NEP-2020's Implementation & Execution: A Study Conducted Using Neutrosophic PESTEL Analysis

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Abstract

It is evident how crucial education is to a person's overall development. The knowledge of the economy and society is still in its infancy. In terms of social and economic elements, education has emerged as the most significant factor for individual and national growth. Given this context, it would be worthwhile to examine the New Education Policy 2020 for the benefits and impacts it has on the various stakeholders. Such analysis is important to fulfill the needs and objectives of NEP-2020. Despite having many universities and schools, Indian education still needs some improvements. Many Indian children still do not have access to education, and more importantly, the education system in India has not undergone significant reform in the last few decades, so changes must be made to keep up with the changing needs of society. The purpose of this study is to use the neutrosophic PESTEL analysis technique to mathematically identify and rank the major factors required to be identified for the successful implementation of NEP. Numerous factors that are grouped into six primary categories—political, economic, social, technological, legal, and environmental. These are presented by a thorough literature review of the subject. The present work employs neutrosophic PESTEL analysis, to identify the main obstacles to the implementation and execution of NEP-2020 in India. The study shows that social and economic factors, with 84% and 60% respectively play a significant role while political and technical factors are also important and come in second place since they each represent 25% and 34% of the barriers to the implementation of the NEP-2020. The last two factors are legal and environmental, contributing only 13% and 3%, respectively. The primary goal of the study is to identify and statistically rank the biggest obstacles to NEP-2020 implementation in India. In many aspects, this research will help government organizations and policymakers prioritize the main obstacles early in the implementation process as well as during execution, ensuring that the results are as anticipated and that the project is finished within the allotted time limit.

Keywords: National Education Policy 2020; Neutrosophic Logic; Neutrosophic Cognitive Maps; PESTEL Analysis.

1. Introduction

The term "policy implementation" refers to a sequence of operations carried out by many entities, including the government, to achieve the aims and objectives that are outlined in policy pronouncements. The act of implementation may be carried out by official actors as well as by informal players, such as lawmakers, judges, bureaucracy, pressure groups, community organizations, or even individuals themselves. Power is not concentrated in any institution but rather dispersed among all levels of government. According to the Indian Constitution, the President formally holds

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

the Union's executive power. The Prime Minister-led Council of Ministers serves as the President's channel for exercising this authority. The New Education Policy (NEP) is the result of the Prime Minister's supervision of its creation and effective implementation. Additionally, the Prime Minister has the authority to choose the Ministers of Education and other government representatives in charge of carrying out the NEP. Additionally, the Prime Minister is in charge of expressing the government's viewpoints on education policy to the Parliament and responding to inquiries from lawmakers about this topic.

The Government of India worked on the New Education Policy (NEP) 2020 for many years. The Ministry of Human Resource Development (now the Education Ministry) established a committee in 2017 to assess the current educational policy and suggest reforms, which marked the beginning of the NEP development process. The NEP 2020 was published in July of that year after the committee, led by Dr. K. Kasturirangan, delivered its findings [1]. The New Education Policy 2020 (NEP) aims to update the education system to be more assembled, adaptive, and multidisciplinary, aligning with the requirements of the current century and the Sustainable Development Goals of 2030 [1]. The implementation of the NEP 2020, which constitutes a significant change in India's educational policy, is anticipated to take place over several years [1].

Various factors are having an impact on the implementation of NEP in some way. Most of the time any such changes in a public affair are opposed by the opposition political parties, other groups, and NGOs in that domain. Budgets and other economic factors are critical in such changes. It is essential to consider the impact on social harmony, people's reactions, and legal matters.

The successful execution of this policy necessitates a long-term perspective, consistent access to expertise, and coordinated action from all parties involved at the national, state, institutional, and individual levels. The Central Advisory Board of Education (CABE), which will have a much broader mandate and not only serve as a forum for widespread consultation and examination of issues relating to educational and cultural development, is recommended to be strengthened and given more authority in this context by the Policy. In close cooperation with MHRD and the relevant apex organizations of States, the renovated and revitalized CABE shall also be in charge of continuously formulating, expressing, reviewing, and modifying the national education vision. Additionally, it will develop and regularly examine the institutional frameworks necessary to realize this objective [1].

The PESTLE study of the NEP 2020 helps identify potential risks and problems both before and during the implementation of the plan. A well-thought-out policy has allowed itself to avoid receiving severe criticism. However, both those who support the policy and those who oppose it have expressed concerns over the implementation of the program. An approach that is proactive, preventative, and inclusive of emerging gaps requires building bridges since India is a country with numerous languages, as well as cultural and religious beliefs, and it has a large population living in a variety of geographical locations, each of which has particular requirements.

PESTLE is an acronym for Political, Economic, Social, Technological, Legal, and Environmental. Why are these factors important, and what would be their sub-factors? Their significance is discussed below, but we'll see this in the experts' discussion.

Social: - One of the crucial purposes of education is to build society. Nation-building requires a healthy society. Does the policy put enough focus on it? How important is the quality of stakeholders in this case? How much effort should be put into each factor to get the optimal output?

Political: - According to historical evidence, political disputes over matters relating to education frequently develop between the central government and the states during the implementation phase. Most of the authority is given to the center under this new policy. How might opposition parties, political agendas, political influencers, and both governments affect implementation depending on many other crucial factors?

Economical: - Similarly, economic factors need to be considered. Every stakeholder—teachers, students, educational institutions, and industry—requires funds to purchase critical technologies and maintain their livelihoods. Scholarship programs are currently offered by governments, non-governmental organizations, and educational societies and institutions. More such programs are still required. Funding is also required for establishing more institutions and for a more prosperous society. Allocation of funds (proposed at 6% of GDP) should not remain a dream unfulfilled.

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

Technological: - During and after pandemics, we have seen that technology is not optional but mandatory most of the time. With the aid of other factors, we will concentrate solely on the employability and productivity of students. How much of a role does technology play for the stakeholders in education and the environment? We'll find out. Numerous digital government programs like SWAYAM, MOOC, DIKSHA, and ABC should be taken into account.

Legal: - The implementation of the NEP-2020 is not a one-hit task. It is intended to be phased in, gradually replacing the old policy with this in various aspects. To achieve this time limit, various factors need to be considered. Important factors in this regard, in the expert's opinion, are the specific responsibilities of various stakeholder groups in education, along with the persons appointed for a specific role to play during the implementation phase. To raise the bar and improve education The revision of the recruitment and retention policies of the teachers and various other stakeholders is very important. How much impact do these factors have? Finally, how can we forget about corruption?

Environmental: - Environmental factors comprising digitalization, promoting greenery, and other aspects are also important to consider.

Since the NEP 2020 is getting close to putting its plan into action, it would be smart to use PESTLE analysis to learn from past experiences (policies from 1968, 1986, 1990, and 1992, as well as educational projects from the last 20 years).

According to research conducted by Forbes, the failure of 90 percent of business strategies can be attributed to a single, overarching factor: ineffective execution [34]. Therefore, it is essential to investigate the causes and contributing variables that are accountable for poor execution. in addition, what are the significant aspects of the implementation that need to be taken into consideration so that it can be improved?

In the following sections, we are going to discuss the implementation of a neutrosophic pestle risk analysis tool for the NEP-2020 implementation. In light of this, we compiled the results of a literary survey. that can be found in the next areas. Section 4.1 explains the neutrosophic pestle analysis, its background, and its effectiveness in terms of major principles of scenario analysis. Section 4.2 titled "Material and Methods," provides a concise introduction to the necessary tools and terminologies, along with some examples. Followed by this, a detailed discussion of the suggested framework is presented. Section 5 titled "result and discussion" presents the expert's opinions that are acquired by surveying the literature present related to factors that are mentioned in section 4.1.1. The NCM and matrices are obtained based on their opinions. In addition, a variety of calculations are performed for the analysis approach that is proposed. A table is made with all of the intermediate findings to make it easier to grasp based on the outcome, and a pie chart is also constructed to summarise the outcomes of the computations. At long last, section 5 concludes the work by providing the findings of the study.

2. Related Work

A significant amount of work has already been done in generating various ideas, such as why the NEP-1986 needs to be reformed [2]. The primary focus of the educational system will move from what the system thinks the students should learn to what the students themselves want to learn, with the existing boundaries of the educational stream being broken down to accommodate the students' desires and needs [2]. The level of higher education available in a nation is one of the most important determinants of its future in terms of its economy, society, technological development, and human behavior [3]. The previous NEP was primarily concerned with empowering women, caring for children, promoting literacy, and bringing about change in the education of teachers through the process of modernizing the education sector in terms of enhancing services. However, it does not adequately prepare graduates with research and employment skills [3]. To overcome these failures of older NEPs the NEP-2020 is proposed [again] which comes into effect on July 29th of 2020 [30]. The question arises as to how successful this policy may be, as well as how difficult it would be to bring about such a significant and abrupt shift in policy. These considerations are analyzed in further depth in [4]. This article also analyses the amount of time that will be necessary for the policy to become operational, as well as the outcomes that we anticipate it will produce. How and why this policy ought to be welcomed by students and educational institutions, as well as why it ought not to be welcomed.

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

How the flexible structure of the program, which allows it to bypass traditional barriers, will enable students to develop their research and job-seeking skills.

3. Problem Statement

Even though India has made significant progress in the seven decades since its independence, most people sincerely believe that the country has not acceded to its proper position in the community of countries. There is no doubt that there is much room for improvement in our entire educational system. A reduction in learning abilities among students is seen in several evaluation research. Government schools, whose dropout rates are still large, are nevertheless plagued by teacher shortages and absenteeism. The process of appointing, and transferring teachers, as well as the process of approving and recognizing educational institutions, are plagued with numerous instances of corrupt behavior. Donations are required for entry into many different types of schools, and this practice is pretty popular in technical and medical education. Examination materials are often compromised, plagiarism is rampant, and mark sheets are frequently fabricated [2], [3].

Approximately 65 percent of India's population is younger than 35 years old now [32], [33]. If India invests in modernizing its educational system, it will be able to reap significant demographic benefits. The children of India have the requisite intelligence and potential; what they lack is the opportunity to receive a good education [2]. Technology cannot solve the issue of inadequate educational quality on its own; the human element is just as vital, if not more so. Several imbalances caused by socioeconomic, gender, and geographic differences are now acknowledged and can be corrected with the right interventions and a well-defined approach. Numerous educational institutions are run by faculty members who are not able to conduct their duties well and behave much like instructional facilities [2].

There are numerous other potential causes also for these problems. The policy does not adequately address issues like if. Since that is outside the purview of our investigation, we won't go into depth. But they are primarily the result of poor implementation. That is why the implementation of a policy is a very important aspect in which we are interested. For the implementation and execution of this strategy, we wish to analyze the elements that must be taken into account and their relative importance [4].

4. Proposed Methodology

Using In 2001 Florentin Smarandache proposed the Neutrosophic theory to deal with uncertainty. In this, he utilizes the Neutrosophic logic & Neutrosophic set and generalizes the Fuzzy set theory. When we are working on the unsupervised data of a real-life problem, we often come across the relationship between two factors neither be determined nor denied. In such condition Neutrosophic logic come into play with the concept of indeterminacy [5].

4.1. PESTEL

PESTEL analysis is a very popular business analysis tool. It is easy and effective to use [6]. Using PESTLE Analysis in situation analysis is proposed [7]. The basic function of PESTEL analysis is to analyze a situation from six perspectives; political, economic, social, technological, ecological, and legal use [6].

4.1.1. Identification of PESTEL factors

Finding the crucial PESTEL components and sub-factors was the goal of this step. The factors that were gleaned from the specialists and will be examined in section 6 are as follows. To categorize factors, the literature is employed. Each factor has been given a succinct name, which will be utilized in the subsequent calculation and depiction of the information to make it more understandable.

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

Political

1.	Political issues b/w central and state gov (Education is a shared field of interest of both).	F01
2.	Opposition from political parties (not in power)	F02
3.	Political influencers (Maybe from governing parties or opposition)	F03
4.	Central Government (’s contribution)	F04
5.	State Government (‘s contribution)	F05
6.	Quality of nation	F06
7.	Teaching in Regional language	F07

Economical

1.	Professional growth of Faculty/Teachers	F08
2.	Well-being of faculty/Teachers	F09
3.	Financial support to education stakeholders	F10
4.	Education Fund/Budget	F12
5.	Education fund for Institution	F13
6.	Scholarships	F14
7.	Poverty	F15
8.	Family well-being	F16
9.	Employability of students	F17
10.	Taxes	F18
11.	Promotion	F19

Social

1.	Health	F20
2.	Quality of institution	F21
3.	Administration of Edu. Institutions	F22
4.	Quality of Teachers	F23
5.	Quality of Teachings	F24
6.	Quality of education	F25
7.	No. of Students	F26
8.	Foreign students	F27
9.	Quality of citizens	F28
10.	Social disparity	F29
11.	Inter-social & regional differences	F30
12.	Castism	F31
13.	Religious practices	F32
14.	Pandemic effect	F45

Technological

1.	Growth of IT/Corporations	F34
2.	E-books	F35
3.	Online medium/tools for Edu. Like (Laptop, zoom)	F36
4.	E-learning plate forms (SWAYAM, MOOC, Diksha, etc.)	F37

Legal

1.	Specific responsibilities	F38
2.	Corruption	F39
3.	Recruitment Policy (Faculty/Teachers)	F40
4.	Retention Policy	F41

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

Environmental

1. Pollution F43
2. Edu. Institution's infrastructure F33

By combining the Neutrosophy with cognitive mapping we can quantitively analyze the PESTEL factors [7], [8]. And then draw the conclusion like which factor is more significant or less significant. Cognitive mapping is based on graph theory, which is the basis of indices and calculations [9]. Neutrosophic Cognitive Map (NCM) represents existence, non-existence, and indeterminate relationships among the different concepts (using a directed graph) [7], [8]. We are going to draw the NCM for the PESTEL factors (section 5.2). An adjacent matrix for the NCM would be generated (section 5.3), which will be used to conclude our result and objective (section 6).

4.2. Material and Methods

Definition 1. Neutrosophic set: - Let N be a subset of universal set U and x ϵ U has a degree of membership (truth) T, Indeterminacy I, and non-membership (false) F in N such that,

$$a_{i,j}^{T}$$

$$x(T,I,F)\epsilon N$$

$$\text{Or } N=\{(T,I,F): T,I,F\epsilon[0,1]\}$$

then **N** is called the Neutrosophic set.

Definition 2. Neutrosophic Matrix: - A matrix whose elements are from a neutrosophic set,

$$M=(<a_{ij}^{T},a_{ij}^{I},a_{ij}^{F}>)$$

i.e., each element is in the form a + Ib, where a,b ϵ R and I is the indeterminant valve.

This matrix M is called the Neutrosophic matrix.

Definition 3. Neutrosophic Cognitive Map: - A neutrosophic directed graph that represents the type of relationship whether it is determinant or indeterminant among the nodes (events, policy, rule). The edge represents the determinant relationship and the dotted edge represent the indeterminant relationship.

Definition 4. Neutrosophic numbers: - A neutrosophic number is referred to the combination of the determinant (integer) and indeterminant (denoted by I).

$$N=a+bI$$

The addition and subtraction of neutrosophic numbers are defined as,

Let two neutrosophic numbers,

$$N_1=a_1+b_1I$$
$$N_2=a_2+b_2I$$

Then,

$$N_1+N_2=a_1+a_2+(b_1+b_2)I$$
$$N_1-N_2=a_1-a_2+(b_1-b_2)I$$

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4.2. Proposed Framework

The goal is to come up with a framework based on PESTEL and NCM and give it more details. There are five steps to making the model shown in the following figure.

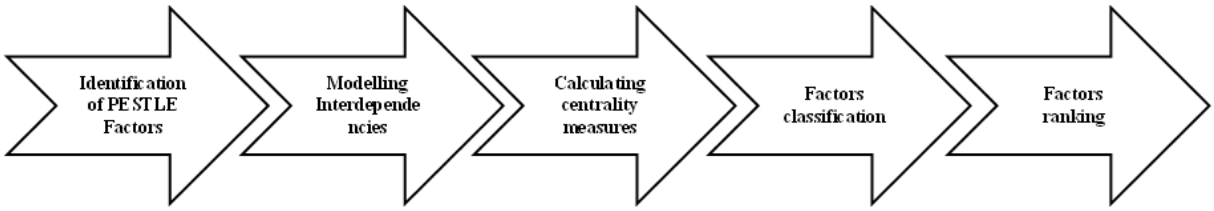

Figure 1: The framework for analysis.

4.2.1. Identification of PESTEL factors

This step was about finding the important PESTEL factors and sub-factors. Find the factors and subfactors that make up the PESTEL model to make a hierarchical system. The literature is used to put sub-factors into groups.

4.2.2. Modeling interdependencies

This step, which involves building NCM subfactors based on the opinions of an expert or expert team, models the causal interdependencies between PESTEL sub-factors.

When n experts take part, the following formula is used to figure out the adjacency matrix of the collective MCD:

$$E = \mu(E_1,\ E_2,\ E_3, \dots, E_n) \quad (1)$$

Most of the time, the arithmetic mean serves as the operator.

4.2.3. Calculate centrality measures

Absolute values of the NCM adjacency matrix are used to determine centrality measurements.

1. **Outdegree od(v_i)** Any graph's out-degree indicates how strongly a variable outgoing is related to other variables. It is defined as the total of all the elements in a row of the neutrosophic adjacency matrix.

$$od(v_i) = \sum_{i=1}^{N} c_{ij} \quad (2)$$

2. **Indegree id(v_i)** It demonstrates the overall power of all the variables that come in the variable. It is defined as the addition of the absolute values of a column in the neutrosophic adjacency matrix.

$$id(v_i) = \sum_{i=1}^{N} c_{ij} \quad (3)$$

3. **The centrality degree (total degree td(v_i))** It is defined as the sum of a variable's indegree and outdegree.

$$\mathrm{td}(v_i) = \mathrm{id}(v_i) + \mathrm{od}(v_i) \quad (4)$$

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Received: June 15, 2022 Accepted: January 28, 2023

4.2.4. Factors classification and ranking

Factors are classified as the transmitter(T), receiver(R), and ordinary(O). The transmitter means a factor has either positive or indeterminant outdegree but zero indegrees. The receiver is defined as factors having either positive or indeterminant indegree but zero outdegrees. Variables are called ordinary(O) if they have a non-zero degree, and depending on how their indegrees and outdegrees are related, they can be thought of as either receiving variables or sending variables.

The procedure of de-neutrosophication gives a number range for centrality based on the highest and lowest values of I. Between these two possible values, a neutrosophic value is switched every so often [0], [1].

A variable's importance in an NCM can be determined by evaluating its degree of centrality, which reveals the strength and directionality of the variable's links to other variables. A centrality value is calculated by taking the middle number between the two extremes i.e., the median.:

$$\lambda([a_1, a_2]) = \frac{a_1+a_2}{2} \quad (5)$$

Then,

$$A > B \Leftrightarrow \frac{a_1+a_2}{2} > \frac{b_1+b_2}{2} \quad (6)$$

After all the data had been collected, a ranking of the factors could be established.

4. Results and Discussion

Using It is not possible to tell how successful this plan may be or how difficult it would be to implement such a big shift in policy at this time. These components receive a comprehensive discussion in [4]. The period required for the policy to take effect properly and the results that we may anticipate as a result of it are both discussed in this article as well. Why students and educational institutions should or shouldn't support this policy, as well as the reasons why they should. Students will be better able to enhance their research and employment abilities if they can break downstream borders and be adaptable.

5.1. Selection of experts and their opinion

Experts are chosen based on their professional accreditation, educational background, professional experience, peer evaluation, and public recognition, as well as the elements of survey, review, and situation analysis. Additionally, they made a significant effort to take stakeholders into account while analyzing how the NEP would be implemented. We will consider the expert's opinion in detail later in this section. let's have a look into the domain of expertise requirement related to the implementation of NEP-2020.

What are the primary goals of the NEP-2020? We talk about how we're going to do this and what needs to be taken into account throughout the implementation stage. These all questions are answered by expert-9. We all know that the NEP-2020 exists solely for the benefit of the student. Due to his insight into the future and proficiency in his field, expert-10 was chosen. He gave an example of how the future educational system will alter as a result of this new approach. It talked about how the stakeholders would be affected by this futuristic educational system. This expert-3 was chosen due to her great work, with a particular focus on the role of teachers in improving the quality of education. We value expert-2 expertise as a result of their excellent analysis of NEP 2020's goal. They also talked about methods for putting this policy into practice. We cannot avoid technology's influence on education which is continuously increasing as it develops. The importance of current technology in contemporary educational institutions is discussed by expert 4. It is imperative to consider the significance of a few key social determinants and their relative influence on the various stakeholders as stated above. For the sake of this aspect, we consider expert-5. Political considerations must be taken into account while discussing the implementation of a policy for the entire nation. Since expert-7's work focuses mostly on the politicization of education, its significance, its effects on stakeholders,

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

as well as many other issues. The Covid 19 pandemic, which affected the entire world, including India, just before the NEP-2020 launch, significantly altered the educational landscape. All of the pandemic's consequences on education and other education stakeholders must be taken into account. For that reason, this expert-6 is taken into account. Every stakeholder and element has a part to play in how this policy is put into practice. What are the driving forces behind the same? What difficulties do they encounter? And how are these all connected? Expert 8 discusses each of these in his work. Now we will see each expert one by one.

Expert-1

The students and the teachers make up one of the most important groups of stakeholders in the educational system. If the professors are good, there will be more students. The recruitment policy, the retention policy, and the professional growth policy all contribute to the morality of the teaching staff. Because the education system falls under the purview of both governments, disagreements often arise between the two. There may be some difficulties in putting the new policy into effect if the two parties occasionally have different agendas. Which also has the effect of resulting in opposition from many other political parties [31].

Both the central government and individual state governments contribute to the education fund by providing monetary assistance, which has a highly beneficial impact on the health of the nation's educators as well as the no of students. The financial and physical health of a family has the greatest influence on the number of students enrolled in a school, and the converse is also true [31].

Expert-2

I consider this expert due to their great work in the analysis of NEP -2020 in terms of its objective. They also discussed strategies related to the implementation of this policy [4], [10].

Employment and entrepreneurship-oriented education are expected to be deployed by the institution funded by the central and state government to promote education and increase the number of students in institutions. More foreign students will promote education which ultimately increases the count of both, Indian as well as foreign students. Good teachers increase the quality of education and encourage employment opportunities. To achieve good results funds must be provided by both the center and state governments for all the stakeholders including the teachers, institutions, students, etc. to get good teachers central and government should interfere to improve the recruitment and retention policy [4], [10].

Expert-3

This expert is selected because of her excellent work special focus on the teacher’s role in education quality enhancement. In this paper, other important factors are also considered which would be very helpful in strategizing the implementation of NEP -2020 [11].

In Nation building, quality education plays a vital role. Quality Education will only be provided by good quality teachers and they are the backbone of education. But this noble profession is losing its status and standards due to several factors like casteism, corruption, political influences, and many other factors. A teacher should be aware, adoptive, and updated with the latest technologies for teaching and learning. By improving the quality of teaching and adding employer-centric learning they increase the quality of education as well as one of the main outcomes, employability. There are various digital and online plate forms available where online courses are available which not only increase the quality of education but also enhance the quality of teachers [11].

Expert-4

As technology advances, its impact on education is unavoidable. Modern technology plays a very crucial role in modern education systems which is addressed by M. Pallavi [12].

During the pandemic, most of the work started to be done in virtual mode. Like classes of education, training, and placement interviews. Digital mediums like laptops, smartphones, tablets, etc. help in connecting people virtually through online plate forms like zoom and google meet. This has not only helped the teachers but also benefits the students. Various courses are made available through SWAYAM, MOOC, and various other platforms which ultimately enhance the quality as well as employability [12].

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

Expert-5

It is a must look at the importance of some crucial social factors and how much impact they have on the various stakeholders as discussed above. For sake of this aspect, we have considered Kalyani V, Murugan K, and Prof. D. as the experts [13].

It is trivial that students grasp concepts easily and quickly in their mother tongue. To promote it and for ease, many teachers switched to the regional language. But this also has its consequences as it increases the inter-social disparity between different parts of the country. There are various other factors like social and regional differences that promote the disparity among the different sections of society. This will badly affect the migration of students as well as online education. This disparity can slightly be reduced by using different means to improve the wellness of an average Indian family [13].

Expert-6

Just before the launching of NEP-2020, the whole world including India faced the pandemic, the Covid 19, which has changed the education system very much. We have to consider all the effects of the pandemic related to education and other stakeholders of education. For that this expert is taken into consideration [14].

Management or administrations and policies taken by the administration have an indirect impact on the quality of education and the quality of teachers. Quality education is dependent on online mediums of education and the reverse is also true, but the nature of dependencies is not significant. The pandemic has increased the dependency on technology and online plate forms.

One of the major outputs of education is the employability of the student. Which is directly influenced by good teaching and education. Online education also has a significant impact on the employability of students [14].

Expert-7

When we talk about implementing a policy for the whole country, we can't ignore the political factors. This expert is taken for the same as their work is mainly on the politicization of education, its importance, and its effect on stakeholders as well as on various other factors [15].

Education and politics have influences on each other. This relation can vary on a case basis. It can be positive or negative. Various factors increase the power of political influencers and political parties like religious practices, the economic condition of an average Indian family, and casteism. In defense and to reduce the opposition from the political parties, the government took many initiatives like scholarship schemes. For that funds for education must be increased and optimizing taxation in such a way that the poor are less affected [15].

Also, some specific representatives must be chosen from the various part of the society based on religion, caste, and economic conditions for suggestions. This will help in nation-building. The same quality of education must be increased. Factors affecting the education quality are again the social disparity, funds, and intersocial and cultural differences. The influence of social disparity is not specific because it was caused due to many factors including some political agenda, poverty, castism, people in power, intersocial and cultural differences, and different religious practices [15].

Expert-8

Every stakeholder and factor has some role to play in the implementation of this policy. What are the motivators for the same? What are the challenges they face? And all of these related to each other? All of these are discussed by Rakesh Pathak in his work [16].

Infrastructure improvement enhances the quality of teaching and the quality of the institution. The Quality of faculty is the most important factor the for success of educational institutions. Faculty motivation is important because it enhances the quality of teaching and quality education. Faculty motivation is negatively affected by corruption, castism as well as political influences. The Basic needs of faculties should be taken care of by the administration of educational institutions. Administration of Institutions that are supposed to boost the motivation of faculty are also harshly affected by the political influencers through some agenda or corruption [16].

DOI: https://doi.org/10.54216/IJNS.200207
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Faculty motivation and technology can enhance the outcome of higher education. IT sector growth not only increases the quality of education but also the employability of students and hence plays a vital role quality of the nation. Quality teachers also play a vital role in nation-building by enhancing the employability of students [16].

Expert-9

What are the main expectations from this NEP-2020? How we are going to achieve this, and things to be considered during the implementation phase are discussed in the work NEP-2020: A roadmap for India 2.0 by Alok Kumar [17].

Educational institutions have been given the option to become autonomous or they can be part of the existing university for that they have to maintain the quality of education. If education quality is constant or increasing, more students will get enrolled. New NEP is more focussed on the overall development of a student with cross-disciplinary and outcome-based education. ABC is proposed at the National level. Many digital platforms are either existing or newly proposed, to help students and teachers to increase the quality of teaching using online education. Online education has a very positive effect on increasing the number of foreign students. The quality of the Institution has been influenced very positively. The Indian government focussed on establishing world-class educational institutions which will attract more foreign students. The quality of institutions will be decided by their contribution to the delivery of Quality education. Educational Institutions fund supported by the education fund in the der Budget proposed are supposed to be used in maintaining Ebooks and digital libraries, Scholarships to meritorious students. Financial support to educational stakeholders also helps in enhancing the quality of education. The number of students also affects the Quality of education because good education enhances students' employability. Which is the key focus of the new NEP. Administration of Educational institutions is given freedom for admission of students, recruitment, and retirement of teachers and other staff [17].

Expert-10

The sole of the NEP-2020 is to benefit the student. This expert Pawan Kalyani is selected due to his future vision and expertise in his domain. He provided a model of how this new policy will change the future education system. And discussed the effect of this futuristic education system on the stakeholders [18].

Some radical changes in NEP-2020 will shape the students in new ways. Now they are not going to be bounded by the different streams like science, commerce, and arts, etc. and they are now free from peer pressure groups and the family to choose whatever combination they want. Students with employability skills are very useful for their personal growth and the industry [18].

Education is very important for the building of a developed and progressive society free from social disparity which in turn leads to a developed nation [18].

NEP-2020 has put a bigger responsibility on the shoulders of teachers. They have to advance themselves with the latest technology and digital plate forms for the old as well as new courses with upgraded versions. Their recruitment policy and retention policy stricken will work as the filter for the quality teacher and hence increase the quality of education [18].

Since all the stakeholders are part of the society it's a moral duty to return the favor. For a quality nation quality of citizens is very important. The quality of citizens is not only depending on education but also health as a healthy mind resides in a healthy body. If a person in the family is sick and their investment in health increase most of the time this extra is managed by cutting the budget of education [18].

5.2. NCMs of experts' opinion

Considering the experts' opinions discussed in section 6.1, NCMs are drawn below. Since there are more than 40 factors, to make it understandable only those factors are shown in the NCM which has some relation with others in the expert's opinion. The remaining factors are dropped from the NCM. The colored boxes represent the group of factors they belong to. Purple for political, green for economic, grey for social, orange for technological, blue for legal, and lastly sky blue for environmental. Directed edges represent the effect of one factor on another. The nature and magnitude

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

of the relationship are shown with the weight of the edges they carry. The positive, negative, and indeterminants representing indegree and outdegree are discussed in detail in section 4.2.

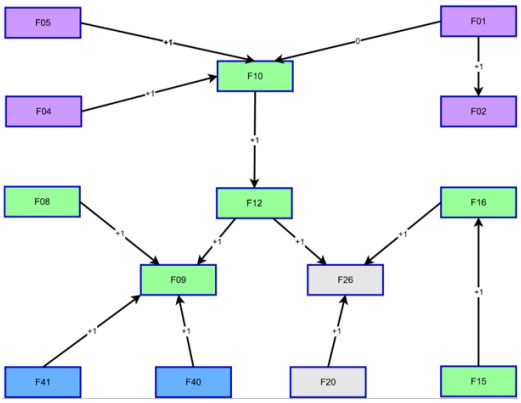

Figure 2.1. NCM of expert-1.

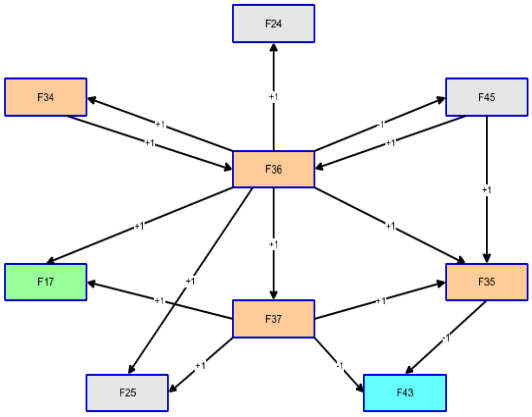

Figure 2.2. NCM of expert-1.

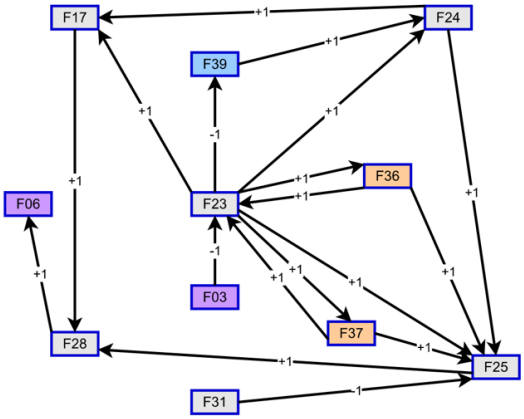

Figure 2.3. NCM of expert-1.

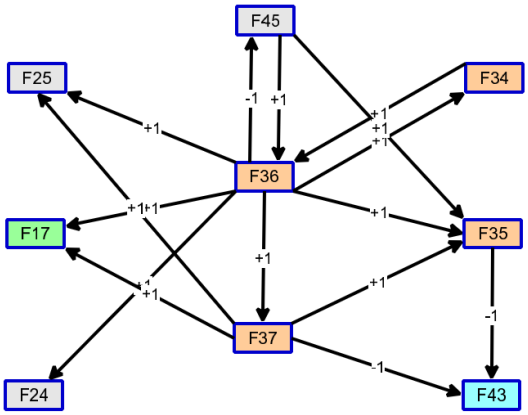

Figure 2.4. NCM of expert-1.

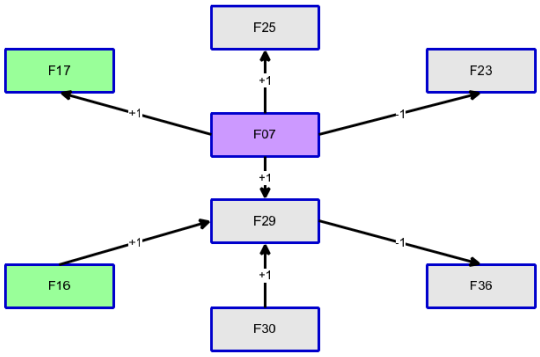

Figure 2.5. NCM of expert-1.

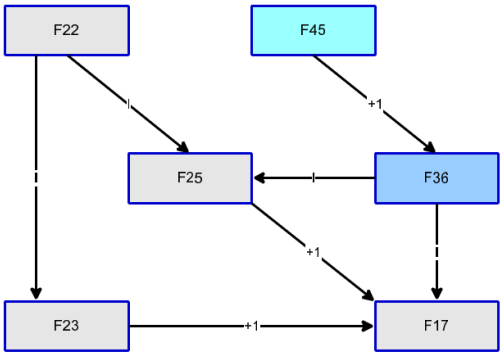

Figure 2.6. NCM of expert-1.

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

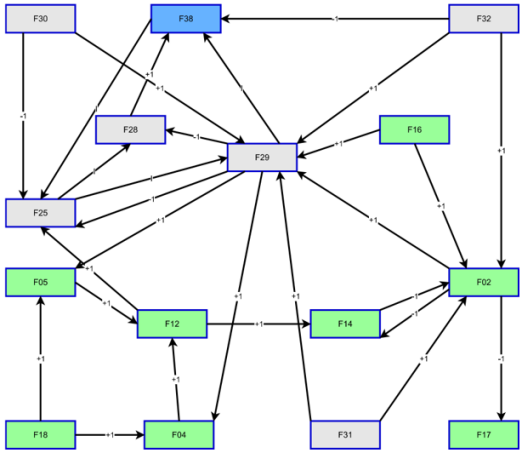

Figure 2.7. NCM of expert-1.

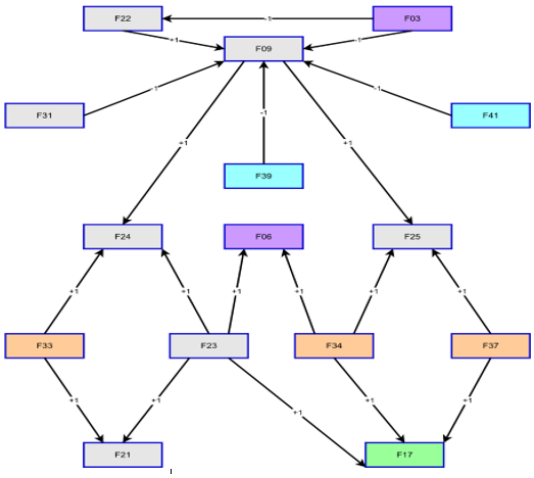

Figure 2.8. NCM of expert-1.

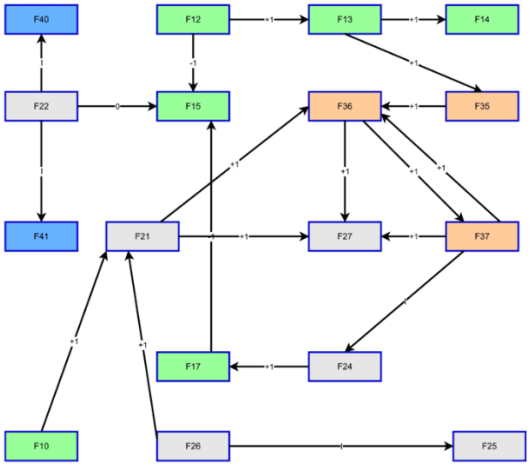

Figure 2.9. NCM of expert-1.

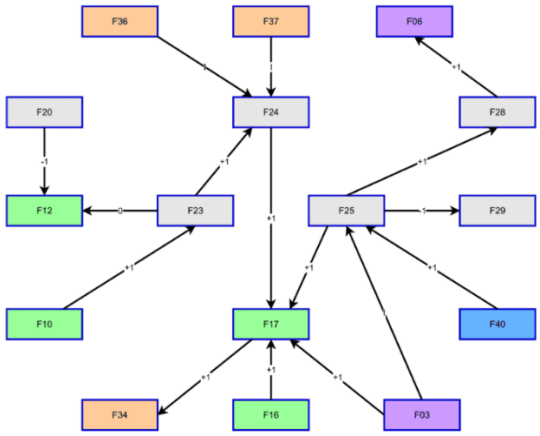

Figure 2.10. NCM of expert-1.

5.3. Adjacent Matrices of NCMs of experts

The NCMs that are located above are used to assist in the construction of adjacent matrices. For the sake of clarity and ease of comprehension, all of the components that, in the opinion of the expert, are not related have been eliminated.

Table 1.1. NCM of expert-1

	F01	F02	F04	F05	F08	F09	F10	F12	F15	F16	F20	F26	F40	F41
F01	0	1	0	0	0	0	0	0	0	0	0	0	0	0
F02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F04	0	0	0	0	0	0	1	0	0	0	0	0	0	0
F05	0	0	0	0	0	0	1	0	0	0	0	0	0	0
F08	0	0	0	0	0	1	0	0	0	0	0	0	0	0
F09	0	0	0	0	0	0	0	0	0	0	0	1	0	0
F10	0	0	0	0	0	0	0	1	0	0	0	0	0	0
F12	0	0	0	0	0	1	0	0	0	0	0	1	0	0
F15	0	0	0	0	0	0	0	0	0	1	0	0	0	0
F16	0	0	0	0	0	0	0	0	0	0	0	1	0	0
F20	0	0	0	0	0	0	0	0	0	0	0	1	0	0
F26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F40	0	0	0	0	0	1	0	0	0	0	0	0	0	0
F41	0	0	0	0	0	1	0	0	0	0	0	0	0	0

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

Table 1.2: NCM of expert-1

	F04	F05	F10	F12	F13	F14	F17	F19	F23	F25	F26	F27	F40	F41
F04	0	0	1	0	0	0	0	0	0	0	0	0	1	1
F05	0	0	1	0	0	0	0	0	0	0	0	0	1	1
F10	0	0	0	1	0	0	0	1	0	0	0	0	0	0
F12	0	0	0	0	1	1	0	0	0	0	0	0	0	0
F13	0	0	0	0	0	1	0	0	0	1	0	0	0	0
F14	0	0	0	0	0	0	0	0	0	0	1	1	0	0
F17	0	0	0	0	0	0	0	1	0	0	0	0	0	0
F19	0	0	0	0	0	0	0	0	0	0	1	1	0	0
F23	0	0	0	0	0	0	1	0	0	1	0	1	0	0
F25	0	0	0	0	1	0	0	1	0	0	1	1	0	0
F26	0	0	0	0	0	0	1	0	0	0	0	0	0	0
F27	0	0	0	0	0	0	1	1	0	0	0	0	0	0
F40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F41	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1.3: NCM of expert-1.

	F03	F06	F17	F23	F24	F25	F28	F31	F36	F37	F39
F03	0	0	0	-1	0	0	0	0	0	0	0
F06	0	0	0	0	0	0	0	0	0	0	0
F17	0	0	0	0	0	0	1	0	0	0	0
F23	0	0	1	0	1	1	0	0	1	1	-1
F24	0	0	1	0	0	1	0	0	0	0	0
F25	0	0	0	0	0	0	1	0	0	0	0
F28	0	1	0	0	0	0	0	0	0	0	0
F31	0	0	0	0	0	-1	0	0	0	0	0
F36	0	0	0	1	0	1	0	0	0	0	0
F37	0	0	0	1	0	1	0	0	0	0	0
F39	0	0	0	0	-1	0	0	0	0	0	0

Table 1.4: NCM of expert-1

	F17	F24	F25	F34	F35	F36	F37	F43	F45
F17	0	0	0	0	0	0	0	0	0
F24	0	0	0	0	0	0	0	0	0
F25	0	0	0	0	0	0	0	0	0
F34	0	0	0	0	0	1	0	0	0
F35	0	0	0	0	0	0	0	-1	0
F36	1	1	1	1	1	0	1	0	-1
F37	1		1	0	1	0	0	-1	0
F43	0	0	0	0	0	0	0	0	0
F45	0	0	0	0	1	1	0	0	0

Table 1.5: NCM of expert-1

	F07	F16	F17	F23	F25	F29	F30	F36
F07	0	0	1	-1	1	1	0	0
F16	0	0	0	0	0	-1	0	0
F17	0	0	0	0	0	0	0	0
F23	0	0	0	0	0	0	0	0
F25	0	0	0	0	0	0	0	0
F29	0	0	0	0	0	0	0	-1
F30	0	0	0	0	0	1	0	0
F36	0	0	0	0	0	0	0	0

Table 1.6. NCM of expert-1

	F17	F22	F23	F25	F36	F45
F17	0	0	0	0	0	0
F22	0	0	I	I	0	0
F23	1	0	0	0	0	0
F25	1	0	0	0	0	0
F36	I	0	0	I	0	0
F45	0	0	0	0	1	0

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

Table 1.7. NCM of expert-1

	F02	F04	F05	F12	F14	F16	F17	F18	F25	F28	F29	F30	F31	F32	F38
F02	0	0	0	0	-1	0	-1	0	0	0	1	0	0	0	0
F04	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
F05	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
F12	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
F14	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F16	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
F17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F18	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
F25	0	0	0	0	0	0	0	0	0	I	I	0	0	0	0
F28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
F29	0	1	1	0	0	0	0	0	-1	-1	0	0	0	0	I
F30	0	0	0	0	0	0	0	0	-1	0	1	0	0	0	0
F31	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
F32	1	0	0	0	0	0	0	0	0	0	1	0	0	0	-1
F38	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0

Table 1.8:NCM of expert-1.

	F03	F06	F09	F17	F21	F22	F23	F24	F25	F31	F33	F34	F37	F39	F41
F03	0	0	-1	0	0	-1	0	0	0	0	0	0	0	0	0
F06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F09	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
F17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F22	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
F23	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0
F24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F31	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0
F33	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
F34	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
F37	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
F39	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0
F41	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0

Table 1.9: NCM of expert-1.

	F10	F12	F13	F14	F15	F17	F21	F22	F24	F25	F26	F27	F35	F36	F37	F40	F41
F10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
F14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F21	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
F22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	I
F24	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
F25	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
F26	0	0	0	0	0	0	1	0	0	I	0	0	0	0	0	0	0
F27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F35	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
F36	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
F37	0	0	0	0	0	0	0	0	I	0	0	1	0	1	0	0	0
F40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

Table 1.10: NCM of expert-1.

	F03	F06	F10	F12	F16	F17	F20	F23	F24	F25	F28	F29	F34	F36	F37	F40
F03	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
F06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F16	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
F17	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
F20	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0
F23	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
F24	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
F25	0	0	0	0	0	1	0	0	0	0	1	-1	0	0	0	0
F28	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F36	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
F37	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
F40	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0

5.4. Considering all experts

The following NCM is drawn with the help of all the NCMs above. As discussed in section 5.2, the group of factors they belong to is shown by the colored boxes. Directed edges show how one element affects another. The weight of the edges they carry reveals the type and extent of the relationship.

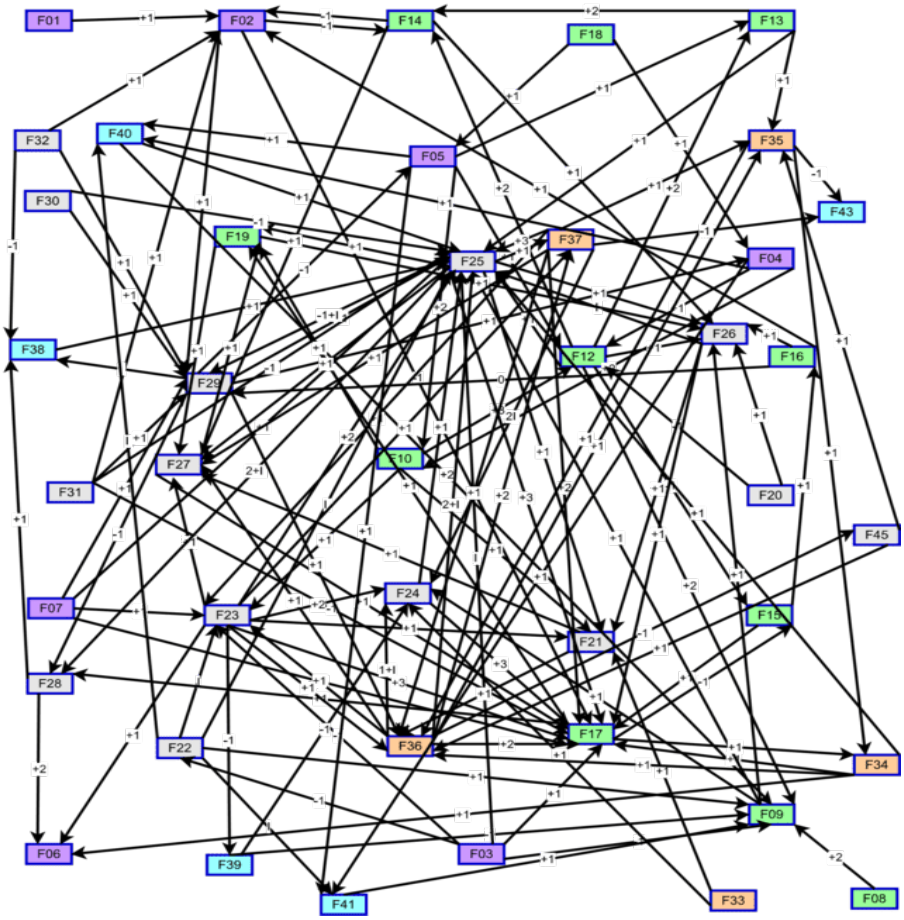

Figure 3: NCM of all experts experts.

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

The result of this case is generated in the form of a neutrosophic adjacency matrix, as follows, of NCM above.

Table 2. Neutrosophic Adjacency Matrix

Now, the measures of centrality are computed for static analysis of factors. Equations 2, 3, and 4 are used to perform the calculations necessary to calculate the measures of centrality. These centrality metrics are based on both in- and out-degree measurements. The measurements of centrality are displayed in Table 3 below.

Table 3. Indegree, Outdegree, and Total degree of variables

Nodes	In Degree	Out Degree	Total Degree
F01	0	0.33	0.33
F02	1.65	0.99	2.64
F03	0	1.32 + I	1.32 + I
F04	0.66	1.66	2.32
F05	0.66	1.66	2.32
F06	1.33	0	1.33
F07	0	1.32	1.32
F08	0	0.67	0.67
F09	3.34	0.99	4.33
F10	1.34	1.32	2.66
F12	1.32	3	4.32
F13	1	1.33	2.33
F14	1.67	0.99	2.66
F15	0.66	0.33	0.99
F16	0.33	0.99	1.32
F17	6.98	1.32	8.30
F18	0	0.66	0.66
F19	1.32	0.66	1.98
F20	0	0.66	0.66
F21	1.32	0.66	1.98
F22	0.33	0.33 + 4I	0.66 + 4I
F23	1.65 + I	4.32	5.97 + I
F24	1.99 + 2I	1.67	2.66 + 2I
F25	5.98 + 5I	3.65 + 2I	9.63 +7I

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

F26	2.31	0.66 + I	2.97 + I
F27	2.31	0.66	2.97
F28	1.33 + I	1	2.33 + I
F29	1.99 + I	1.65 + I	3.64 + I
F30	0	1	1.00
F31	0	1.32	1.32
F32	0	0.99	0.99
F33	0	0.66	0.66
F34	0.66	1.32	1.98
F35	1.32	0.99	2.31
F36	2.31	3.66 + 2I	5.97 + 2I
F37	1.33	3.32 + 2I	4.65 + 2I
F38	0.66 + I	I	0.66 + 2I
F39	0.33	0.66	0.99
F40	0.66 + I	1	1.66 + I
F41	0.66 + I	0.34	1 + I
F43	0.66	0	0.66
F45	0.33	0.33	0.66

Units with a positive outdegree and a zero indegree are referred to as transmitter factors. Units with a positive indegree and zero outdegrees are known as receiver factors. Ordinary factors are those with non-zero values for both the outdegree and indegree (mean). The following table 4 depicts the factors as the transmitter, receiver, and ordinary factors.

Table 4. Classification as Transmitter, Receiver, and Ordinary.

F01	T	F12	O	F22	O	F31	T	F43	R
F02	O	F13	O	F23	O	F32	T	F45	O
F03	T	F14	O	F24	O	F33	T		
F04	O	F15	O	F25	O	F34	O		
F05	O	F16	O	F26	O	F35	O		
F06	R	F17	O	F27	O	F36	O		
F07	T	F18	T	F28	O	F37	O		
F08	T	F19	O	F29	O	F38	O		
F09	O	F20	T	F30	T	F39	O		
F10	O	F21	O	F41	O	F40	O		

The process of de-neutrosophication results in a range of numbers for centrality, with the highest and lowest possible values of I serving as the basis for this range. An interval consisting of these two values has a neutrosophic value swapped in between them at regular intervals. [0,1].

Table 5. De-neutrosophication

F01	0.33	F12	4.32	F22	[0.66,4.66]	F32	0.99	F43	0.66
F02	2.64	F13	2.33	F23	[5.97,6.97]	F33	0.66	F45	0.66
F03	[1.32,2.32]	F14	2.66	F24	[2.66,4.66]	F34	1.98		
F04	2.32	F15	0.99	F25	[9.63,16.63]	F35	2.31		
F05	2.32	F16	1.32	F26	[2.97,3.97]	F36	[5.97,7.97]		
F06	1.33	F17	8.30	F27	2.97	F37	[4.65,6.65]		
F07	1.32	F18	0.66	F28	[2.33,3.33]	F38	[0.66,2.66]		
F08	0.67	F19	1.98	F29	[3.64,4.64]	F39	0.99		
F09	4.33	F20	0.66	F30	1.00	F40	[1.66,2.66]		
F10	2.66	F21	1.98	F31	1.32	F41	[1,2]		

Now to make it useful for calculation we calculated the median (Table 6) using equations 2,3 and 4.

Table 6. Total degree using the median of the de-neutrosophicated values

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

F01	0.33	F12	4.32	F22	2.66	F32	0.99	F43	0.66
F02	2.64	F13	2.33	F23	6.47	F33	0.66	F45	0.66
F03	1.82	F14	2.66	F24	3.66	F34	1.98		
F04	2.32	F15	0.99	F25	13.13	F35	2.31		
F05	2.32	F16	1.32	F26	3.47	F36	6.97		
F06	1.33	F17	8.30	F27	2.97	F37	5.65		
F07	1.32	F18	0.66	F28	2.83	F38	1.66		
F08	0.67	F19	1.98	F29	4.14	F39	0.99		
F09	4.33	F20	0.66	F30	1.00	F40	2.16		
F10	2.66	F21	1.98	F31	1.32	F41	1.5		

The results obtained through the neutrosophic PESTLE analysis are summarized in the following chart (figure 3).

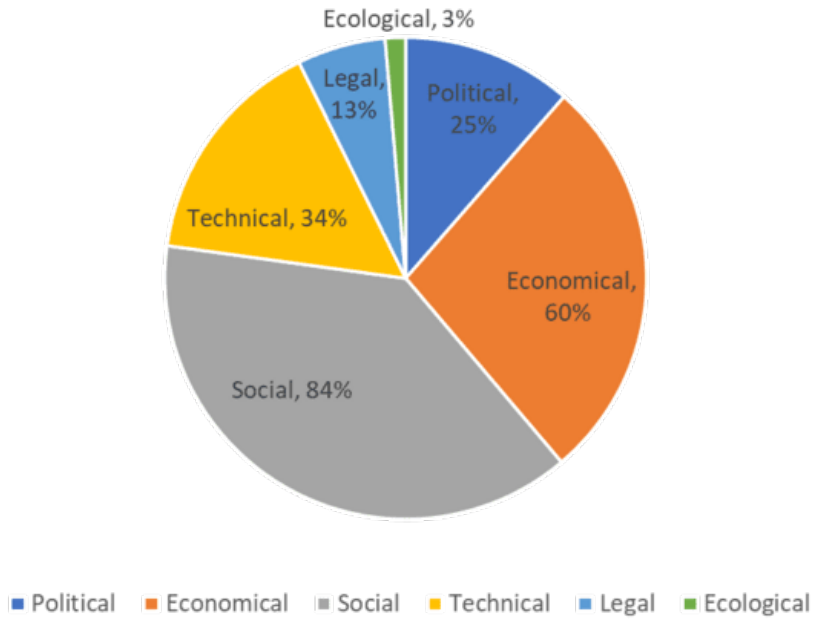

Figure 3: Neutrosophic PESTEL Analysis using Factors

5. Conclusion

This work is an attempt to find out and understand the challenges faced during the implementation of the National Education Policy 2020. This is done with the help of various experts using the neutrosophic PESTLE risk analysis tool. This work, it is tried to contribute to the existing research in this regard. This work is the need of the hour as we had tried to contribute to the NEP - 2020 in its implementation phase by pointing out the challenges. The present work is the result of the literature review of related surveys, studies, and research. All these surveys and research provided the required factors and sub-factures that can cause hindrances in the implementation of NEP - 2020. The relationships among them are also drawn with the help of all those research and surveys, represented in terms of Experts above. These factors are initially categorized into a group of six, namely political factors, economic factors, social factors, technological factors, legal factors, and environmental factors, which constitute the six pillars of this risk analysis tool the PESTLE. These relationships are modeled using neutrosophic cognitive maps to represent the nature of relationships and then neutrosophic adjacency matrices are generated to analyze quantitively. With the help of all the NCMs and adjacency matrices, a final NCM and Adjacency matrix is formulated. A comprehensive static analysis is done to check the importance of various factors and prioritize them accordingly. The Findings of the present work are as follows:

DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023

- The social factors and economic factors are very important as they contribute 84% and 60% as hindrances to the implementation of NEP – 2020.
- Political and Technical factors play an important role and come second as 25% and 34% respectively of them contribute as the barrier during the NEP – 2020 implementation.
- Legal and environmental factors come last contributing only 13% and 3% respectively.

In terms of factor importance Quality of education and employability of students are the top two factors. Further, online educational tools along with technological gadgets, the Quality of teachers, digital and online platforms of learning and teaching, the wellbeing of teachers/faculty, funds for education, and social disparity are some more important factors in decreasing the order of their importance. The current work is an example of neutrosophic PESTLE analysis and can be applied to more complex problems. For more detailed and optimized results, this analysis tool can be hybridized with effective techniques of machine learning.

Funding: "This research received no external funding"

Conflicts of Interest: "The authors declare no conflict of interest."

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DOI: https://doi.org/10.54216/IJNS.200207
Received: June 15, 2022 Accepted: January 28, 2023