

e-ISSN:2582 - 7219



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 4, Issue 7, July 2021



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 5.928



9710 583 466



9710 583 466



ijmrset@gmail.com



www.ijmrset.com



A Survey on Impact of Quality Management in Construction on its Productivity- A Case Study

Sumit Prakash Barde, Pranav Lende

PG Student, Department of Civil Engineering, G. H.Raisoni University, Amravati, Anjangaon Bari Road,
Amravati, India

Professor, Department of Civil Engineering, G. H.Raisoni University, Amravati, Anjangaon Bari Road,
Amravati, India

ABSTRACT: Construction Professionals have not yet realized the importance of Quality management System in construction. The Quality Management System (QMS) in construction industry refers to quality planning, quality assurance, quality control. The main goal of construction industry is to ensure that construction projects are successfully completed within the constraints of best quality, stated period and at minimum possible cost.

This study is an exploratory research conducted primarily to give insight about quality practices, tools, techniques, management commitment towards quality implementation in construction projects. It also explores the issues faced during the implementation of Quality Management Systems. The research uses a qualitative questionnaire approach to gather data. A case study which substantiates the questionnaire is conducted using content analysis method. Conclusions are drawn based on the results of the analysis and the case study data. Suitable suggestions on how to overcome the issues of implementation of QMS has been made by consulting the experts through an unstructured interview.

KEYWORDS: Quality Management System (QMS), Management Responsibility, Relative Importance Index (RII), Productivity.

I. INTRODUCTION

1.1 General:

The Construction industry has a great influence on the economy of all countries. It is one of the parts that provide vital factors for the development of any economy. According to World Bank, the share of construction industry in developing countries is approximately between 6-9% of the Gross Domestic Product (GDP). (Unit, South Asia Sustainable Development, 2007)

The construction industry is an important part of the economy and has a considerable impact on the efficiency and output of other industries. It is not possible having extensive investment in manufacturing, agriculture, or service sectors without construction of infrastructure facilities in place. Residential projects make up 85% of the Indian real estate market. Between 2015 and 2020, we expect demand to grow from approximately 880 million square feet to 1.35 billion square feet. While we also expect demand for hospitality, retail and commercial real estate to increase, residential real estate will continue to represent the bulk of the demand. The Reasons for high demand for residential real estate in Pune, include a continuing urbanization trend and reduced household sizes due to the rise of nuclear families

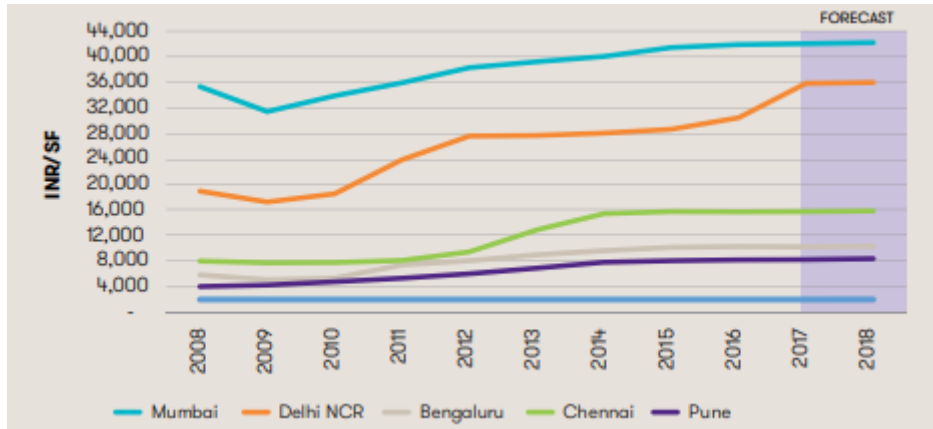


Fig 1.1: Average residential capital value trends (Source: GT India Research)

Pune has become one of the most sought after cities in the realty market. It has the advantages of being a stable market with consistent demand coming from a number of strong and dependable business sectors. Due to multiple growth drivers, Pune has been witnessing large scale migration. Exhibit 8 presents this trend in Pune, which is fueling its housing demand.

Description	2011	2001
Actual Population	9,426,959	7,232,555
Male	4,936,362	3,769,128
Female	4,490,597	3,463,427
Population Growth	30.34%	30.73%
Area Square Km	15,643	15,643
Density/Square Km	603	462
Proportion to Maharashtra Population	8.39%	7.47%
Sex Ratio (females per 1000 males)	910	919
Average Literacy Rate	87.19%	80.45%
Male Literacy Rate	92.72%	88.34%
Female Literacy Rate	81.13%	71.89%

Fig 1.2: Census 2011 Key Highlights (Source: Census 2011)

Now quality management has become an integral part of construction. Acknowledging the quality issues in construction and increasing demand for quality products, specific regulations to the implementation of the Quality Management Systems have been framed. ISO 9001 standards were set up for this purpose.

1.1.1 Quality Management System:

The results of a survey on Quality in construction by FIDIC has clearly indicated that the failure in construction quality is a big problem worldwide. In order to attract customers, ISO certification has become a trend in most industries including construction industry. According to ISO organization, 178 Countries are ISO members, 3335 technical bodies are responsible for standards development and 1.1 million certificates are issued across 178 Countries and Economics. By the end of the year 2013, nearly 37,958 organisations in India had adopted ISO 9001 certification. The QMS which is being implemented are based on the ISO 9000 series of standards. ISO 9001 is one such standard. The important clauses in ISO 9001 for quality implementation are quality management system, management responsibility, resource management, product realization and measurement, analysis and improvement. Quality Management in construction project means maintaining the construction quality to the desired level of the customer.



Figure 1.3: World distribution of ISO 9001 certificates in 2013

1.1.2 ISOQuality Standards:

ISO

"ISO (International Organization for Standardization) is the world's largest developer and publisher of International Standards. ISO is a non-governmental organization that forms a bridge between the public and private sectors. On the one hand, many of its member institutes are part of the governmental structure of their countries, or are mandated by their government. On the other hand, other members have their roots uniquely in the private sector, having been set up by national partnerships of industry associations. Therefore, ISO enables a consensus to be reached on solutions that meet both the requirements of business and the broader needs of society." (International Organization for Standardization (a))

ISO9001

ISO9001 is an internationally recognized standard for the quality management. ISO9001 standard applies to the processes that create and control the products and services an organization supplies. It prescribes systematic control of activities to ensure that the needs and expectations of customers are met. It is designed and intended to apply to virtually any product or service, made by any process anywhere in the world. ISO 9001 is one of the standards in the ISO 9000 family. (ISOQAR)

The ISO 9000 family of standards represents an international consensus on good quality management practices. It consists of standards and guidelines relating to quality management systems and related supporting standards. The term ISO 9000 refers to a set of quality management standards. ISO 9000 currently includes three quality standards: ISO 9000:2000, ISO 9001:2000, and ISO 9004:2000. ISO 9001:2000 presents requirements while ISO 9000:2000 and ISO 9004:2000 present guidelines.

ISO 9001:2000 (the transition to ISO 9001:2008 is now taking place) which gives the requirements for quality management systems is now firmly established as the globally implemented standard for providing assurance about the ability to satisfy quality requirements and to enhance customer satisfaction in supplier-customer relationships. Implementing a Quality Management System will motivate staff by defining their key roles and responsibilities. Cost savings can be made through improved efficiency and productivity, as product or service deficiencies will be highlighted. From this, improvements can be developed resulting in less waste, inappropriate or rejected work and fewer complaints. Customers will notice that orders are met consistently, on time and to the correct specification. This can open up the market place to increased opportunities. (ISOQAR)

ISO 9001:2008

ISO 9001:2008 is the standard that provides a set of standardized requirements for a quality management system, regardless of what the user organization does, its size, or whether it is in the private, or public sector. It is the only standard in the family against which organizations can be certified – although certification is not a compulsory requirement of the standard.

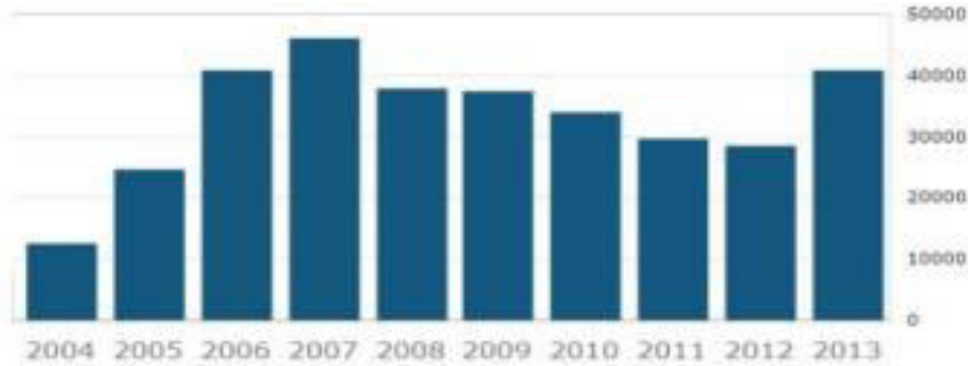


Figure 1.4: Evolution of ISO certificates in India

X-axis denotes the year and the Y-axis denotes the number of certifications in India. Considerable research has been conducted on QMS implementation within construction projects globally as well as in India. Most of the recent research are conducted on the advantages and disadvantages of implementation of QMS. Limited researches have been carried out on the issues faced during the implementation of QMS. The debates whether QMS is suitable for construction industry will never end.

1.1.3 Demand Supply mis-match in Pune Residential Real Estate Market:

Fig 1.5 shows that while maximum demand was witnessed in the 35-40 lakhs category homes, its supply was the least (rated 4). The maximum inventory supply was in the 40-60 lakhs category and the 2nd highest inventory supply was in the 60-80 lakhs category

	INR 35-40 lakhs	INR 40-60 lakhs	INR 60-80 lakhs	> INR 80 lakhs
Demand*	1	2	3	4
Inventory Supply*	4	1	2	3

Fig 1.5: Pune housing demand supply mis-match (Source: ICICI Property Services)

1.2 Research problem:

The real estate sector is one of the most recognized sectors across the world. In India it is next to agriculture sector i.e. second largest sector in terms of employment generation. The growth rate of this sector is expected at 30 % over next decade. Real estate sector can be categorized into four sub-sectors i.e. - housing, retail, hospitality, and commercial. The Indian real estate market is expected to touch US\$ 180 billion by 2020. (Christopher Crowe et al, 2012)

The housing sector alone contributes 5-6 % to the country's Gross Domestic Product (GDP). In the period FY2008-2020, the market size of this sector is expected to increase at a Compound Annual Growth Rate (CAGR) of 11.2 %. Retail, hospitality and commercial real estate are also growing significantly, providing the much-needed infrastructure for India's growing needs. Though the global recovery in residential real estate market will be gradual, the Indian situation is unique. Due to convergence of multiple factors, there will be acute housing shortage in urban areas. Pune's example highlights how fast a city can grow due to several growth drivers. Based on current scenario of the real estate sector in Pune, it is very important to analyze the social and cost impacts of the growing real sector. This will lead to better understand an economic perspective which can be an extremely valuable tool in policy making and identify the challenges with respect to the benefits and welfare of the Puneities

1.3 Research aim and objectives:

The main aim of this research is to help organizations to establish the standards of quality management system, and form it to document, implementing and maintaining it, and continually improving its effectiveness. To fulfil this aim the following objectives will be achieved:

- To identify the processes needed for Quality Management System and its application in the construction organization.



- To determine the sequence and interaction of these processes.
- To determine the necessary criteria and methods to ensure the effective operation and control of these processes.
- To ensure the prevailing quality practices followed in the local construction projects and management commitment towards quality implementation.

1.4 Limitations of the study:

The work for evaluation of the impact of quality on construction projects is carried out only in the construction industry of Pune. The work is limited to the residential real estate sector only and the results will depend on the data obtained after pursuing interviews with the professionals engaged in this industry.

1.5 Need for study:

1. Quality is one of the critical factors in the success of construction projects. Quality of construction projects is linked with proper quality management in all the phases of project life cycle
2. Quality of construction projects is linked with proper quality management in all the phases of project life cycle.
3. Design and construction are the two important phases of project life cycle which affect the quality outcome of construction projects significantly
4. Further, quality of construction projects can be regarded as the fulfillment of expectations of the project participants by optimizing their satisfaction
5. Since the quality outcomes of the projects are not according to required standards, faulty construction takes place.
6. 6-15% of construction cost is found to be wasted due to rework of defective components detected late during construction and 5% of construction cost is wasted due to rework of defective components detected during maintenance
7. Hence, quality has become one of the most important competitive strategic tools which many construction organizations have realized

II. LITERATURE REVIEW

1) A.I. Romanova (2016), Improving the Quality of Construction Works in Terms of the Self- Regulation:

The author researched on improving the Quality of Construction Works in Terms of the Self- Regulation. Author learned the concepts of implementing, managing the quality aspects in the construction management. The management related to quality will be researched by the self-regulatory organizations. As author study the existing system of the construction quality control in the Republic of Tatarstan and the established self-regulation system to propose measures of improving the quality of construction products.

2) LI Qing, LIU Rengkui, ZHANG Jun, SUN Quanxin (2014), Quality risk management model for railway construction projects:

The author mentioned about analyzing the quality risk management model for railway construction projects to overcome increasing of risk in the system. The main focus of author was to manage the combined concepts and process of the AFFTM including information technology and implementation scheme of a new risk management system. The railway management quality management leads to design and develop workable information tools quality risk management. Further author analyzed the data standards of RCPQMIS and creates a model for tracking the quality risk for providing pre warning. So this paper presents the functional modules of the RCPQMIS and its practical applications. Where the applications reveals the unified management of risk source information and multi-level sharing. As author describes that in future we will investigate methods to improve the data quality and to achieve further integration of the system functions in the risk management of railway construction projects.

3) TurgutAcikara, AynurKazaz, SerdarUlubeyli (2017), Evaluations of Construction Project Participants' Attitudes Toward Quality Management in Turkey:

The author management the quality system related to construction in Turkey. The construction projects includes risk which author investigates to overcome the quality and risk issues by implementing or minimizing occurrence of risk at the construction sites. The quality management policy of project participants to quality management



process will negatively affect the management of the project and competitiveness of the firms. Author make a questionnaire for 120 participants of construction projects in Turkey, which the feedback shows a positive response towards the need of quality in construction projects.

4) **Tao Yu , Qingpeng Man, Yaowu Wang, Geoffrey QipingShen ,Jingke Hong , Jiasheng Zhang , JiaZhong (2019), Evaluating different stakeholder impacts on the occurrence of quality defects in offsite construction projects: A Bayesian-network-based model:**

The author researched on the quality defects in offsite construction projects which impacts by the stakeholders. The author aimed to enhance quality defect management in offsite construction projects where it is important to evaluate the different stakeholder impacts on the occurrence of quality defect.

5) **Javon Adams, Cassie Castorena, Y. Richard Kim (2019), Construction quality acceptance performance-related specifications for chip seals:**

The author describes the research on the construction quality on establishing framework for construction quality. The management will be categorized and author in this paper aim the objective to determine appropriate test methods to evaluate each defined AQC.

6) **ArashHosseini, Ahmed Faheme , Hani Titi, Scot Schwandt , Evaluation of the long-term performance of flexible pavements with respect to production and construction quality control indicators:**

The author researched on Evaluation of the long-term performance of flexible pavements with respect to production and construction quality.

This paper describes by the author on details process to develop a framework for connecting pavement construction quality control indicators to long-term performance at the network level. To define the statistical correlation between quality during asphalt mix production and surface construction to in-service performance this paper demonstrates the ability of the developed system.

7) **NokulungaMashwama, Clinton Aigbayboa&DidiThwala (2017), An Assessment Of The Critical Success factor For The Reduction Of Cost Of Poor Quality In Construction Projects In Swaziland:**

The author mentioned the research on the assessment of the Critical Success factor For the Reduction of Cost of Poor Quality in Construction Projects. The poor quality of construction work deals with the 40% of revenues that is used for managing the quality of projects. Author research adopted quantitative research and 50 useable questionnaires were used as an instrument tool for the study.

8) **Mahajan Ganesh S, (2016), Poor quality in building projects:**

The author researched on the poor quality in building projects. The main reason in the cost of quality which deals with the funds in construction projects. Author aimed to overcome and identify the cost of quality so that one can determine the expenses associated with the use of quality in construction industry. The objective of the author is to consider different projects in industry which focus on construction defects on respective projects and poor quality cost measurement.

9) **Ka Chi Lam b, S.Thomas Ng (2006), A cooperative Internet-facilitated quality management environment for construction:**

The author researched on the quality management environment for construction. The aim was to improve in quality at both project and organization levels has not been truly realized. Author analyzed an automated and user-friendly quality management system would be helpful.

10) **Fei Cheng, Research on construction quality and improvement of assembly construction:**

The author researched on the construction quality and improvement of assembly construction. The main aim of the author was to increase the demand of the construction management by improving the quality in the urban areas. The quality improvement and thus the efficiency of the construction leads to be promoted by the industry.

The study focus on the analysis of the connotation of the assembly structure and analyzes the quality problems in the construction process of the construction projects and puts forward the improvement measures to promote the improvement of the building quality and the construction of the building Construction speed. Also author this paper analyzes the structural system and design of prefabricated building. At results the author believed that the



implementation of relevant measures in place and technological development use to promote the sustainable development of the construction industry.

III. CONCLUSION

This study examined the construction quality management practices and challenges that arise at construction Company. Three research questions were developed and tested in this study. The first question is to understand the practice of construction quality control management. The second question is to understand the challenges faced by the company in the process of practicing quality management in construction. The last question is to assess the different factors issues that are related to impact of quality management in construction. The study used document analysis (annual performance reports and other documents), interview with top and middle management members and self-administered questionnaire to top and middle management, project manager's construction equipment administration and maintenance case team leaders of head office and projects, and senior technicians. Questionnaire data were analyzed using descriptive statistics and data from interview and document reviews were interpreted qualitatively. Equipment management remains a critical competency for the success of construction firms. Even though there are best quality control management methods available theoretically those aids in equipment management process, most equipment managers still use their subjective and potentially inadequate judgments in most of the equipment management decisions. Generally, as the result obtained from the study and based on its specific objectives the following conclusion are drawn. The current trend of construction quality management practice in the company is not satisfactory. Unless, it result ineffective management of material and will contribute its negative impact to successful accomplishment of the construction projects in construction company on time. The result of the study reveals the existence of construction quality control policy at Construction Company but affirms also that it lacks clarity and simplicity. Moreover, the construction policy manual does not cover various aspects of quality management. It has been also seen in the study result as Construction Company prepares short and long range construction quality management which is primarily made to augment its capacity and competitiveness in the construction sector of the country. Quality control proposal is assumed to be initiated from head office and equipment administration and maintenance unit of the company play a vital role in the initiation process. It was also found to be as the company did not adopt quantitative and qualitative method to analyse and select quality control proposal alternatives. An internally developed technical and financial criterion is adopted by the company to select construction management. Least price, standardization and management decision are the three major criteria used in the quality management selection process. It was revealed in the study that Construction Company did not have well organized and integrated quality management maintenance system. Corrective and unscheduled type of maintenance is mostly practice in the construction company. As a result of limited practice of corrective type of maintenance in the construction company, construction projects are not accomplished as per their contractual schedule. It was revealed in the survey as there was no appropriate ways such as Construction Company own database and formally organized use of other company experience upon which construction quality is determined in the construction company. Quality standardization is believed to improve the overall performance of equipment management activity. It plays an important role by increasing the availability of spare part, lowering maintenance cost, improving safety and supplier relationship in the process of equipment maintenance activity. Survey result reveals as construction quality management record keeping is weak in the construction company. Because of lack of continuous monitoring, controlling and timely action to adjustments by the enterprise, equipment utilization, daily report by operator, timely equipment utilization report, equipment costs and maintenance data and costs records are not properly undertaken in appropriate manner. Moreover, the existence of manual based method of quality control record keeping makes quality activity more difficult

REFERENCES

- [1] J.A.I. Romanova - Improving the Quality of Construction Works in Terms of the Self-Regulation - Procedia Engineering 150 (2016) 2108 – 2112
- [2] LI Qinga, LIU Rengkui, ZHANG Jun, SUN Quanxin - Quality risk management model for railway construction projects - Procedia Engineering 84 (2014) 195 – 203
- [3] Turgut Acikara, Aynur Kazaz, Serdar Ulubeyli - Evaluations of Construction Project Participants' Attitudes Toward Quality Management in Turkey - Procedia Engineering 196 (2017) 203 – 210



- [4] Tao Yu , Qingpeng Man , Yaowu Wang , Geoffrey QipingShen ,Jingke Hong , Jiasheng Zhang , JiaZhong - Evaluating different stakeholder impacts on the occurrence of quality defects in offsite construction projects: A Bayesian-network-based model - Journal of Cleaner Production 241 (2019) 118390
- [5] Javon Adams, Cassie Castorena, Y. Richard Kim - Construction quality acceptance performance-related specifications for chip seals - Volume 6, Issue 4, August 2019, Pages 337-348
- [6] ArashHosseini , Ahmed Faheem , Hani Titi , Scot Schwandt - Evaluation of the long-term performance of flexible pavements with respect to production and construction quality control indicators - Construction and Building Materials 230 (2020) 116998
- [7] NokulungaMashwama, Clinton Aigbavboa&DidiThwala - An Assessment Of The Critical Success factor For The Reduction Of Cost Of Poor Quality In Construction Projects In Swaziland - Procedia Engineering 196 (2017) 447 – 453
- [8] Nils Rinke , Ilka von Gösseln , VitaliKochkine , Jürgen Schweitzer , Volker Berkhahn , Fritz Berner ,HansjörgKutterer , Ingo Neumann , Volker Schwieger - Volume 76, April 2017, Pages 24-35
- [9] Tan Chin-Keng , Abdul-Rahman, Hamzah - Study of Quality Management in Construction Projects - July 2011, Vol. 10, No. 7, 542-552
- [10] Mahajan Ganesh S - Poor Quality in Building Projects - 5(7): July, 2016 , Value: 3.00
- [11] Ka Chi Lam , S Thomas . Ng - A cooperative Internet-facilitated quality management environment for construction - Automation in Construction 15 (2006) 1 – 11
- [12] Fei Cheng - Research on construction quality and improvement of assembly construction - Earth and Environmental Science 94 (2017) 012092
- [13] LiJuan Chen, HanbinLuo - A BIM-based construction quality management model and its applications - Automation in Construction 46 (2014) 64–73
- [14] Peurifoy, R. L., Schexnayder, C. J., and Shapira, A., (2006). Construction planning, equipment, and methods, 7th Ed., McGraw-Hill, Boston
- [15] Tatari, O., Skibniewski, M., Integrated agent-based construction equipment management: Conceptual design. J. Civil Eng. Manage. 12 (3), (2006). 231–236.
- [16] Tatum, C.B., Gren, G. H., Fett, H. (2006). Construction Equipment and their Uses, Journal of Construction and Engineering Management, pp.132-137.
- [17] Mayer, R. H., Jr., and Stark, R. M. "Earthmoving logistics." J. Constr. Engrg. and Mgmt., ASCE, 107, (1981). 297-312.
- [18] Tavakoli, A., Productivity analysis of construction operations. Journal of Construction Engineering and Management , 111 (1), (1985). 31-39.
- [19] Amirghanian, S., & Baker, N., "Expert system for equipment selection for earthmoving operations", Journal of Construction Engineering and Management , 118 (2). (1992). 318-331.
- [20] Haidar, A., Naoum, S., Howes, R., Tah, J., Genetic algorithms application and testing for equipment selection. J. Constr. Eng. Manage. 125 (1), (1999). 32–38.
- [21] Shapira, A., and Goldenberg, M., "Development of systematic process and practical model for equipment selection in construction projects.", National Building Research Institute, Technion, Haifa, Israel. (2005). Research Rep. No. 017-730.
- [22] AviadShapira and Marat Goldenberg,"Soft Considerations in Equipment Selection for Building Construction Projects", Journal of construction engineering and management,ASCE, 2007.133:749-760.
- [23] Major virendersinghpoghat and Ajitpratapsingh,"Selection of Equipment for Construction of a Hilly Road using Multi Criteria Approach", 2nd Conference of Transportation Research Group of India, Social and Behavioral Sciences,104(2013)282 – 291.
- [24] Nichols, H. (1976). Moving the earth, North Castle Books, Greenwich, CT.
- [25] JariwalaSiddharth and JayeshkumarPitroda, "a critical literature review on factors affacting in selection of construction equipment",International Journal of Advanced Technology in Engineering and Science Volume No.02, Issue No. 12, December 2014.



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor:
5.928

ISSN

INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY



9710 583 466



9710 583 466



ijmrset@gmail.com

www.ijmrset.com