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## FUNCTIONAL AND STRUCTURAL IMPROVEMENT IN METRO MANAGEMENT STRUCTURE

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**Abstract:** Metro project becomes more challenging day by day due to modern challenges. Management structure needs to redefine to overcome these challenges. To manage all the departments and huge resources, matrix management structure is the most suitable structure for any metro project. But due to its size and dual nature, this management structure faces some issues. These issues may create significant problem if not treated well and can put the success of the project in danger. Most of the projects failed to meet their specific goals. Project faces time delay and budget overrun significantly. Main problems with this system are conflicts, power struggle, improper communication and coordination, non-alignment of the goal, uncertainty in authority, unclear roles and responsibility, low project spirit, distrust, lack of motivation etc. This calls for effective management of the project. All these problems are structural and functional in nature. These problems can be solved by adopting some structural and functional improvement which are suggested in this research paper. Responsibility-authority balance, documentation of problem solving approach, new reward system to promote project spirit are the modifications proposed under functional improvement and integration of staff function of line and staff organization with matrix organization structure at execution level as a structural improvement. This proposed modification and existing structure is evaluated for its efficiency and performance by analytical tool like paired t test and scoring model analysis.

**Index Terms -** Metro, Management, matrix, organizational structure.

### I. INTRODUCTION

Management structure has prime importance in successful completion of any project. Metro projects are the giant project in the infrastructure which touches many streams like construction, management, mechanical, electrical, electronics etc. To manage all the mentioned streams and huge resources involved in construction activity, matrix management structure is the most suitable structure. That's why this matrix structure is adopted by all metro projects. But still there are many drawbacks of this system. It is found that 59% and 67% of the project doesn't fulfil expectation in terms of cost and time respectively due to the effect of the organizational structure and 63% of the project fulfil quality expectation irrespective of the organizational structure [8]. This calls for efficient management of the construction projects. It is difficult to overcome all the limitation of the structure. But still there are significant chances of improvement. Improvement of structure and quality of training will improve overall performance of the metro project but less expenditure is allotted for the same. Process control will improve performance of each activity [6]. Human resource should be developed to quality oriented operation and outcome. Goal setting should be done to measure the performance and quality of the outcome. The bar of quality and performance should be improved through continuous analysis and improvement of the structure. Employee should be empowered with skill & knowledge and should be involved in decision making. New model can be proposed on the basis of this study. This model can be evaluated through scoring model analysis. In this technique, few important parameters are decided to weigh the performance of the available management structure, and these parameters are then assigned relative weightages based on their relative importance in successful completion of the project by Expert opinion [2]. Questionnaire survey is fast and best way to get wide variety of aspects and ideas from experts [7]. Scores are assigned to the alternatives based on their expected performance on the selected parameters according to experts. The cumulative weighted score for each alternative is calculated. The alternative with the highest cumulative score is selected as the best management structure. Hypothesis can be generated to compare the two alternative having similar parameter. Paired t test- used to test the hypothesis when two groups are under comparison and dependent on same parameter. Numerical value of this t test is compared with standard t test distribution table and after comparing both value, it is decided whether to accept null hypothesis or go for alternate hypothesis.

## II. LITERATURE

2.1 Lokesh Kumar Meena, S. L. Bairwa, K. Lakra, Maina Kumari, & R.S. Meena, 2013. [5] – Author of this paper suggested that the line and staff organization is the addition of the staff function in line structure. Main advantage of line command is unity in direction, but line organization is applicable only for small firm. Line and staff is evolved for the organization which is bigger but still needs unity in direction for command. Function of the staff is to supervise the subordinate level and advise or assist the higher management authority. Generally, staff has no functional and managerial authority over other team. Staff work as supportive function only. Sometimes organization is divided into different department and staff is assigned to supervise and assist each department. Line and staff organization overcome some of limitations of the line organization. But still it has some demerits which makes this organization inapplicable for large construction projects like metro project.

2.2 J.R. San Cristóbal, V. Fernández, E. Diaz. [3] – Author of this paper suggested that matrix is most suitable structure available for major projects. Advantages of this structure are efficient allocations of specialists, effective information flow, employees can shift to another project without making the permanent change, strong project coordination and better control. This structure also has some disadvantages like high administrative costs, unclear roles and responsibility which creates confusion, shared authority between functional and project managers which causes conflicts and dual reporting makes relations complex.

2.3 Lin He, Qiangsheng Liang, Siyuan Fang 2016 [4] – Author of this paper suggested that existing management system couldn't satisfy increased network level operations. The old management mechanism has shown strain in handling large-scale operations and its management. Another reason is low efficiency of detailed job specialization in large scale construction operations which needs quick action. Network level operations require more association among different divisions, a higher response rate and a wide management aspect and more efficient and all-inclusive management system.

2.4 John A Kuprenas, 2001 [1] – Author of this paper suggested that successful implementation of the matrix structure is difficult. This is because of challenges in implementation of matrix structure. These challenges are unclear roles and responsibility due to dual authority nature, reporting system, politicization of the project and resource, need of proper communication skill, lack of project level focus etc. Matrix structure has some drawbacks but matrix management also improve the performance of the structure. Matrix structure improves flexibility and efficiency in handling multiple project, optimum use of resources, improved functional and management capabilities.

## III. METHODOLOGY

Combination methodology is used in this research work starting from data collection, data analysis, assumptions, hypothesis testing, result and conclusion. Data is collected from literature review and expert's opinion. Two separate questionnaire forms were drafted. first questionnaire was focused on existing metro management structure. Advantages, limitations and disadvantages of existing structure is thoroughly studied and scope of improvement is found out. Parameters are selected to evaluate the performance of existing and proposed structure. New model is proposed by analyzing the collected data. This model is again evaluated through another questionnaire survey which was extended to the same respondents who was selected for first questionnaire survey. Then structure is evaluated based on the performance of each structure in selected parameter. Hypothesis is generated and tested to compare the existing and proposed structure. Paired t test and scoring model analysis are the two tool used for selection of best alternative. Conclusion is carved out from the result.

## IV. DATA COLLECTION

Literature review, questionnaire survey and expert interview are the main sources of the data used in this research work. Literature is studied to find out the advantages, disadvantages, limitations and applicability of existing metro management structure. Questionnaire form is drafted and handed over to the experts having profound experience in management and execution in metro project. General format of this survey is structured questionnaire and nature of survey is exploratory. Main objective of the questionnaire is to compare the existing and proposed structure on the basis of performance in selected parameter. Scheduled interview of senior level manager and functional head is also conducted to get focused information about the scope and applicability of the proposed structure in actual implementation in the metro projects.

## V. DATA ANALYSIS

Collected data is then sorted, validated for its truthfulness and categorized in selected parameter. Parameters are identified to evaluate the performance of the existing and proposed metro management structure. Identified parameters are communication and coordination, team motivation & spirit, dispute resolution, risk Management, project planning & scheduling, health & occupational safety, accountability, roles & responsibility. The questionnaire survey asked respondents to assign relative weightage to these selected parameters. Weightage is assigned depending on the relative importance of each parameter in successful completion of the project. This relative weightage of selected parameters are shown in chart no. 5.1. Chances of improvement was asked through questionnaire form for each parameter in existing management structure and proposed structure. Collected data is in the qualitative form which is then converted into quantitative form on the scale of 0 to 5. This data is used as sample set for testing the hypothesis and scoring model analysis. It is found that there is huge chance of improvement in communication and coordination, team motivation & spirit, accountability, roles & responsibility. All other parameters are performing comparatively well than these parameters. Modified structure is proposed by studying and analyzing the collected data.

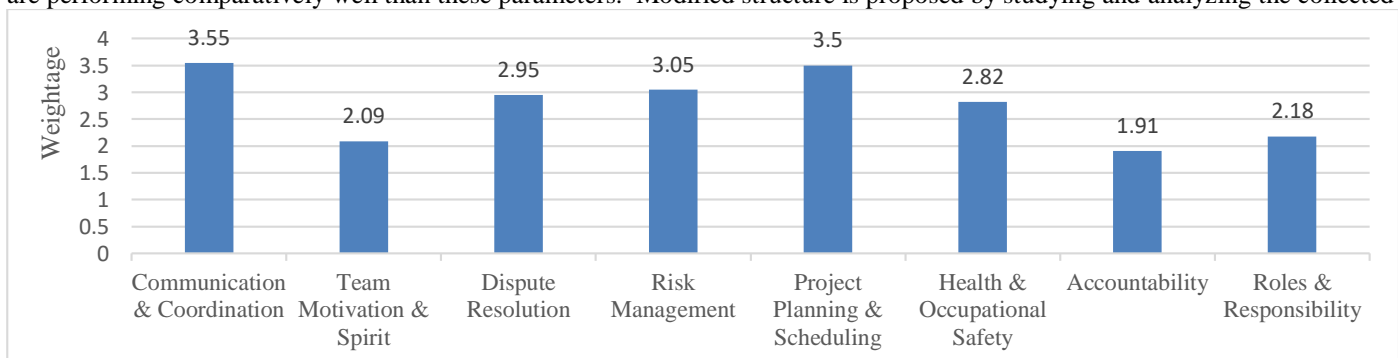


Chart no. 5.1 Weightage of parameter

## VI. HYPOTHESIS TESTING

The null hypothesis ( $H_0$ ) is that the performance of the proposed structure is the same as the existing structure. The null hypothesis will be accepted if the calculated value of the test statistic 't' is higher than the probable value of 'R:t' as obtained from the standard table. The alternate hypothesis ( $H_1$ ) is that the performance of the proposed structure is better than the existing structure. The alternate hypothesis will be accepted if the calculated value of the test statistic 't' is lesser than the probable value of 'R:t' as obtained from the standard table. The testing of the hypothesis will be done by considering performance of each parameter of both the structures obtained from valid sample space which is collected by questionnaire survey. Hypothesis is tested by the t test formula which is shown in Eq. 6.1 and squared standard deviation is shown in Eq. 6.2. Probable value of the test statistics is taken from the Students' t-distribution table of one side test for a level of significance of 5% and degree of freedom = n-1.  $X_i$  is weighted performance rating of existing structure and  $Y_i$  is weighted performance rating of proposed structure, n is the number of total valid respondents.

$$t = (D-0) / (\sigma/\sqrt{n}) \quad (6.1)$$

$$\sigma^2 = (\sum D_i^2 - (D^2) \times n) / (n-1) \text{ For } n = \text{size} \leq 30 \quad (6.2)$$

where  $D_i = X_i - Y_i$  and  $D = \sum D_i / n$

Summation of difference between weighted performance rating of existing structure and proposed structure  $\sum D_i$  is -344.53 and its square is  $\sum D_i^2 = 8478.66$ . Standard deviation  $\sigma$  is 12.11 and Calculated value of the t test is -6.07. Probable value of the test statistics from the Students' t-distribution table of one side test for a level of significance of 5% and for degree of freedom 21 is -1.721.

## VII. RESULT

Calculated value of the t test is -6.07 and the probable value of R; t is -1.721. This indicates that calculated t test value is lesser than the standard value obtained from standard table. Hence null hypothesis is rejected and alternative hypothesis is selected. This indicates proposed structure will perform better than existing structure.

Performance of the existing structure and the proposed structure can be evaluated based on each parameter considered. Weighted average performance of each structure is considered for the comparison. Weighted average parameter can be calculated by multiplying the average performance rating of that parameter with weightage of same parameter. Table no. 6.1 shows weighted average of each parameter of existing and proposed structure where column sum indicates summation of performance rating of each parameter. Chart no. 6.2 shows parameter-wise performance of both the structure. Cumulative weighted average will indicate the performance of that parameter in the structure. As per calculation, cumulative weighted average of existing structure is 34.60 and cumulative weighted average of proposed structure is 50.25. Chart no. 6.3 shows the performance of existing and proposed structure. These results indicate that proposed structure will perform better than existing structure.

Table no. 6.1 weighted average of each parameter of existing and proposed structure.

Parameters	Existing structure					Proposed structure				
	Total	No. of Respondents	Average	Weightage of Parameter	Weighted Average	Total	No. of Respondents	Average	Weightage of Parameter	Weighted Average
Communication & Coordination	30	22	1.36	3.55	4.83	67	22	3.05	3.55	10.80
Team Motivation & Spirit	30	22	1.36	2.09	2.85	64	22	2.91	2.09	6.08
Dispute Resolution	29	22	1.32	2.95	3.89	44	22	2.00	2.95	5.91
Risk Management	37	22	1.68	3.05	5.12	37	22	1.68	3.05	5.12
Project Planning & Scheduling	43	22	1.95	3.50	6.84	34	22	1.55	3.50	5.41
Health & Occupational Safety	32	22	1.45	2.82	4.10	48	22	2.18	2.82	6.15
Accountability	39	22	1.77	1.91	3.38	58	22	2.64	1.91	5.03
Roles & Responsibility	36	22	1.64	2.18	3.57	58	22	2.64	2.18	5.75
					34.60					50.25

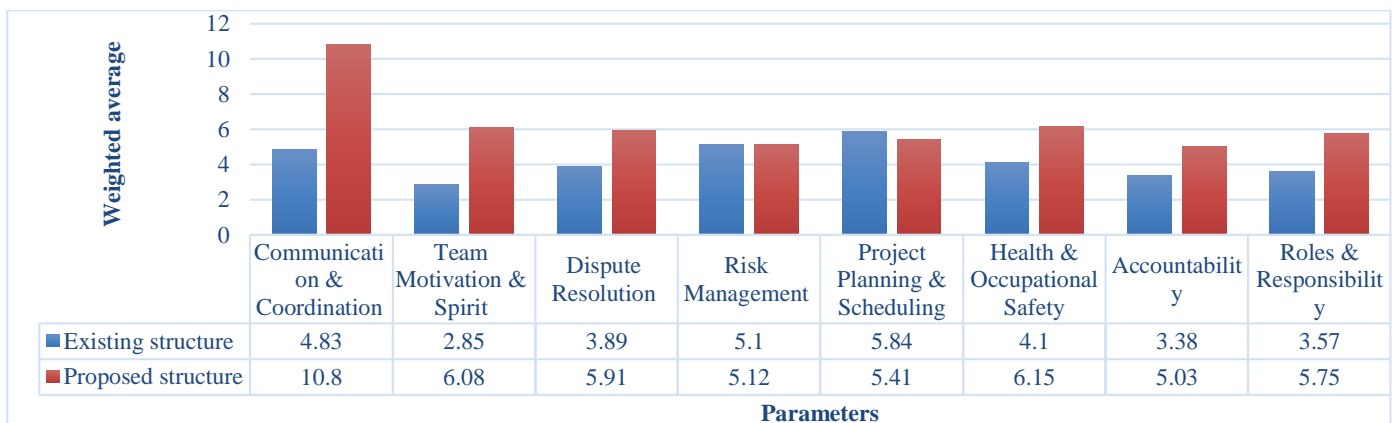


Chart no. 6.2 Parameter-wise performance of existing and proposed structure

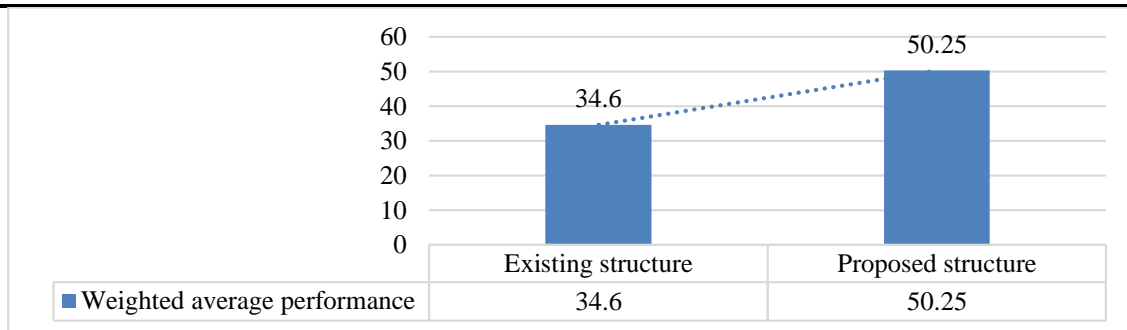


Chart no. 6.3 Performance of existing and proposed structure.

## VIII. CONCLUSION AND DISCUSSIONS

### 8.1 Proposed structure

To overcome the limitations of existing structure, few changes are proposed in the existing metro management structure. These modifications are categorized in two types, one is structural change and another is functional changes. These improvements are intended to improve coordination, monitoring and controlling mechanism of the management structure. According to research, all parameter cannot be improved at a time because of the complexity of structure, so this research is focused on the few important parameter which causes problems in existing structure. These parameters are communication and coordination, team motivation & spirit, dispute resolution, accountability, roles & responsibility. This research work doesn't address other considered parameter like risk management, project planning & scheduling, health & occupational safety at greater extent.

#### 8.1.1 Functional changes

A) Responsibility-Authority balance - Authority and responsibility should go hand in hand, but this is not the case in many of the management structure. It is found that the responsibility overcomes the authority. This create the concertation of the power and shorten the border between roles and responsibility. This lead to power dispute which is reported by many respondents. So in the proposed system both should be effectively balanced. Higher authority should be given for the higher responsibility and lesser authority should be given to lesser responsibility. If the person is awarded with right authority, then he can reduce the time taken for decision making. This can reduce the dispute and enhance the commitment of the team because of the responsibility. For example, quality engineer has the responsibility to maintain the quality of the work, so the authority should be given to him to stop the work and improve the quality of the execution team if faulty workmanship is found, this authority is not given in many sites. This change will distinguish the roles and responsibility which was unclear in existing structure and will create power balance

B) Documentation of problem solving approach - Problem solving approach is the most important quality required in any complex activity. But in many cases this approach is not structured. If one is capable of solving the problem, then he can reduce the time and cost. Problem solving approach can enhance the speed of the work and can deliver higher income. Problem solving is the skill and everyone has different approach to see the problem, that's why problem solving approach should be documented. This will prevent the loss of valuable solutions, ideas and approach. This will also help in continuous improvement by studying, evaluating and improving the data generated by this documentation. This data can be used for training purpose and can be implemented in execution level. The strong message will convey to the team member that their problem solving skills are identified by the organisation and this will encourage the problem solving approach in the team.

C) Reward system - New reward system should be implemented in the structure to encourage the team member. This reward should be based on the problem solving approach & continuous development and not based on just completion of the project. In most of the cases incentives are provided as per the early completion of the work. But for new reward system, two ceases should be considered, one is continuous development and another is problem solving approach. Improvement in skill through training, skill development program like PMKVY, higher education and improvement in quality should be considered in continuous development and reduction of time and money due to problem solving approach should be considered. Reward can be in the monetary form. Monetary benefit should be calculated by considering the quality improvement and mitigation of the risk because of the problem solving approach. Some fraction of total monetary benefit should be shared between the concerned team. This will encourage the team and pump the project spirit into team. This reward system will enhance the healthy competition among the team and help in their personal growth which is ultimately benefit for the company.

#### 8.1.2 Structural changes

Some structural changes also need to be done in the existing management structure along with the functional changes. The proposed functional improvements will put extra bourdon on the structure. Management structure is already occupied in various roles. Result also indicates that there is big scope of improvement in the organizational behavior. Both the things demand the structural changes. Structural gap need to fulfil in the existing structure. As per the demand, the supporting function needs to be introduced in the structure. This function can be taken from line and staff organization. In that structure, staff is the post which is supportive to the higher authority. But as per the research finding, more money and weightage is wasted on the upper management while actual work is carried by the execution level team. This should be balanced. This can be done by borrowing the staff function from line and staff organization and introduced it into the execution level team for their supportive role. The new post is proposed in management structure to improve performance. Figure 8.1 shows proposed structural changes in the management structure.

functions of new post will be-

1. Monitor the authority rights which is given under responsibility-authority balance.
2. Documentation of the problem solving approach.
3. Maintain the data of new reward system.
4. Motivate the team and promote project spirit, help the team member for their personal growth & skill development.
5. Act as supervisory link and report to management authority.
6. To make coordination, monitoring and control mechanism more effective.
7. Create awareness about company's goal, aim and objectives in execution team.
8. To have clearer picture and transparency so as to reduce the distrust and disputes.
9. Create awareness about role, responsibility and significance of the work in execution level team.



This post is proposed to assist the team & report to the senior level manager and has no functional authority in the organization, hence will not create parallel structure.

### 8.2 Outcome

- According to expert, proposed structure is expected to perform better than existing structure in communication and coordination, team motivation and spirit, accountability, roles and responsibility. This indicates that some of the limitations of the existing structure will be rectified.
- Staff function will improve hand in hand approach hence coordination and communication of overall planning, execution and risk identification and sharing will be improved.
- Proposed structure will impart accountability into team, improve commitment through authority-responsibility balance and transparency can be achieved.
- Proposed structure will pump project spirit, motivation and boost the moral of the employee which will have its direct impact on the productivity, efficiency and the success of the project.
- Problem solving approach will be implanted in the team which will reduce the risk and will speed up the work.
- Whole organizational behaviour will be improved.

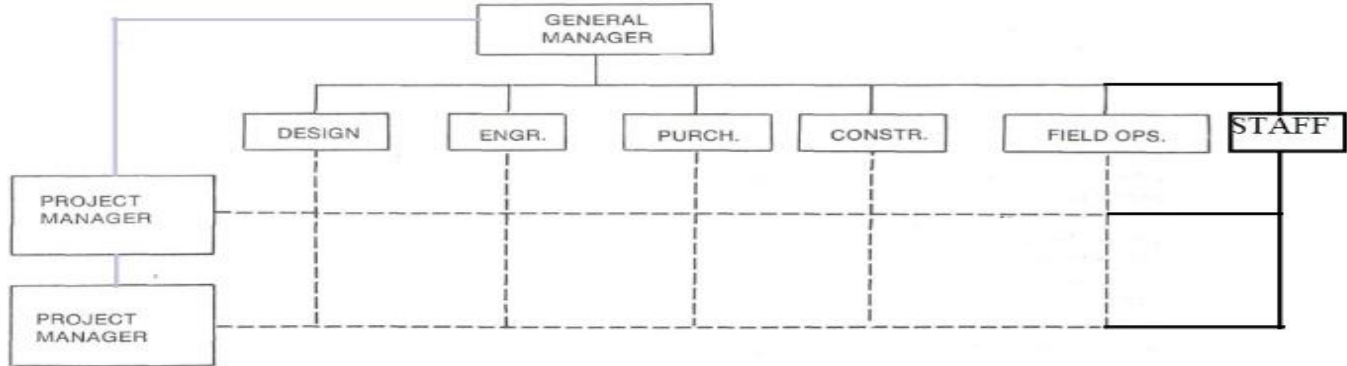


Figure 8.1 Proposed structural changes in the management structure.

### IX. ACKNOWLEDGMENT

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### REFERENCES

- [1] John A Kuprenas, 2001, Implementation and performance of matrix organization structure, IJOPM.
- [2] Jounce. Moore, Jr., & Norman r. Baker 1969 "An Analytical Approach to Scoring Model Design Application to Research and Development Project Selection"
- [3] J.R. San Cristóbal, V. Fernández, E. Diaz. 2018 "An analysis of the main project organizational structures: Advantages, disadvantages, and factors affecting their selection" Elsevier.
- [4] Lin He, Qiangsheng Liang, Siyuan Fang 2016 "Challenges and Innovative Solutions in Urban Rail Transit Network Operations and Management: China's Guangzhou Metro Experience", springer.
- [5] Lokesh Kumar Meena, S. L. Bairwa, K. Lakra, Maina Kumari, and R.S. Meena, 2013, A study of line and staff organisation in organization behaviour, researchgate.
- [6] Miryam Barad & Tzvi Raz, June 2000, Contribution of quality management tools & practices to project management performance, International Journal of Quality & Reliability Management.
- [7] S Rupa, M.S. Rani, 2017 Questionnaire designing for survey, JIOS.
- [8] Winfred Aniagyei, B. Sc (Hons.) 2011 "The effect of organizational structure on project performance."