

# Methodology Paper on the Impact of Inventory Control on Construction Industry Post Covid-19 in Amravati District

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**Abstract-** *One of the most important aspects of any business is inventory management. Those who have never worked in the business sector may not understand the importance of efficient inventory management. But, the reality of it is if we don't have control of our inventory, we will be unable to ascertain and will have enough inventories on hand to handle the needs of our customers. This paper deals with the project methodology in detail, questionnaire measure & data collection of buildings. Analysis of questionnaire survey on inventory control is also done in this chapter. Based on a questionnaire survey and in-depth interviews with a variety of industry stakeholders, it proposes ways in which the construction sector can become more involved as for economic cost-efficient buildings are considered. The purpose of this paper is to present the research methodology used to achieve the two objectives, one is to make an analysis about suggestion of experts through questionnaire survey about inventory management system in construction industry and second is to identify the impact and influence of inventory management system in reducing time delay and material scarcity.*

**Keywords-** Seismic Analysis, Damping System, Dampers, Rectangular Building, Hollow Building.

## I. RESEARCH PARADIGM

One of the researcher said, "The positivist paradigm, which postulates that reality is objectively measurable using metrics that are independent of the researcher and the research instrument used, was embraced in this study for several reasons".

Initially, the abovementioned objects of this study demanded quantitative data to establish the inventory-management practices presently used by the researchers. Therefore, the positivist paradigm was supposed to be suitable as it's the research paradigm that advocates the use of quantitative survey. Secondly, the positivist paradigm was opted because it requires the use of the well-defined structure that enables a researcher to engage closed ended

questionnaires that can be easily analysed statistically. Thirdly, the positivist paradigm was decided because of its objectiveness, since quantitative data is more reliable to use. Fourthly, the paradigm was named due to time and financial constraints, given that it requires the use of styles that are fairly fast and fairly affordable to administer, analogous as the questionnaire survey. Because of the ultimate, the paradigm allows the researcher to use a large sample size which eventually improves generalizability of the results acquired.

## II. JUSTIFICATION FOR QUESTIONNAIRE SURVEY METHODOLOGY

Numerous options were considered for the collection of data, and eventually a questionnaire survey distributed personally by the researcher was supposed to be the most suitable technique for variegated reasons. Initially, a questionnaire check is easy to allocate in comparison to the other techniques similar as interviews. Combined with the reachable- sampling technique, the researcher had to go to a accessibly located construction companies, approach possible respondents and, when given consent, await as respondents filled in the questionnaire. Secondly, using a self-apportioned questionnaire survey is one of the most effective ways of accelerating the response rate. The approach allowed the researcher to request consent from implicit respondents and to distinguish speedily those who weren't interested. This enabled the experimenter to achieve a desirable sample size with relative ease, unlike-mailing the questionnaire which generally has a low response rate or choosy responses to questions. Thirdly, by distributing the questionnaire personally, the researcher was went an occasion to fluently explain, clarify and interpret the questions to business proprietors/ administrant, numerous of whom were foreign citizens and demanded help in understanding the questions written in the English language. This enhanced the delicacy of their responses.

Fourthly, information collected through a close-ended questionnaire was standardized and easy to attain and

anatomize. Fifthly, the questionnaire format is one that was familiar to utmost respondents as many people have had to answer a questionnaire at one point in their lives. This aids in quickening the data- collection process. Incipiently, using questionnaires was one of the most cost-effective and time-saving ways to collect data from numerous repliers.

### III. RESEARCH POPULATION AND SAMPLING TECHNIQUE

A research population isn't a demographic population but the entire collection of all compliances of interest (people, objects or events) as defined by the researcher. The target population in this study was the delegates working in construction sector under varied well known consultancies. An accessible- sampling method was employed. Accessible sampling is also known as accidental sampling, erratic sampling or attainability sampling and is a non-probability or non-random sampling in which members of the target population are named for the purpose of the study, if they meet certain practical criteria, similar as geographical propinquity, vacuity at a certain time, easy availability, or amenability to bestow. It involves using respondents who are nearest and most readily available. This technique was supposed suitable as data collection could be eased in a short duration of time. It's also a veritably cost-effective method of collecting data if the units of analysis are located in areas accessible to the researcher, as was the case in this study. The simplicity of this technique also justified its use in this study as it has moderately numberless rules that govern how the sample should be opted.

Using the accessible- sampling technique, personals were opted and approached from different municipalities and questionnaires were self- administered to respondents. Thus a count approach was espoused given the limited population size. In this study, anyone with knowledge of a business's inventory management was allowed to respond to the questionnaire. Directors, proprietor- directors, shop workers or accountants were open to participating in the inspection as it was assumed they had knowledge about the business's inventory management and could give relative responses to the questions contained in the questionnaire. The use of the accessible-sampling method was justified on the grounds that it was quick, inexpensive and fairly easy to administer.

### IV. DESCRIPTION OF SECTIONS OF QUESTIONNAIRE

According to authors, a questionnaire is a properly thought-out device designed to elicit data that may be acquired through written responses from the examine subjects. In this

study, the questionnaire covered quantitative questions very well organized and piloted to make sure they contemplated a high degree of 'validity'. It consisted of six pages divided into 3 sections specifically A, B and C. A 7th page with inside the form of a cover page becomes covered to provide an in-intensity clarification of the purpose of the study and the terms of the survey. In the questionnaire, the sections have been specially based in this kind of manner that the questions therein might be eliciting solutions to the research questions offered in Chapter 1 of this have a look at. The questionnaire become designed to take kind of 15 minutes to reply and it comprised 31 questions, 15 of which contained standard variables associated with inventory management and ultimate sixteen are divided beneath inventory control, inventory cost, inventory speed and inventory accountability which needed the respondent to apply a Likert scale to rate the degree of agreement or confrontation with the statement provided. This become in a bid to lessen the time it might take to finish the questionnaire because it already comprised 31 questions. Many questions which have been taken into consideration intrusive have been excluded after the primary pilot in an effort to inspire the respondents to take part extra freely. The sections with inside the questionnaire contained the subsequent information.

**Section A: Demographics:** This section includes the general information about the organization and the respondent's profile. General information comprised of the name of organization followed by its socio details like address of the organization, name of owner, year of establishment, contact details, etc. it also contains some technically sound questions like turnover of organization, cost of project, number of employees, etc. The respondents profile comprised of questions related to the respondent only i.e. name of respondents, his/her designation in the organization, department of work, education qualification, work experience in total, etc.

**Section B: Project Characteristics:** In this section project characteristics are mentioned in the form of question. A description of the most recently completed/on-going project section on which respondent were personally involved, are specified. Questions states the idea about type of work in which respondent was involved in on-going project. The first question is about the type of work on-going on project site categorized as Infrastructure work, utility diversion work and other (any other option to be filled by respondents itself). The complexity of project with contract price and proposed duration of project.

**Section C: Inventory Management Overview:** General questions about applications of inventory management are

opted in this section. The questions are to be marked by respondent by using Likert's scale depending on whether they agree with variable statement or not. The variables are also designed by considering the pros and cons of inventory with respect to project management. Total 15 variables are presented here.

**Section D: Organization Performance due to Proper Inventory Management:** In all 16 variables related to the inventory control, costs, speed, and accountability are proposed in this section. The respondent will opt the answer depending on his/her level of agreement with respect to variable. Also a space for positive suggestion's and recommendation is given to the respondent to cover the skipped data according to his concern.

### V. DATA COLLECTION PROCESS

The data-collection process was initiated by creating a list of all the suburbs situated in the Pune city. This was done to ensure that the survey had a wide coverage of all suburbs situated in Pune. A plan was then made to visit the towns with a daily target of ten completed questionnaires. A door-to-door visit to conveniently placed construction companies in the city was conducted. Preference was given to small businesses on the main roads or in the central area, which were easily accessible and convenient to reach. The researcher used the first five minutes of the conversation to request permission to use the business for a school research, to communicate the purpose of the research, and mention was made of the fact that the information would be used solely used for research purposes. Respondents were encouraged to participate voluntarily. Respondents were also reminded that no compensation would be given for participation and assurance was given that there were no risks involved in participating in the survey. When potential respondents showed interest in being a part of the survey, they would be handed the consent letter for signing. Unwilling participants were thanked for their time and the next business approached. For those who participated, the questionnaire took on average ten to fifteen minutes and in most cases where foreign nationals were the owners of the businesses, the researcher had to read, explain and clarify the questions for them, given the language barrier. In such cases, answering the questionnaire took slightly longer than the average time indicated above. After completing the questionnaires, respondents were thanked for their help and asked if they had any questions they would like to ask concerning the research. No questionnaires were administered via e-mail. The questionnaire was administered to owner-managers, managers or designated personnel responsible for inventory. No questionnaires were e-mailed to respondents.

### VI. DATA ANALYSIS PROCESS

With the data collected being numerical scores, which can be analyzed, interpreted and summarized using standard statistical procedures; descriptive and inferential statistics were employed to organize, analyses, interpret and summaries the data collected. To carry this task out, Likert's scale is used for analysis. This software is useful in the handling of complex data manipulations and analyses. It is fairly fast and easy to use. It allows the use of percentages, graphs, charts and means of other useful interpretations from a simple pull-down menu. It was then decided that it would be the best to use in this survey. The appearance of the study's research data had been anticipated and the descriptive statistics that would allow an understandable presentation of results had been planned beforehand. Descriptive statistics were therefore employed on all variables, displaying standard deviations, percentages, frequencies and means. Simple graph analysis was also employed to help show the descriptive statistics in a way which would help provide summaries on observations made in the sample. These descriptive statistics are discussed in the upcoming next section of data collection and analysis.

### VII. LIMITATIONS OF SURVEY

Previously, we had been given to non-response as one of the limitations of the survey instrument used. Simply put, non-response is defined as a failure to collect data from a sample unit in the target population which transpires when anticipated respondents do not participate in the survey or decline. Two reasons may give rise to this type of non-response. It may occur because of refusal by some units in the sample to return the completed questionnaire or when a unit provides information to some but not all of the questions in the questionnaire. This is called 'item non-response'. Item non-response may be as a result of irrelevant or sensitive questions in the questionnaire: a question not understood or through fatigue or lack of knowledge. The size of non-response then becomes an indication of how reliable the survey data is. In an effort to diminish the effect of a non-response bias, care was taken to make sure that different respondents ranging from managers and owner-managers to supervisors were approached to respond to the questionnaire from their own work angle.

No incentives, either material or financial, were used in the study. It was therefore fairly difficult to convince potential respondents to participate with the full knowledge that they had nothing to gain. To alleviate a huge non-response rate, careful explanation that the research was for school purposes was always given, allowing many of the respondents

who were parents themselves to willingly help without incentive. Another limitation identified in this study was a low response rate. A particular brick wall in this study was due to the political atmosphere surrounding the time when the data collection was carried out. Questionnaires were handed to respondents a few weeks after the Corona Pandemic, as they themselves were supposed to work at a site with open mind after a long span.

**VIII. STATISTICAL DATA ANALYSIS**

This section describes the data analysis employed in this study. The collected dataset went through a data screening process for accuracy of data and missing data. Next, factor descriptive analysis and finally reliability test were conducted.

- i. Descriptive Analysis: The factors responses were presented through descriptive analyses such as mean, variance and standard deviations. These important statistics were organized, summarized, simplified, and conclusions made from the dataset.
- ii. Reliability Analysis: Reliability measures how well the indicator variables serve as a measurement instrument for latent variables. Reliability can be accessed through internal consistency, which is the degree to which the items that make up the scale are all measuring the same underlying attribute. The most common way to measure internal consistency is by using the Cronbach's coefficient alpha. This statistics tool provides an indication of the average correlation among all the items that make up the scale. The values range from 0 to 1, where higher values indicate a greater reliability.

**IX. QUESTIONNAIRE MEASURE**

The questionnaire is measured based on a Likert's Scale of five ordinal measures from one (1) to five (5) according to the level of agreement by the respondents as stated in Figure 1. As discussed earlier, the data generated from the questionnaire survey is analyzed using factor descriptive analysis and reliability test by finding out Cronbach's coefficient alpha. The measurement tools in the survey provide quantitative indication of qualitative judgments.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>

Figure 1- Likert's scale used for this Study

The rating scale used for the questionnaire is;  
1 = Strongly Disagree

- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

**X. RELIABILITY TEST USING CRONBACH ALPHA COEFFICIENT**

Cronbach's alpha, (or coefficient alpha), developed by Lee Cronbach in 1951, measures reliability, or internal consistency. "Reliability" is how well a test measures what it should. For example, a company might give a job satisfaction survey to their employees. High reliability means it measures job satisfaction, while low reliability means it measures something else (or possibly nothing at all). Cronbach's alpha tests to see if multiple-question Likert's scale surveys are reliable. These questions measure latent variables — hidden or unobservable variables. These are very difficult to measure in real life. Cronbach's alpha will tell you if the test you have designed is accurately measuring the variable of interest.

Reliability is defined as the extent to which similar research conducted in future will yield similar outcomes (Leedy & Ormrod, 2001). To enhance reliability, the researcher will compute Cronbach's Alpha Coefficient to determine the internal consistency of the items in the questionnaire (Cronbach, 1951). The Alpha coefficient ranges in value from 0 to 1 and the higher the score, the more reliable the questionnaire will be. Nunnally (1978) indicated 0.7 to be an acceptable reliability coefficient. If the Alpha coefficient is, however, found to be between 0.7 and 0.9, then the research instrument will be deemed to be reliable.

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Figure 2- Thumb Rule for Cronbach's Alpha Result

**XI. SUMMARY**

In this paper, the survey design and methodology employed in meeting the research objectives set was discussed in detail. After an introduction describing the main objectives of the research and what to expect in the chapter, the research paradigm chosen for this research was then discussed. A case for the justification of the use of the questionnaire as a survey tool was immediately given afterwards. The research

population and sampling technique were then discussed. An in-depth description of the sections of the questionnaires, what they contained and why the questions were asked, was then given. The process of pilot testing then immediately followed. The data-collection process and the data analysis then followed each other. Limitations of the questionnaire survey chosen also explored. Finally, statistical analysis and procedures applied to examine the objective of this study such as data screening; descriptive analysis, factor descriptive analysis, reliability testing were discussed in detail. From the above mentioned, a conclusion can be made that the methodology outlined was appropriate for addressing the objectives of the research. The findings, as well as the results of the methodology discussed in this paper, will be presented in the final paper.

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### REFERENCES

- [1] Do Young Jung, Seung Heon Han, Keon Soon Im, Chung Kyu Ryu, 'Modelling an Inventory Management in Construction Operations Involving Onsite Fabrication of Raw Materials', Proceedings IGLC-15, Michigan, USA, pp 367-379, July 2007
- [2] Khyomesh V. Patel, Prof. Chetna M. Vyas, 'Construction Materials Management on Project Sites', National Conference on Recent Trends in Engineering & Technology, B.V.M. Engineering College, V.V.Nagar, Gujarat, India, 13-14 May 2011.
- [3] Salawati Sahari, Michael Tinggi and Norlina Kadri, 'Inventory Management in Malaysian Construction Firms: Impact on Performance', SIU Journal of Management, Vol.2, No.1. ISSN: 2229-0044, pp 59-72, June, 2012.
- [4] Prince Boateng, 'A Dynamic Systems Approach to Risk Assessment in Megaprojects', Royal Academy of Engineering Centre of Excellence in Sustainable Building Design, School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University, Edinburgh, UK, September 2014
- [5] Dhanashree S Tejale, Dr. S D Khandekar, Dr. J R Patil, 'Analysis of Construction Project Cost Overrun by Statistical Method', International Journal of Advance Research in Computer Science and Management Studies, Volume 3, Issue 5, ISSN: 2321-7782 (Online) May 2015.
- [6] D. Deepak, M, Sasi Kumar, 'Inventory Management and Cost Analysis', International Journal of Scientific & Engineering Research, Volume 7, Issue 4, ISSN 2229-5518, pp 177-182, April-2016.
- [7] Ujjavala Patel, Anand Patel, 'Application of Inventory Material Management Techniques in Construction Project- Case Study', Journal of Emerging Technologies and Innovative Research (JETIR), ISSN-2349-5162, Volume 4, Issue 05, May 2017.
- [8] Jyoti Sanjeev Mohopadkar, D. P. Patil, 'Application of Inventory Management in Construction Industry', International Journal on Recent and Innovation Trends in Computing and Communication, ISSN: 2321-8169, Volume: 5 Issue: 6, pp 229-231, June 2017.
- [9] Miss. Monika Ramdas Nanaware, Prof. U. R. Saharkar, 'Application of Inventory Control Technique in Construction', International Journal of Engineering Research and General Science Volume 5, Issue 4, ISSN 2091-2730, pp 49-54, July-August, 2017.
- [10] Ms. Priya Patil, Prof. Dr. A. W. Dhawale, 'A Review on Concept, Applicability and Implementation of Just-In-Time Technique in Construction Industry', International Journal of Engineering Science Invention (IJESI) ISSN (Online): 2319 – 6734, Volume 7 Issue 3 Ver. II, pp 07-10, March 2018.
- [11] Dr. P. Vidyapriya, Dr. M. Mohanasundari, Dr. P. Suntharalingam, Sailendharani A. P., 'Impact And Assessment Of Cost Overrun Due to Material Cost in Construction Projects', International Journal of Civil Engineering and Technology (IJCIET), Volume 10, Issue 02, pp. 1099-1115, February 2019.
- [12] Shreya Bansod, Prof. Syed Sabihuddin, 'Inventory Management System in Construction Industry: A Review', IJSRD - International Journal for Scientific Research & Development| Vol. 8, Issue 5, ISSN (online): 2321-0613, 2020.
- [13] S.Ramya, S.Janani, 'A Literature Review on Analysis of Lean Concept in Construction Industry', International

Journal of Scientific & Technology Research, Volume 9,  
Issue 02, ISSN 2277-8616, pp 4364-4366, February 2020.

- [14] Sachin S. Pal, Prof. Himanshu Ahire, 'Study of Material Management Techniques on Construction Project', IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 13, Issue 4 Ver. II, PP 12-17, Jul. - Aug. 2016
- [15] V. Rathina Kumar, K. Lalitha Priya, Prasanna kumar, C. Ravekumar, 'Construction Material Management through Inventory Control Techniques' International Journal of Engineering & Technology, 7 (3.12) (2018) 899 -903
- [16] Ahmad Zeb, Daud Khan, Muhammad Sajid, Sikandar Bilal Khattak, 'Inventory Analysis of Construction Project', Proceedings of the First International Conference on Industrial Engineering and Management Applications ISBN: 978-969-7710-01-0
- [17] T.Subramani, V.Bhaskaran Nair, A.David, B.Mohamed Ghouse, N.Siva Kumar, 'A Study of Inventory Management System in Construction Industry', International Journal of Application or Innovation in Engineering & Management (IJAIEEM), Volume 6, Issue 5, ISSN 2319 – 4847, May 2017
- [18] M. M. Rahman, Y. H. Yap, N. R. Ramli, M. A Dullah, M. S. W. Shamsuddin, 'Causes of shortage and delay in material supply: a preliminary study', IOP Conf. Series: Materials Science and Engineering 271 (2017) 012037
- [19] Lukasz Rzepeck, 'Optimization of inventory costs management in the construction enterprise', IOP Conf. Series: Materials Science and Engineering 603 (2019) 032046.
- [20] Job Onyinkwa Osoro, Denis Nkurunziza, 'Assessment of Inventory Control on the Performance: A Case Study Fair Construction Company', Scholars Journal of Economics, Business and Management
- [21] Kini, D.U., "Materials management: The key to successful project management." J. Manage. Eng., 15(1), 30-34 [https://doi.org/10.1061/\(ASCE\)0742-597X\(1999\)15:1\(30\)](https://doi.org/10.1061/(ASCE)0742-597X(1999)15:1(30))