)	0.096	4	0.014	24
		Customised facility, latest technologies & cyber security tools (IT4)	0.278	2	0.040	9
Role of governance (RG)	0.301	Economic stimulus package to be provided (RG1)	0.224	2	0.067	3
		Social security programmes for the vulnerable (RG2)	0.274	1	0.082	1
		Cooperation of Government and industry (RG3)	0.175	3	0.053	5
		Measures to ensure demand (RG4)	0.115	4	0.035	10
		Quick decision making (RG5)	0.042	7	0.013	26
		Norms for personal Hygiene (RG6)	0.104	5	0.031	12
		New healthcare norms (RG7)	0.066	6	0.020	20
Supply Chain & Logistics (SCL)	0.172	Smooth movement of goods and services across the supply chain (SCL1)	0.164	3	0.028	14
		Smooth movement of workers should be a priority (SCL2)	0.283	2	0.048	7
		Smooth movement of essential goods (SCL3)	0.447	1	0.076	2
		Comprehensive and excellent quality healthcare facility to be provided (SCL4)	0.106	4	0.018	21
Industry Protocol (IP)	0.028	The safe return of workers to the workplace (IP1)	0.269	2	0.007	32
		Organise standard operating procedures (IP2)	0.294	1	0.008	30
		Shift management (IP3)	0.078	5	0.002	40
		Flexible production size (IP4)	0.048	6	0.001	41
		Workers safety and health (IP5)	0.149	3	0.004	37
		Transparency (IP6)	0.039	7	0.001	42
		Welfare scheme (IP7)	0.120	4	0.003	39
Environmental Issues (EI)	0.037	New environmental assessment models (EI1)	0.277	2	0.010	28
		Pollution has been reduced (EI2)	0.467	1	0.017	22
		Newer energy sources (EI3)	0.095	4	0.003	38
		Energy-efficient devices to be used (EI4)	0.160	3	0.005	34
Capacity Building (CB)	0.063	The focus should be on realignment, retraining and re-skilling of the employees (CB1)	0.666	1	0.042	8
		Digitisation, automation and artificial intelligence will have to be accelerated in every stream (CB2)	0.333	2	0.021	17
Change Management (CM)	0.126	The morale of the workers to be boosted& fear to be removed (CM1)	0.401	1	0.050	6
		Training for new normal (CM2)	0.070	5	0.008	29
		Psychological issues and management (CM3)	0.163	3	0.020	18
		Awareness to be created (CM4)	0.124	4	0.015	23
		Safety of the consumers is to be ensured (CM5)	0.239	2	0.030	13
Organisation Culture (OC)	0.081	Organisational should coalesce as a team (OC1)	0.268	2	.021	16
		Wearing of the masks should be made mandatory (OC2)	0.164	3	0.013	25
		Proper hygiene to be ensured (OC3)	0.072	5	0.005	35
		A regular medical check-up should be conducted (OC4)	0.099	4	0.008	31
		The commitment of the top management (OC5)	0.395	1	0.032	11

Table 6

Values of other factors after changing the RG values from 0.1 to 0.9.

Factors	Values	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
ETC	0.0450	0.0579	0.0515	0.04510	0.0386	0.03221	0.0257	0.01933	0.0128	0.0064
IT	0.1444	0.1860	0.16535	0.1446	0.12401	0.1033	0.0826	0.0620	0.0413	0.0206
RG	0.3010	0.1000	0.2000	0.3000	0.4000	0.5000	0.6000	0.7000	0.8000	0.9000
SCL	0.1716	0.2210	0.1964	0.1718	0.1473	0.1227	0.09821	0.07366	0.04910	0.02455
IP	0.0289	0.0372	0.0331	0.0289	0.0248	0.0206	0.0165	0.01241	0.00827	0.0041
EI	0.0370	0.0477	0.0424	0.0371	0.0318	0.0265	0.0212	0.0159	0.0106	0.0053
CB	0.0638	0.0822	0.07311	0.0639	0.0548	0.0456	0.0365	0.0274	0.0182	0.0091
CM	0.1266	0.1630	0.14493	0.1268	0.10870	0.0905	0.0724	0.0543	0.0362	0.0181
OC	0.08131	0.104	0.0930	0.0814	0.0698	0.0581	0.0465	0.03490	0.0232	0.0116

ETC: Economic Trade & Commerce; IT: Information Technology Preparedness; RG: Role of governance; SCL: Supply Chain & Logistics; IP: Industry Protocol; EI: Environmental Issues; CB: Capacity Building; CM: Change Management; OC: Organisation Culture.

industry experts is required to frame policies to accelerate the positive transitions. An economic stimulus package is required for reviving the growth in the post-COVID -19 era. The purpose of the fund would be in providing low-cost money to industrial units, especially MSMEs for their immediate working capital requirements and to help those who are at the bottom of the value

chain. A targeted social security programme for these individuals has to be developed and implemented using a roadmap for helping to make the needed changes while ensuring health and safety of the workers, and others in the reverse and forward supply chains. It may happen that industries put environmental sustainability initiatives behind social sustainability issues in the wake of the

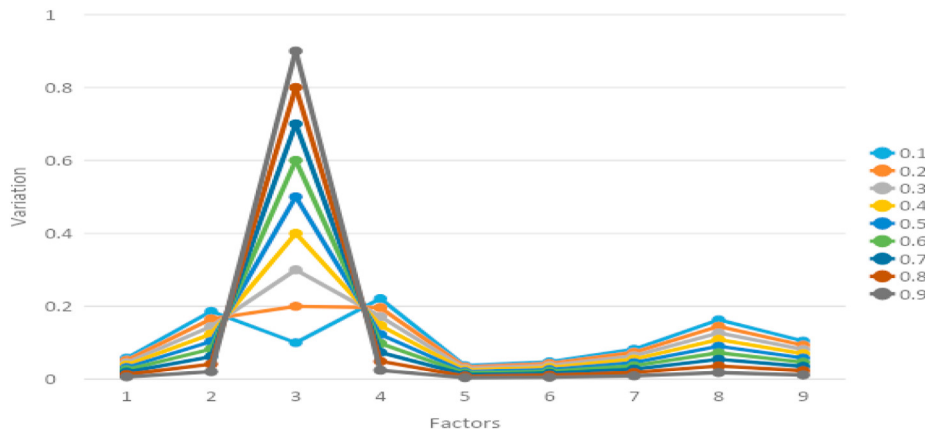


Fig. 5. Values of other factors after changing RG values from 0.1 to 0.9.

Table 7
Ranking of sub factors when increasing RG values from 0.1 to 0.9.

Sub factors	0.1	0.2	0.3	0.301093 (Normal)	0.4	0.5	0.6	0.7	0.8	0.9
ETC1	26	26	26	19	26	26	26	26	26	26
ETC2	29	29	29	27	29	29	29	29	29	29
ETC3	32	32	32	33	32	32	32	32	32	32
ETC4	36	36	36	36	36	36	36	36	36	36
IT1	2	4	7	4	8	8	9	9	9	9
IT2	11	13	14	15	15	15	15	15	15	15
IT3	18	20	20	24	20	20	20	20	20	20
IT4	6	9	11	9	12	12	12	12	12	12
RG1	7	3	2	3	2	2	2	2	2	2
RG2	5	1	1	1	1	1	1	1	1	1
RG3	9	5	3	5	3	3	3	3	3	3
RG4	14	8	5	10	4	4	4	4	4	4
RG5	25	19	15	26	11	9	7	7	7	7
RG6	17	10	6	12	5	5	5	5	5	5
RG7	21	14	10	20	7	6	6	6	6	6
SCL1	8	11	12	14	13	13	13	13	13	13
SCL2	3	6	8	7	9	10	10	10	10	10
SCL3	1	2	4	2	6	7	8	8	8	8
SCL4	12	15	16	21	16	16	16	16	16	16
IP1	34	34	34	32	34	34	34	34	34	34
IP2	33	33	33	30	33	33	33	33	33	33
IP3	40	40	40	40	40	40	40	40	40	40
IP4	41	41	41	41	41	41	41	41	41	41
IP5	38	38	38	37	38	38	38	38	38	38
IP6	42	42	42	42	42	42	42	42	42	42
IP7	39	39	39	39	39	39	39	39	39	39
EI1	31	31	31	28	31	31	31	31	31	31
EI2	28	28	28	22	28	28	28	28	28	28
EI3	37	37	37	38	37	37	37	37	37	37
EI4	35	35	35	34	35	35	35	35	35	35
CB1	13	16	17	8	17	17	17	17	17	17
CB2	22	23	23	17	23	23	23	23	23	23
CM1	4	7	9	6	10	11	11	11	11	11
CM2	23	24	24	29	24	24	24	24	24	24
CM3	15	17	18	18	18	18	18	18	18	18
CM4	19	21	21	23	21	21	21	21	21	21
CM5	10	12	13	13	14	14	14	14	14	14
OC1	20	22	22	16	22	22	22	22	22	22
OC2	24	25	25	25	25	25	25	25	25	25
OC3	30	30	30	35	30	30	30	30	30	30
OC4	27	27	27	31	27	27	27	27	27	27
OC5	16	18	19	11	19	19	19	19	19	19

pandemic. The pandemic could also cause a reversal in the trend toward more sustainable societies as Governments take steps to loosen environmental law enforcement policies to favour the short-term survival of businesses.

But the pandemic has given us dramatic, new insights of the

significance of delivering a proactive response and of the urgent need to take timely actions. The industries and their competitors will be differentiated in the post COVID world by their commitment to implementing sustainability issues and on their willingness and commitment to actualize such holistic, proactive practices (Amankwah-Amoah, 2020). The experts in this research predicted that during the post COVID-19 era, much manufacturing will be shifted back from China to India. Therefore, the “Made in India Programme,” should be given a push by providing domestic and foreign manufacturers policy and fiscal incentives for manufacturing the products locally. The idea of *building back better* in terms of living in harmony with nature should be utilized rather than going back to the ‘old’ normal (The Hindustan Times, 2020).

Supply chains & logistics have obtained the next highest weight, which underscores the importance of fulfilling the essential needs of the citizens. Healthcare equipment has to be supplied on a priority basis so that timely treatment can be provided and the lives of the individuals can be saved. Keeping this in mind, specific industries have to be supported to resume operations. However, they will have to follow the mandatory protocols of social distancing and to maintain proper hygiene. The focus should be on the manufacture of products which are important in dealing with the situation. Technology giants such as Apple and Tesla have drawn in their expertise and their supply lines to source supplies and to produce essential products in the USA rather than to depend upon global supply chains. (Cankurtaran and Beverland, 2020). Health care systems need an uninterrupted supply of medical equipment, testing equipment and protective equipment. Therefore, restructuring of the existing industrial units is required so that they can produce the products which are required to respond to the urgent needs by making changes in their existing plants (Elavarasan and Pugazhendhi, 2020). Also, the COVID-19 pandemic has helped to improve the environmental sustainability of the supply chain. But, that is not necessarily helpful enough in addressing the challenges of restarting businesses post COVID-19. That requires direct emphasis on re-establishing economically, ecologically, socially, sustainable and resilient supply chains (Kumar et al., 2020).

IT preparedness obtained the weight of less than half the weight obtained by the factor “Role of governance”. Survival of the businesses post-COVID-19 era will depend on their digital transformation. Several useful technologies of Industry 4.0 and Industry 5.0 can help to provide the much-needed help to properly control and manage COVID-19 pandemic (Javaid et al., 2020). Technological strategies can provide essential support in dealing with the pandemic state of affairs. Technology can aid health care facilities and can help in uniting the society to function as one (Elavarasan

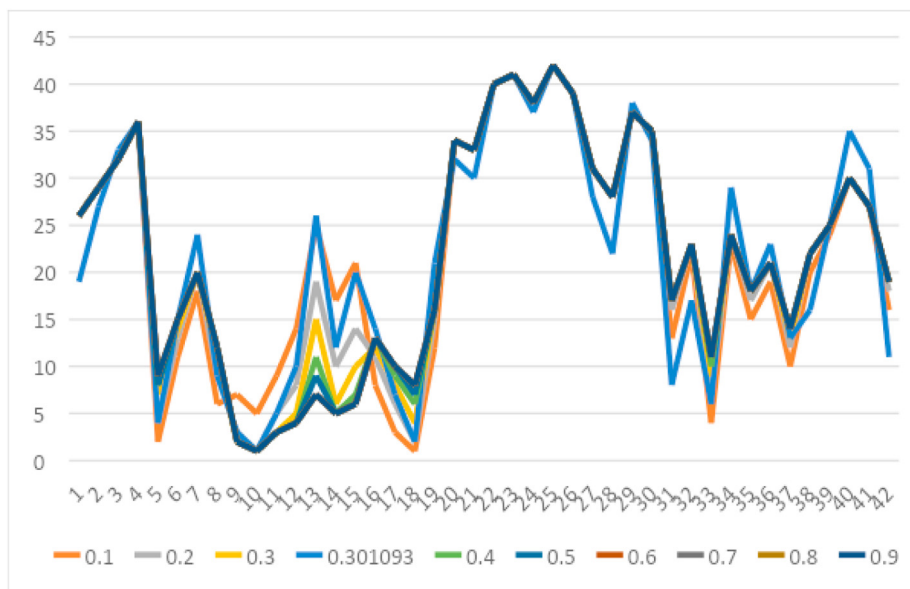


Fig. 6. Ranking for Factors when the increasing weight of “Role of governance” factor is changed from 0.1 to 0.9.

and Pugazhendhi, 2020). IT can play crucial roles in every sector of the country. IT-enabled services should be used to benefit all during and after this crisis. Firms like Microsoft and Facebook have joined hands with the World Health Organisation for organising #Build-forCOVID19, a global hackathon for developing a software for addressing issues related to the pandemic (Cankurtaran and Beverland, 2020). Additionally, more than 75 million people of India have already downloaded the “Aarogya Setu” mobile application. This app is one of the most important tools in fighting COVID-19 and one of the lifelines for common people during this global pandemic (P.I.B, 2020c). It informs the people of their potential risks of infection and the steps to be followed to stay healthy. IT-enabled services should also be utilized to provide telemedicine services, especially in rural parts of India. This will bring much-needed relief to people who are finding difficulty in accessing medical services. However, digital transformation requires proper IT and security tools to prevent cyber-attacks (PwC Report, 2020). This was followed in priority by “Change Management”. It is a means to transform the company’s goals into reality. The main objective is to implement the plan of action for accomplishing change and in helping people to adapt to the changes (Alicke et al., 2020). Stringent public health measures have to be implemented to curtail the spread of COVID-19 (Rajkumar, 2020). Strategies have to be formulated to reduce the fear of the disease.

“Organisational culture” received the next highest priority. Corporate leaders should evaluate the flexibility of their organisation in making decisions for addressing market changes (Bernauer and Slowey, 2020). The COVID-19 pandemic and lockdown lessons should serve as a warning for industries and governments to plan for anticipating, preparing for and in effectively responding to future shocks. Emphasis should be given on implementation of Industry 4.0 technologies. Assurance should be provided to the employees that their safety and health are considered to be extremely important to the company (Haleem et al., 2020). “Capacity building” has received the next highest weight. Taking cognizance of the situation, it has become necessary to upgrade the skills of the workers. Training on Industry 4.0 technologies should be provided. Short term courses and diplomas in such technologies should be provided to prepare the workers to work in companies of the future.

This dimension was followed by “Economics, trade and commerce, Environmental issues and Industry protocols” In this context, the COVID-19 pandemic has given us the opportunity to envision and hopefully to implement an economic system that focuses on the 17, UN Sustainable Development goals. Firms which operated during the pandemic are perceived in a very positive way; this will help to enhance their reputations among their customers. Take for example, the decision made by Brewdog, a firm in UK, to utilize its idle transportation capacity for distributing food to children of lower economic strata, helped to enhance Brewdog’s reputation among its customers. Many firms have taken similar steps in times of crisis to keep their work going (Cankurtaran and Beverland, 2020). This type of altruistic behavior is beneficial for those who receive help and for enhancing the reputation of the company in the post pandemic era. Transformation of economic and socio-economic systems should support to help to make them environmentally sustainable and socially equitable, while continuing to be economically sound.

The AHP approach was followed by performing sensitivity analysis that was used to analyse the robustness of the results obtained by the AHP methodology. This analysis showed that the “Role of Governance” factor category influences and impacts many other factor categories. Thus, an integrative, holistic, multi-factorial approach is needed to make the needed transitions.

7. Implications of the research

COVID-19 is the most severe pandemic that the whole world has encountered recently. Recognising essential factors helps in identifying those factors which have received more weight.

7.1. Theoretical implications

Given the possibility of future pandemics as stated by WHO chief, and the higher probability of adverse environmental events due to increasingly severe consequences of climate changes, it has become necessary to identify factors which can help to restart the industries so that they are more resilient and also that they can help societies to become more resilient. The objective of the authors of the paper was to integrate this research with earlier related

research on design thinking. Design thinking was chosen because it focussed upon disruptive thinking and on reframing; therefore, it provides relevant insights pertaining to restarting companies in the context of crises. This term was first used by Herbert Simon (1969) in reference to the unique mental tools used by researchers in solving problems. The special features of design thinking such as creativity and innovation, capability to visualize, scope of ambiguity and failure, mixing analysis with intuition along with the approach of brainstorming were found to be beneficial for addressing the “wicked problems” associated with the COVID-19 pandemic (Head and Alford, 2015).

Issues brought up by the pandemic are considered to be “wicked” as they are defined as the problems in which they are not defined properly, there is no proper information, there are no agreements on ideas between the customers and the decision-makers and where the consequences of the decisions taken are not even clear (Cankurtaran and Beverland, 2020). The pandemic has produced a number of wicked problems for industries which, suddenly met with lack of markets and no future for their products. Therefore, the ‘new normal,’ will require deploying decision thinking responses to emerging and multifaceted challenges imposed by the COVID-19 pandemic.

7.2. Practical implications

The current research can help the Government in reviewing its policies formulated for MSMEs and society as a whole so that they can be benefitted and motivated to rebuild their businesses. It is very important for the Government to review the cyber security law so that the policies favouring MSMEs can be incorporated (Alicke et al., 2020). The big lesson that the pandemic has taught us is the need for self-reliance and how each village, district, state and the country as a whole needs to become self-sufficient. It can happen if domestic capabilities are given a boost to help in prevention of the disruption of the supply chains in the future.

Disruption in the supply chains can be prevented by evaluating automotive alternatives to reduce the number of workers on the shop floor. It is also very important to transfer new knowledge across supply chains and training supply chains that must be nurtured, strengthened and supported. It is paramount to communicate about the best practices as the situation evolves and help the suppliers to implement them (PwC Report, 2020).

The effects of COVID-19 emphasize the significance of using sustainable, holistic policies, procedures and technologies that will become vital for businesses to sail through the present and future pandemics, as they co-work with governmental leaders to implement the goals related to ecologically sustainable, economic development of cities and communities. The pandemic has highlighted the need of having flexibility in the existing norms, which could improve the ease of the survival of businesses in the short-term. But the survival of businesses in the long-term will depend on their commitment to incorporate an array of aspects of sustainability in their policies, business plans, product-service system designs, as well as how they work with all stakeholders in their supply chains, as well as with their consumers and their neighbours.

The authors of this paper underscore the necessity for investing in the health care systems of the country. The most important factor in preventing the spread of the disease is to empower citizens with the right information and keep social distancing and maintain personal hygiene. Social distancing is necessary until the time an effective vaccine is developed to eradicate the disease.

Also, lessons from past outbreaks revealed that social distancing measures, communication and international cooperation can help in curbing the spread of the disease. Many researchers from the

past pandemics infer that steps related to social distancing, cancelling public gatherings, isolating the sick, and wearing masks were the most effective measures to slow the spread of pandemics (Peeri et al., 2020; Vaka et al., 2020). But cushioning the effect of COVID-19 will require the companies to draft innovative ways to ensure the health of workers while simultaneously protecting the environment and their economic viability. Though it is tough to sell environmentally friendly policies, incentives by the Government and demands from consumers and other stakeholders will help the companies to draft and implement the guidelines ensuring the incorporation of all three aspects of sustainability.

7.3. Unique contributions of research

The present research is a contribution of the authors towards society as a whole in encountering the pandemic by identifying the essential factors which can be used to help to rebuild the nation, especially the industries in the post lockdown era.

Guidance from academicians, industry experts and medical doctors was used to identify, evaluate and prioritise the groups of factors which are most likely to be effective in rebuilding the systems by making changes to the ‘new normal’.

The present paper was designed and prepared to help to instil confidence that we, as the citizens of India, should have faith in ourselves in the transition to the future.

Taking cognizance of the present work can help in understanding that the factors highlighted to help many to become ‘Corona Warrior,’ if followed properly. The ‘Corona Warriors’ can help in confronting the pandemic and in assisting in creating a restructured society in which there will be a “New Normal,” as depicted in Fig. 7.

8. Conclusions

Limitations of the Present work and Future Work.

Global societies are facing multiple challenges in seeking to combat the COVID-19 pandemic, which is ‘among the most critical challenges,’ we have had to address in a long time. Some of the consequences of this pandemic are that many manufacturing organisations were forced to stop their operations and this forced leaders of some firms to explore implementation of sustainable solutions which can help them in building resilient industries and sustainable societies which are able to withstand such shocks in the future.

The current study was designed to identify and to prioritise the essential factors that affect in the rebuilding of more robust, resilient, equitable, sustainable industries in the post COVID-19 era. Categories of nine major factors with forty-two variables were selected, based on the advice of the experts. It was followed by using the AHP approach, which was used to develop priorities to the forty-two variables. The AHP approach was used to identify and prioritise the factors which can contribute effectively to make needed changes. Based upon the calculations, it was found that the factor ‘Role of Governance’ received the highest weight.

The “Role of Governance,” is critical in developing and implementing policies to revive the economy by rebuilding the industries. But there are also many other aspects that must be addressed to effectively transit to a more resilient, equitable and sustainable society in the face of disruptions from the current pandemic and to respond effectively in building a society that is fully engaged in seeking to reverse climate changes.

Although, the authors of the paper have tried to contribute by identifying the factors which can help in building resilient industries, still the paper has limitations which provide opportunities for further research. The findings were primarily based on the

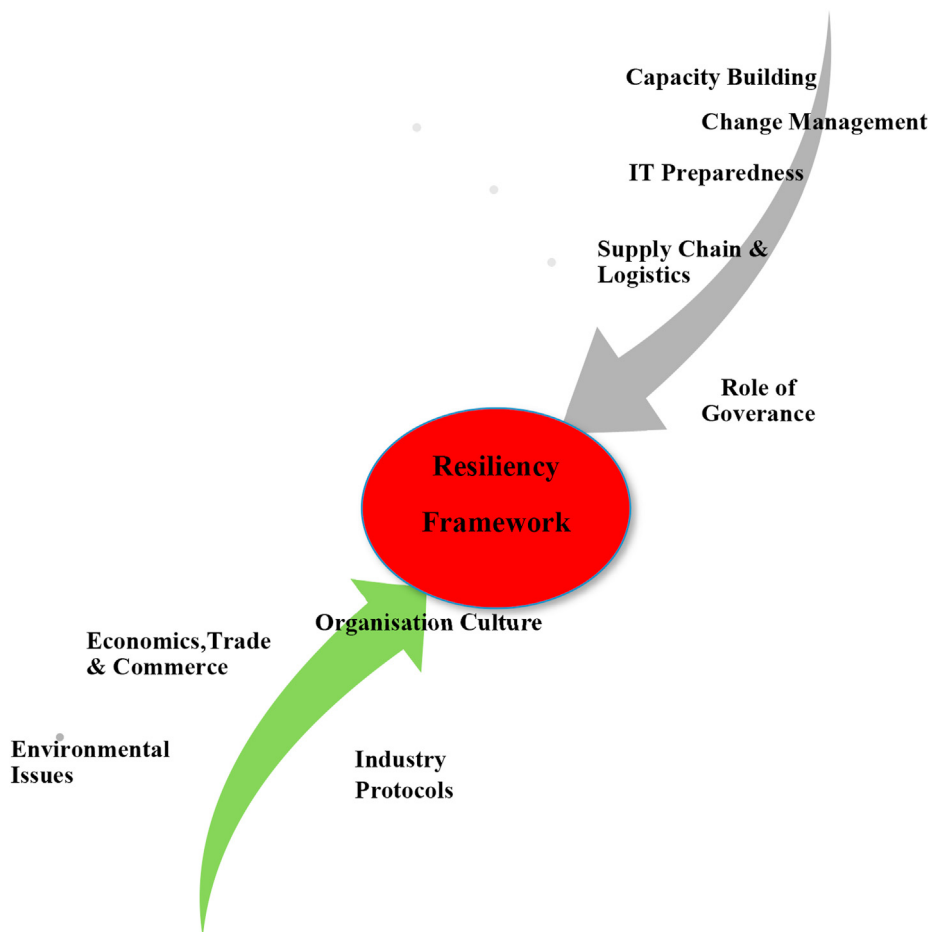


Fig. 7. Dimensions “Corona Warriors,” need to address to help in building resilient industries within the “New Normal Society.”

review of literature, reports of international organisations and opinion of the experts. The priorities for future action were based upon the opinions of experts obtained with the help of the questionnaire mailed to them. Due to the social distancing norms that had to be followed, the entire procedure was conducted via mail. It would have been better to conduct the procedure of getting the questionnaire filled by ‘face-to-face’ interactions with the experts. Additionally, the selection of experts from various sectors of the industries was not uniform; thus increasing the probability that the findings of the study may be somewhat biased towards a particular industrial sector. Also, the AHP technique has a limitation of inaccuracy associated with the expert’s judgements. Thus, the fuzzy AHP, which can provide freedom to experts to express their viewpoints with natural languages, should be addressed in our future research. Additional research should be performed on individual companies to obtain more comprehensive insight into the issues they must face due to this pandemic’s disruption in their supply chains, their employee’s health and their customer’s capacity to ‘buy’ or to rent their products and services.

This will help, to obtain a more generalized overview.

Additionally, the effects of short and long-term governmental and corporate policies on different industrial sectors, needs to be examined.

Awareness should be created on maintaining personal hygiene. The fight against the COVID-19 pandemic begins with regular hand-washing and wearing masks that are practices which have been found to be useful in slowing the spread of the virus. On these and other levels India has been a leader in addressing the challenges of

the COVID-19 pandemic.

The objective of the authors of this paper was to provide researchers with a challenge to take these suggestions and help to facilitate their implementation at the local, regional and national levels for the short and long-term future of India and other countries. Also, companies that exhibit their dedication towards sustainability issues in the wake of and in the post COVID-19 era will be respected for their holistic responses to the challenges and for their stronger relationships with their key stakeholders.

The authors look forward, with optimism, that global societies will be able to ‘conquer’ the pandemic and will emerge with new norms, new lifestyles, and new tools in anticipating and in dealing with future crises.

CRedit authorship contribution statement

Sonal Khurana: Ideas, Conceptualization, Writing - original draft, Data Collation and Curation, Methodology. **Abid Haleem:** Ideas, Writing - original draft, Conceptualization, Methodology. **Sunil Luthra:** Formal analysis, Conceptualization, Project administration, Critical Review, Commentary and Revision. **Donald Hui-singh:** Project administration, Critical Review, Commentary and Revision. **Bisma Mannan:** Writing: Data Collection, Formal analysis, Methodology, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no known competing

financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jclepro.2020.124466>.

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