EVALUATION OF THE DECISION-MAKING PROCESS FOR URBAN PUBLIC TRANSPORT IN INDIA: A DELPHI APPROACH

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Abstract: The Government of India has proposed and constructed various Mass Rapid Transit Projects, such as metro rail and bus rapid transit system (BRTS) projects, under the purview of the National Urban Transport Policy (NUTP), Jawaharlal Nehru National Urban Renewal Mission (JnNURM) and other such schemes. However, having very little experience with these newly proposed and constructed systems, the projects are surrounded by controversies and doubts. Many questions have been raised regarding the decision-making process for selecting mass rapid transit systems (MRTS) modes. This study attempts to check these doubts and identify any other issues associated with the decision-making process. The study's objective is to identify and prioritize the issues associated with the decision-making process of selecting modes of public transport (MRTS) in India. The study uses the Delphi method and represents a successful application of the approach in urban transport planning. The study identifies 12 issues and their priority in the decision-making process of selecting a Public Transport (MRTS) mode. The study concludes that the prevailing situations in decision-making process in India contradict the guidelines suggested in NUTP.

Keywords: Delphi; India Urban Transport; MRTS India; Public Transport; Urban Transport.

Introduction

In Indian cities, a lack of effective planning and land-use controls has resulted in widespread sprawled development extending rapidly in all directions, increasing the number and length of trips for most Indians, including those using public transport[1–4]. The unrestricted development has resulted in a significant increase in traffic needs, numbers of vehicles and the accessibility needs of the urbanizing population, in turn putting an enormous burden on the transport infrastructure, especially public transport[1–5].

The Government of India, with the objective of meeting the transport needs of an urban population, introduced the National level policy in 2006, in the form of the National Urban Transport Policy (NUTP)[1], and initiated many urban transport projects under Jawaharlal Nehru National Urban Renewal Mission (JnNURM) and other such schemes. With the introduction of this policy and JnNURM, special attention has been given to public transport, and most cities started planning for their individual needs. Various Mass Rapid Transit Projects such as metro rail and bus rapid transit system (BRTS) projects, were proposed and developed in most of the cities, governed by corporations, special purpose vehicles (SPV's) or special consortiums of the state, central and local bodies and private players[3].

However, having very little experience with these newly proposed and constructed systems, the projects have been surrounded by controversies and doubts. Many questions have been raised on the decision-making process for selecting the modes of mass rapid transit systems (MRTS). Experts raised doubts about the images and types of mode and claimed that specific modes of MRTS are preferred in India as a solution to city mobility needs, irrespective of the city's characteristics. According to Adavni and Tiwari[6]; Mohan[7]; Goel and Tiwari[8]; and Sreenivas[9], metro rail systems are always given preference in the decision-making process of selecting a MRTS mode. Even the city's characteristics and the commuters' needs — trip length, density, urban form, accessibility, travel time, affordability, etc. are overlooked for this reason[6–8,10]. Moreover, these newly constructed MRTS have failed to provide effective and efficient modes of public transport to the urban population. Studies conducted on the proposal and construction of these MRTS found the justifications for the projects invalid, and the systems proved to be failures[6,9]. Thus, Advani and Tiwari[6] conclude, "It is not necessary that a planned high capacity system will generate high demand and thus these systems need careful analysis while planning". Goel and Tiwari[8] state that, as per the 12th five-year plan for urban transport produced by the planning commission, Indian cities with populations of more than 2 million should start planning for rail-based public transport systems, and those with population of more than 3 million may start constructing systems. It is necessary to analyse the statement of the planning commission, as it is improper to plan MRTS based on the criterion of population alone. The choice of MRTS is affected by many city and commuter characteristics such as trip length, urban form, coverage, walk-able distance and mode interchange. Studies by Sangavi and Varia[11]; Ravibabu and Sree[12] suggest that light rail transit system (LRTS) and surface rail might be more efficient and economic modes of public transport in India. However, these modes are overlooked in the decision-making process, and metro rail and BRTS are given preference. NUTP[1,13] suggested promoting all the proven technologies and states that the MRTS mode should be selected based on the city characteristics and needs. However, the prevailing situation appears to contradict these suggestions of NUTP[9,12].

According to Sreenivas[9], the Detailed Project Report (DPR) for the Pune metro rail project shows many weaknesses, overestimates and flaws in the process. Stating observations, he shows that the process seems to be ad hoc and without scientific basis. The process does not include public participation and does not appear to be sufficiently transparent. Further, these systems are not planned appropriately and are not allocated on an equitable basis. These systems are also more capital intensive. With respect to the Delhi Metro, Randhawa[10] claimed that the Metro rail project is causing gentrification in the city, restructuring the urban space for capital accumulation by dispossessions of the poor, giving priority to the middle class and converting the city into a "world class city", without providing a mass rapid transit solution on an equitable basis. Similarly, a study of the Ahmedabad BRTS by Mahdevia, Joshi and Datey[14] shows that, even though the BRTS is promoted as a low-cost alternative of MRTS, it is not successful in doing so. The cost of the Ahmedabad BRTS is considerably higher than bus services and shared auto fares in Ahmedabad and is not affordable for low-income people. The system is not successful in providing access to most of the urban poor, especially women.

Among these issues, the development and performance of MRTS in Indian cities leaves many questions unanswered. To ensure the efficient and effective performance of MRTS in Indian cities, it is first necessary to understand the problems associated with the decision-making process. Thus, this study aims to identify these problems and any other issues associated with the decision-making process and determine whether the guidelines provided in NUTP are currently followed or disregarded in the decision-making process in India.

The Delphi method is used in this study with two major objectives. The first objective is to identify and prioritise the issues associated with the decision-making process of selecting the mode of the public transport system (MRTS) in India. The second objective is to identify and prioritise the necessary indicators for the comparative evaluation of the selection of the MRTS mode. This paper presents the results and findings of the first objective.

The Delphi technique/method is a structured communication process among a group of experts, with controlled opinion feedback. The method is a valid research technique that is widely used in various disciplines of academic and professional fields. The Delphi method can be used for identifying and prioritising issues, forecasting and decision-making, formulating policies, etc. This study identifies and prioritises the issues associated with the decision-making process of selecting a MRTS mode. This is a complex issue with very little empirical information available, requiring knowledge from experts in urban and transport planning. The Delphi method is flexible in its design, having a strong statistical basis and vast practical applications in various fields. This method does not require a large sample size and in-person meetings with the experts. Thus, the Delphi method is used in this study. This study represents a successful application of the Delphi method in urban transport planning. This study identifies 12 issues and their priority in the decision-making process of selecting a mode of Public Transport (MRTS). The study concludes that the prevailing situations in decision-making process for selecting a mode of public transport in India contradict the guidelines suggested in NUTP.

Delphi Method: An Approach to Issue Identification

The Delphi method was designed and developed by the RAND Corporation in the 1950s, while they were conducting a series of studies for the U.S. Army for bomb strategy development, and the method was first proposed for non-military use by the scientists Dalkey and Helmer[15–22]. The main objective of this study is to obtain the most reliable consensus among a group of experts by conducting several rounds of questionnaires and controlled opinion feedback[15,17,22,23].

Okoli and Pawlowski[17] cited the work of (Linstone and Turoff 1975)[24] to capture common characteristics of Delphi as "a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem. Accomplishing this ‘‘structured communication" it is provided as there is: some feedback of individual contributions of information and knowledge; some assessment of the group judgment or view; some opportunity for individuals to revise views; and some degree of anonymity for the individual responses". Pare et al[25] explained Delphi as the structural process of collecting distilled knowledge from a panel of experts by means of questionnaire combined with controlled opinion feedback. Further Pare et el[25] discussed Delphi as "The process is viewed as a series of rounds, and in each round, participants communicate their opinions through a questionnaire that is returned to the researchers, who collect, edit, and return to every participant a statement of the position of the panel and the participant's own position." This method enables researchers to observe how experts discuss a complex problem through a structured communication process, as well as collate divergent responses into a convergent overview[26].

The Delphi technique may be used for forecasting and decision-making when there is a lack of available information. It is used when judgement is indispensable and involves the use of experts' knowledge when little or no empirical evidence exists[15,17,23,25,27]. The Delphi technique is commonly used for forecasting and decision-making based on experts' opinions. The Delphi method is used as a research tool in various fields such as information systems, physical and social sciences, engineering, education, business and economics, public administration and medical sciences[15,25] and is a widely and exclusively used research tool in information systems[17,19,23,25,27].

The most important benefit of the Delphi is, it maintains anonymity and avoids direct confrontation of the experts'[17,25]. Regarding this, Okoli and Pawlowski[17] stated that "The controlled interaction appears to be more conducive to independent thought on the part of the experts and aid them in the gradual formation of a considered opinion. Direct confrontation, on contrary, all too often induces the hasty formulation of preconceived notions, an inclination to close one's mind to novel ideas, a tendency to defend a stand once taken, or, alternatively and sometimes alternately, a predisposition to be swayed by persuasively stated opinions of others."

Delphi studies can be majorly classified into 4 types — Classical Delphi, Decision Delphi, Policy Delphi and Ranking type Delphi — and these types are generally classified based on their objectives and approaches[17,23,25]. Among these four types, Ranking type Delphi is the most extensively used. The main objective of the Ranking type Delphi is to identify and prioritise key factors, items, or other types of issues[17,19,23,25]. As the main objective of this study is to identify and prioritize the issues related to the selection process for MRTS modes, the Ranking type Delphi approach was adopted.

Research Methodology

This study adopts the Ranking type Delphi approach. The methodological approach suggested by Kobus and Westner[23], which is based on the guidelines suggested by the leading methodologist in ranking type Delphi method, is followed in this study. This methodology consists of 4 phases, represented in Figure 1**.** Phase 1, selecting the right experts for the study, is based on Okoli and Pawlowski[17], while phases 2 to 4 for data collection, analysis and representation are based on the guidelines of Schmidt[19] and Pare et el[25].

Choosing the Right Experts

The results of the Delphi method are dependent on the opinions, valuable inputs and judgements of the experts. Thus, choosing the right and qualified experts is the most critical stage in the Delphi method[17,23,25,27]. Okoli and Pawlowski[17] stated that choosing the experts is "perhaps the most important yet most neglected part" and thus suggested very useful guidelines on how to select the right experts for conducting a rigorous Delphi study. It is of the utmost importance to select experts that have extensive knowledge about and experience in the respective topic. Moreover, as a Delphi study depends on experts' knowledge and opinions, the study does not represent any population, and thus the sample size should not be dependent on any statistical or probability approach[17,22,26]. There is no typical sample size in the Delphi method[23,28]. According to Ju and Jin[27]; Alyami et al[26], the optimum number of experts in a Delphi study varies between 10 and 50, while Kobus & Webnar[23] identify various panel sizes of less than 7, between 10 to 15, or approximately 30, suggested in the literature. Okoli & Powlowski[17] suggest four panels, each composed of 10 to 18 experts. In this study, this phase is handled with attention, and efforts are taken to follow the guidelines suggested by Okoli and Pawlowski[23,25,27]. Efforts are also made to maintain a sample size of at least 50.

In this study, the experts were identified based on their publications and work backgrounds. This study identifies experts with academic, private and government backgrounds. The fundamental approach was to select experts who are working in research, planning, social, or technical positions and who have backgrounds in urban transport. An extensive list of experts was obtained from Urban Mass Transit Company (UMTC). The list includes the names of officials and persons from all backgrounds of urban transport and those who were invited to and attended various workshops and training programmes in urban transport planning conducted by UMTC in association with the Institute of Urban Transport, India (IUT) and the Ministry of Urban Development (MoUD). Additionally, names were identified from published papers, books and various academic institutes in the urban transport discipline in various Indian cities. Finally, with the help of identified names from above lists, experts were screened using their designation and work backgrounds, and a consolidated list of experts was prepared. An invitation was then sent in

the initial round to all the identified experts on this consolidated list, and they were asked to forward this to other urban transport experts in their vicinity.

Data Collection

A questionnaire is designed with the objective of researching the selection process for the modes of public transport (MRTS) in Indian cities, and experts are asked to state their opinions regarding the selection process. The data is collected using the online survey portal www.surveymonkey.com. A letter stating the objective of study and a survey link are sent via e-mail. The experts are also asked and encouraged to participate in the study through personal conversations. Moreover, in Round 1, a very in-depth individual interview is conducted with experienced and well-known experts in the urban transport field, and their opinions are noted.

As suggested by Schmidt[19], the initial round could be conducted as a brainstorming session followed by a narrowing down phase[17,25,26,29]. In this study, a combined brainstorming and narrowing down phase is conducted with a broad literature review and explorative individual expert interviews in different cities in India.

Round 1 is conducted as a brainstorming and narrowing down stage, and the next rounds are considered iterative rounds. Thus, this study consists of four rounds of survey questionnaires, including 3 rounds of iterations. Table 1 shows the number of experts who were invited and who participated, and the response rates, in the respective rounds of the study. In round 1, more than 125 responses are received; however, after the screening, only 104 responses are considered valid. In the subsequent rounds, the experts are screened based on experience. The responses of the experts who have more than 5 years of experience are considered in the subsequent iterative rounds. The names of additional experts, identified from the earlier responses from the experts, are then added to this consolidated list. In round 2, the experts who are important for the study but were not able to participate in round 1 are selected and invited for the next Delphi rounds. In the later rounds, the experts are invited based on their participation in the preceding rounds.

In the brainstorming phase of the Delphi method, issues or indicators may be identified based on the literature. In this study, the issues associated with the decision-making process for selecting MRTS modes are identified based on the literature. The literature suggests that in the decision-making process, metro rail systems are given preference while LRTS and sub urban rail systems are overlooked. Some researchers have suggested that BRTS have also been given preference. Moreover, important factors such as socioeconomic aspects and city characteristics are not considered and, in some cases, selection is based solely on population and is without any scientific basis. The study reports, and feasibility studies conducted for mode selection also show, ad hoc processes and many flaws.

In the initial round, the experts' opinions are collected using the online questionnaire and personal interviews. The experts are asked to state their opinions about the current basis of selection of MRTS modes in India. The data collected in round 1 suggest that the decision-making process is based on various criteria, either individually or in combination. Most of the experts suggested that the selection of MRTS mode is made based on city characteristics, trip length, urban form, topography, travel patterns and characteristics, demand, peak hour peak demand traffic (PHPDT) and so on, which are further categorized into aspect of city characteristics. Some of the experts highlighted socio-economic aspects, including affordability, fare, comfort, connectivity, and travel time, and some cited feasibility studies, population, and preference for metro rail. The above aspects are already discussed in the literature and are considered the major aspects in the decision-making process. In addition to these aspects, the experts also mentioned commuters' opinions, political influence, the 4-stage model study, and alternative analysis. However, alternative analysis is cited by very few experts, indicating less awareness of that aspect and limited application in the field.

Based on the opinions collected in round 1 and the issues identified in the literature, the issues are classified into 12 major categories. Further, these aspects are formulated into 12 statements to complete the sentence "The proposal and selection of a new mode of MRTS in Indian cities is" (e.g., the proposal and selection of a new mode of MRTS in Indian cities is done with respect to city characteristics). These 12 statements are listed in Table 2.

The questionnaire for round 2 is designed using the sentence with 12 statements. The experts are asked to share their agreement on a 7-point Likert scale with 1 as 'strongly disagree', 2 as 'disagree', 3 as 'somewhat disagree', 4 as 'neutral', 5 as 'somewhat agree', 6 as 'agree' and 7 as 'strongly agree'. The process is then repeated as per the

Delphi Technique procedure, with the modified questionnaire based on the ranking of the statements as per the analysis in the respective iterations, and then stopped when a stopping criterion is satisfied.

As the experts' anonymity is one of the fundamental characteristics of Delphi, the experts' anonymity are assured and maintained throughout the process.

Data Analysis

Because achieving the most reliable consensus is the main objective in a Delphi study, it is important to understand when to stop the iteration process and to conclude the study. However, there is disagreement among researchers about the degree of consensus and the appropriate statistical methodology to apply[15,18,21,27]. Gracht[21], in a review study, concludes that "general standards on how to measure consensus in a Delphi study do not yet exist." Most studies suggest that researchers have used both parametric and non-parametric statistical techniques to indicate consensus[15,20,21,27,30]. However, a few studies suggest that, because Ranking type Delphi studies use ordinal data, it is a questionable practice to use the mean and standard deviation for a normal frequency distribution to represent a valid interpretation[21,27]. Ju and Jin[27] state that most studies employ a qualitative approach to report consensus; a few of those provide statistical analysis based on means, medians, standard deviations or simply a percentage of the distribution, but very few have addressed the huge gap that exists with using the nonparametric technique to analyse this critical issue. Further, Ju and Jin[27] emphasized that different researchers have used different statistical elements to represent the boundaries, and the boundaries between high and adequate agreement are also vague. On the other hand, Gracht[21] studied many works on Delphi and cautioned understanding the difference between consensus and stability regarding the experts' opinions. He advised that it is not desirable to use only consensus to conclude the study; instead, there must be a thorough consideration of the data for stability among the experts' opinions. To ensure the validity and rigor of a Delphi study, analysis using the nonparametric statistics is advised[21,27]. Therefore, in this study, nonparametric statistical methods are preferred to verify consensus and later it is preferred to check the stability of the experts' opinions.

Kendall's coefficient of concordance, W, as suggested by Schmidt, is widely recognized as the best nonparametric statistical method for measuring consensus in Ranking type Delphi studies[17,22,23,25]. Schmidt[19] has designed excellent guidelines for measuring consensus and applying the stopping rule to stop the iteration process. Schmidt suggested that there are two statistical criteria to determine when to stop the process. The first criterion is strong consensus, and the second is no significant difference in the mean rankings for successive rounds in case strong consensus is not achieved[19]. Pare et al[25] suggest that the stopping rule can be applied when one of three stopping criteria is satisfied: 1) $W > 0.7$, indicating a strong level of consensus, 2) three rounds have been performed; 3) the mean rankings for two successive rounds are not significantly different, based on the McNemar test. Kobus and Westner stated that the "stopping criteria for the Delphi data collection are either strong consensus or a clear indication that no more difference in answers can be expected". For calculating consensus, the value of W ranges from 0 to 1, with 0 indicting no consensus and 1 representing perfect consensus. Schmidt also provided a table interpreting the different values of W.

Kendall's coefficient of concordance, W, is used as the main measure of consensus in this study. However, after three iterations, strong consensus was not achieved among the group of experts. Thus, the stability of the experts' answers was then examined[17,19,21,23,25] to maintain the validity of the study and to prevent experts from dropping out, overburdening the experts with additional rounds and potentially developing artificial consensus in the process[19,21,25]. Therefore, as per the stopping criteria suggested in previous studies, McNemar's test and the Wilcoxon matched pair signed-rank test are conducted to examine the differences in the experts' opinions between successive rounds. Further, the data from the respective rounds are analysed using the intra-class correlation coefficient test to assess the consistency of the responses in consecutive rounds. The rankings of the issues in the respective rounds are mostly unchanging, signifying the stability of the experts' opinions.

Data Representation

A distinctive characteristic of the Delphi method is the important stage of presenting the analysed data to the experts, enabling them to review the data and rethink their opinions. The results for each round are also shared with the experts. The values for Kendall's coefficient of concordance, W, are represented, along with the mean ranks and mean values in each round, to identify the central tendencies. The experts are informed that they may change their

opinions based on the results of previous rounds. The details regarding the experts' participation in the respective rounds are also shared with the experts.

Results and Discussion

The main criterion for stopping the iteration process is strong consensus. However, in cases of weak consensus, it is necessary to conduct at least 3 iterations, and there must be stability in the experts' opinions in the successive rounds. In this study, Kendall's coefficient of concordance, W, is used to measure consensus, with values of $W > 0.7$ representing strong consensus. The results obtained for the Kendall's coefficients of concordance and the priorities of the statements are illustrated in Table 2. In this study, the Kendall's coefficients of concordance, W, calculated using SPSS 20.0, are 0.144; 0.219 and 0.274, respectively, in the successive iterations. These results indicate very weak agreement among the experts, but with some improvement in the values of W in the successive rounds. However, this study conducts 3 iterations and thus satisfies one of the stopping criteria. Later, to check the stability of the experts' opinions in successive rounds, this study conducts a McNemar test, a Wilcoxon matched pair signed-rank test and an intra-class correlation coefficient test using SPSS 20. The values obtained for the levels of significance in McNemar's test and the Wilcoxon matched pair signed-rank test are within the satisfactory levels of significance for all 12 statements in the successive rounds, confirming that there is no significant change in the experts' opinions. Further, the intra-class correlation coefficient test found satisfactory levels of reliability and consistency in the experts' rankings for the statements in the successive iterations. To interpret the level of consistency, this study follows the guidelines of Cicchetti[31]; Blackman and Koval[32]. The guidelines suggest that reliability coefficient values of less than 0.4 represent poor consistency, values between 0.4-0.59 represent fair consistency, values between 0.6-0.74 indicate good consistency and values of more than 0.75 represent excellent consistency. The results of the intra-class correlation coefficient test are shown in Table 3 and demonstrate that the overall agreement and stability over the successive rounds is satisfactory. The level of consistency for 5 of the statements is excellent and varies between good to fair for the remaining statements. Thus, the stopping criteria for this Delphi study is satisfied, and the results of this study are valid.

The result show that the statement 'influenced by political will' is top ranked. The mean value of 5.94 suggests that the experts agree that it is one of the critical issues in the decision-making process for the selection of MRTS mode. However, the level of significance for the statement in the successive rounds is poor. This result may be because, in the initial round, very few experts mentioned influence of political will. In the successive rounds, when this statement was added, the experts started accepting this fact and commented freely on this issue. The consistency between rounds 3 and 4 is poor compared to that between rounds 2 and 3. Additionally, the mean value in round 4 is higher than those in rounds 2 and 3, indicating a shift in the experts' opinions. This result shows that, as the process progresses, hesitation among the experts is reduced, helping to build their confidence in the later Delphi rounds. The same can be highlighted from the experts' comments regarding the influence of political will in the decision-making process. Some experts states that the choice of the mode is based on political preferences rather than an understanding of the technical feasibility and viability of designing a public transportation system. In the opinions of some experts, the decision is made primarily by the political class, and all cities want to have metro rail systems without much deliberative process. There is a perception that a metro is the only symbol of development. The experts' comments indicate that, in the decision-making process under the purview of political will, important criteria and studies are neglected, showing an inclination towards metro rail systems. The results also show that preference for metro rail systems is one of the critical issues affecting decision-making, ranking 2nd with a mean ranking of 8.60. The statements regarding the neglect of LRT and suburban rail systems in the decision-making process are ranked 3rd and 4th, respectively. The mean values for these statements show that experts agree that these aspects are major issues. The influence of political will and preference for metro rail are probable reasons that decision makers neglect LRT and suburban rail systems. An expert stated that "the proposal frequently starts with the question: can we build a metro in this city? And the answer depends on whether there are 30 m wide roads!" Further, population size is an important issue in the decision-making process of selecting a MRTS. The literature

discusses that, as per the guidelines in the 12th five-year plan, the selection of MRTS should be based on population. However, no scientific data support this guideline.

Further, the criteria feasibility study, 4-stage modelling, socioeconomic benefits and city characteristics are successively ranked with the agreement of experts from neutral to somewhat agree. This result shows that these important criteria for selection of the MRTS mode are not given much attention in the decision-making process. However, the experts comments suggest that the MRTS mode must be selected based on the specific characteristics of mode, commuters need and city characteristics. There must be a comprehensive mobility plan, and the studies must incorporate the opinions of the commuters and consider socio-economic aspects. However, these criteria are currently overlooked and considered less important. An expert claimed, "Cities nowadays are choosing fancier systems like metro rail, without any due diligence and evaluation on whether the city is ready for such a capital intensive system in such a volatile atmosphere. Yes, cities are conducting detailed studies, preparing DPRs, spending resources (time and money), but those are just mere eyewash to the public and made to suit and meet the financial viability of the project."

Regarding the issue of higher preference to BRTS, the experts did not agree with the statement, and it is ranked last with a mean rank of 3.83. This result suggests that BRTS is not getting preference in the decision-making process and therefore is not considered an issue. However, some experts comment that BRTS has a negative image in most cities, which needs to be corrected.

It is surprising that comparative evaluation/alternative analysis and commuters' opinions — arguably the most important issues in the decision-making process — are ranked 10th and 11th, with mean values of 3.84 and 3.39, respectively. The mean values for both statements indicate that the experts' agreement is neutral to somewhat disagree on these issues. Thus, both issues are either neglected or given very little attention in the decision-making process. The Ministry of Housing and Urban Affairs (MoHUA) has made it mandatory to submit an alternative analysis under the Metro Rail Policy 2017[33] introduced in August 2017. According to this policy, it is necessary to incorporate alternative analysis into the project report when seeking central government assistance over the horizon of 30 years. A comparative analysis is also mandatory under the metro rail policy, indicating the preference for metro rail in India. The appraisal guidelines released by MoHUA in September 2017 discuss Cost Benefit Analysis (CBA); however, CBA has some limitations with respect to qualitative criteria, and thus other alternative analysis methods may be considered into the policy guidelines[34]. The main objective of NUTP is to plan for people rather than for vehicles, and to promote a more equitable allocation of road space with people. NUTP advises that the choice of the MRTS mode should depend on the characteristics of the city. The Government should encourage planners to consider all the proven technologies and not promote any specific technology. However, the results of this study indicate the opposite conclusion.

Conclusion

This study uses the Delphi method to identify issues and their priority in the decision-making process of selecting a Public Transport (MRTS) mode in India. The results represent a valid and successful application of the Delphi method in urban transport planning. This study identifies 12 issues and their priority in the decision-making process of selecting a Public Transport (MRTS) mode in India. However, the experts disagree on the 12th issue regarding preference for BTRTS, thus eliminating it as an issue in the decision-making process. It is concluded that the influence of political will, higher preference for metro rail, and disregard of LRT and suburban rail systems are the major problems in the decision-making process of selecting a MTRS mode in India. This study confirms that population is also a criterion in mode selection; the literature cites the guidelines of the 12th five-year plan and advises proper scientific study. The study also concludes that the important criteria of city characteristics, socioeconomic benefits and feasibility studies are given less attention. The feasibility studies and the 4-stage modelling study are either manipulated or not considered seriously. The study strongly infers that the important criteria of comparative evaluation and commuters' opinions, which reflect the core objectives of NUTP, are very

insignificantly considered in the decision-making process of selecting a public transport mode. In conclusion, "the prevailing situations in decision-making process for selecting the mode of public transport in India profoundly contradict the guidelines suggested in NUTP".

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Table 1 Experts response rate for Delphi study

Delphi Rounds	Experts Invited	Experts Participated	Response Rate (%)
Round 1	unknown	104	-
Round 2	150	84	56
Round 3	84	70	83
Round 4	70	64	91

Table 2 Results of Kendall's coefficient of concordance in Delphi study-identified issues & rankings

Statements ("The proposal and selection of a new mode of MRTS in Indian cities is…")	Round 4		Round 3		Round 2		Round 2
	Rank (Mean Rank)	Mean	Rank (Mean Rank)	Mean	Rank (Mean Rank)	Mean	Initial Positions
Influenced by political will	1 (9.38)	5.94	2 (8.33)	5.54	1 (8.55)	5.55	2
Higher preference is given to metro rail	2 (8.60)	5.70	1 (8.48)	5.66	2 (8.22)	5.39	9
Light rail transit (LRT) systems are neglected	3 (7.93)	5.28	3 (7.89)	5.2	6 (6.73)	4.77	11
Suburban rail systems are neglected	4 (7.77)	5.34	4 (7.69)	5.27	5 (6.95)	5.01	12
Based on population size	5 (7.27)	4.86	5 (7.64)	5.04	4 (7.15)	4.93	4
Done with respect to feasibility studies (financial and technical)	6 (7.06)	4.72	6 (6.86)	4.64	3 (7.39)	4.96	3
Based on 4-stage modelling	7 (5.95)	4.33	8 (6.07)	4.43	7 (6.65)	4.73	1
Based on socioeconomic benefits	8 (5.77)	4.31	9 (5.57)	4.23	9 (5.90)	4.46	5
Done with respect to city characteristics	9 (5.72)	4.3	7 (6.59)	4.56	8 (6.19)	4.54	6
Dependent on alternative analysis/ comparative evaluation	10 (4.67)	3.84	10 (4.81)	3.86	10 (5.04)	4.04	8
Based on commuters' opinions	11 (4.05)	3.39	11 (4.42)	3.77	11 (4.73)	3.98	7
Higher preference is given to bus rapid transit (BRT)	12 (3.83)	3.41	12 (3.66)	3.33	12 (4.51)	3.83	10
	Kendall's, W = 0.274		Kendall's, W = 0.219		Kendall's, W = 0.144		

Table 3 Results of intra-class correlation coefficient test in Delphi study

Statements ("The proposal and selection of a new mode of MRTS in Indian cities is…")	Consistency for Round 2 and 3	Consistency for Round 3 and 4	Average Measure	Level of Consistency
Influenced by political will	0.372	0.053	0.380	Poor
Higher preference is given to metro rail	0.281	0.468	0.616	Good
Light rail transit (LRT) systems are neglected	0.321	0.616	0.660	Good
Suburban rail systems are neglected	0.256	0.445	0.577	Fair
Based on population size	0.466	0.410	0.648	Good
Done with respect to feasibility studies (financial and technical)	0.572	0.675	0.820	Excellent
Based on 4-stage modelling	0.567	0.553	0.788	Excellent
Based on socioeconomic benefits	0.527	0.614	0.786	Excellent
Done with respect to city characteristics	0.565	0.523	0.740	Good
Dependent on alternative analysis/ comparative evaluation	0.549	0.651	0.781	Excellent
Based on commuters' opinions	0.462	0.581	0.790	Excellent
Higher preference is given to bus rapid transit (BRT)	0.373	0.542	0.633	Good

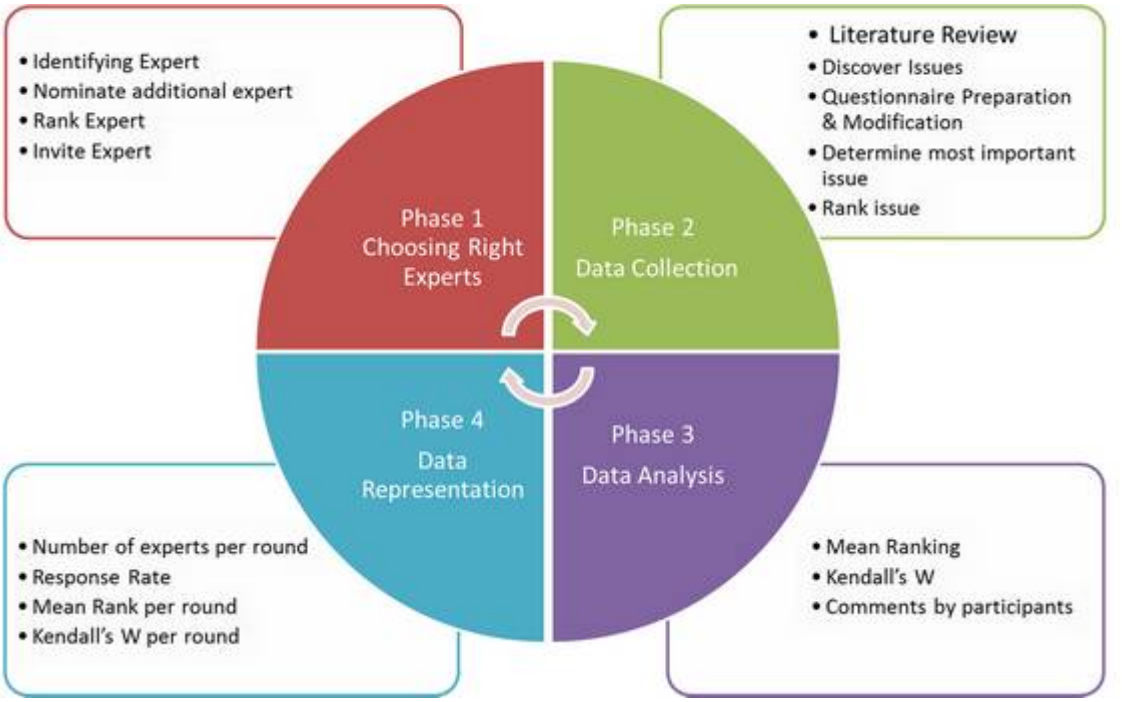

Figure 1 Methodology Approach of Delphi Study