

Comparative Study of Conventional Material Management with Advanced SAP Technique

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Abstract— Material management is simply the process by which an organization is supplied with the goods and services that it needs to achieve its objectives of buying, storage, and movement of material, Efficient material management is very essential. The construction materials may constitute more than 60% of the total cost for a typical construction project so that effective and proper material management can be proved very cost effective. The materials requirements planning, purchasing, inventory planning, storage, inventory control, materials supply, transportation and materials handling are the activities of material management. Material management is made problematic by material shortage, delays in supply, wastage and lack of storing place. Proper material management can improve the productivity and cost efficiency of a project and help to ensure its timely completion. The material management system attempts to insure that the right quality and quantity of materials are appropriately selected, purchased, delivered and handled on site in a timely manner and at a reasonable cost. This paper contains the different methods used by the construction companies and also describes the main results of survey carried out in Pune in different construction companies for their current material management process.

Keywords – *Material management, Construction materials, SAP (System Application & Product)*

1. INTRODUCTION

In residential construction industry, material management plays an important role. Materials constitute a major cost component for construction Industry. The total cost of material may constitute more than 60% of the total cost of the project. Material management is concerned with the planning, identification, procuring, storage, receiving and distribution of materials. The purpose of material management is to assure that the right materials are in the right place, in the right quantities when needed. Problems related to managing the flow of materials can be found in every organization. The efficient management of materials plays a key role in the successful completion of a project.

The control of materials is a very important and vital subject for every company and should be handled effectively for the successful completion of a project. Materials account for a big part of products and project costs. The cost represented by materials fluctuates and may comprise between 20-50% of the total project cost and sometimes more. Some studies concluded that materials account more than 60% of the total project cost.

The total cost of materials will include, in addition to the manufacturer selling cost, the cost of procurement and the site-handling costs. The proper procurement and handling of material represent a key role in the successful completion of the work. It is important for the contractor to consider that there may be significant difference in the date that the material was requested or date when the purchase order was made and the time at which the material will be delivered. These delays can occur if the contractor needs a large quantity of material that the supplier is not able to produce at that time or by any other factors beyond his control. The contractor should always

consider procurement of materials is a potential cause for delay.

Material management is a scientific technique, concerned with planning, organizing and control of flow of materials, from their initial purchase to destination. Material management contains mainly four processes i.e.

- Planning,
- Procurement,
- Logistic
- Inventory.

1.1. Material management problem

In Pune, during survey following were the main manual material management problems found in residential construction industries.

- 1) Human / Manual error.
- 2) Lengthy process to maintain Stock Registers.
- 3) Details cannot be found easily.
- 4) Accuracy is less.
- 5) Difficult to take track record of stock.
- 6) Easy updating is not possible.
- 7) Storage location of material cannot be found.
- 8) Requires more time.
- 9) Communication problem.
- 10) Requires Lock and key place to keep the registers.

1.2. Objectives of material management

- Efficient material planning.
- Buying or purchasing.
- Procuring and receiving.
- Storing and inventory control.
- Supply and distribution of material.
- Quality assurance.

- Good supplier and customer relationship.
- Improved departmental efficiency.

To fulfill all these objectives there should be good co-ordination between all the employs of material management department and also this department should have good co-ordination with other departments in the organization.(N.K. Hannure, S.S. Kulkarni - 2014)

1.3. Functions of material management.

To fulfill the above stated objectives the functions of the material management are also categorized.

(A) Primary Functions

- Materials Requirements Planning.
- Purchasing.
- Inventory Planning and Control.
- Ascertain and Maintaining the Flow and Supply of Materials.
- Quality Control of Materials.
- Departmental Efficiency.

(B) Secondary Functions.

- Standardization and Simplification.
- Make and Buy Decisions.
- Coding and Classification of Materials.
- Forecasting and Planning.

2. LITERATURE REVIEW

1) Khyomesh V. Patel, Prof. Chetna M. Vyas (2011) had discussed about benchmarking process for waste control in building material. They have discussed the objectives and functions of material management. They discussed the process of material management i.e. planning, purchasing receiving, inspection, stacking and storage, issuing material. They have taken survey of material management in Ahmadabad of 3 known builders. They found that there should be centralized material management team co-ordination between the site and the organization. In construction industry there should be proper control, tracking and monitoring of the system is required and also awareness & accountability should be created within the organization.

2) N. B. Kasim, PenielAng Soon Ern (2010) had discussed process of material management. They have taken interview and questionnaire survey of A class contractors in Malaysia. The questionnaire survey was taken on implementation of ICT and interview was taken on acceptance of ICT for material management. They found that, main barrier of implementation of ICT is high cost and there was just average level of acceptance of ICT by the industries. In construction industries, for material management Microsoft office and handheld devices are widely adopted but bar code and RFID tools are not adopted.

3) NawajKalimHannure, SushmaShekharKulkarni (2014) they have surveyed & studied current material management practices followed in the seven different construction companies in Pune, Maharashtra. They have suggested that there is need to change in process of material management. They have recommended using ICT Techniques to manage the material. By using ICT Techniques Purchase orders, Shipping,

delivery, consumption, Inventory of material can be tracked by a single click.

4) NarimahKasim (2011) worked in that area. He has discussed the process of material management. He found out the problems in material management such as lack of site storage spaces, small unloading area. ICT can reduce the level of confusion regarding the materials delivery from suppliers. He has taken a survey of „A” class contractor in Malaysia regarding implementation of ICT and discussed their results. The main reasons of resistance towards the increased level of implementing ICT in materials management are due to the high cost of investment.

5)NarimahKasim, RozlinZainal, AlinaShamsuddin, NaadiraCheKamarudin (2012) The poor material management can affect the overall construction time, quality and budget. Generally the material management information is shared by papers which are error prone. They have discussed the materials management on construction projects and potentialto employ RFID in materials management practices. For large projects material management, complexity always increases. According to them the ICT can give good facility for these large projects.

6) Caldas (2014) they have suggested that Materials management is an integrated process that consists of the people, organizations, technology, and procedures used to effectively identify, quantify, acquire, expedite, inspect, transport, receive, store, and preserve the materials, equipment, and associated information across the life cycle of a capital project. The implementation of a comprehensive materials management program contributes to more-predictable project outcomes, reduced costs, improved productivity and quality, and a safer working environment.

7) Pandey(2013) has studied; the economic growths as well as urbanization in developing countries have led into extensive construction activities that generate large amounts of wastes. Material wastage in construction projects resulted into huge financial setbacks to builders and contractors. In addition to this, it may also cause significant effects over aesthetics, health, and the general environment. These wastes needs to be managed aswell as their impacts needs to be ascertained to pave way for their proper management, however in many cities of India wastes materials management is still a problem. They have discussing the method for the management and control of waste construction materials.

8) S V. Desale(2013). There should be a centralized material management team co-ordination between the site and the organization so that effective material management strategies can be applied and monitored. Construction materials management may present similarities at the conceptual level but the implementation details vary. Material planning considers materials in the order of requirement at site.

9) A.R.Patil(2013).mention that the efficient procurement of material represents a key role in the successful completion of the work. Poor planning and control of material, lack of material when needed, poor identification of material, re-handling and inadequatestorage cause losses in labor productivity and overall delays that can indirectly increase total project cost.

10) G.Kanimozhim(2014). Material procurement and storage on construction sites need to be properly planned and executed to avoid the negative impacts of material shortage or excessive

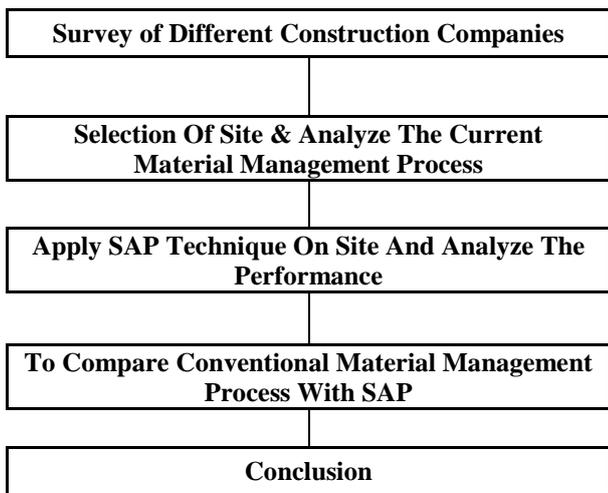
material inventory on-site deficiencies in the supply and flow of construction material were often cited as major causes of productivity degradation and financial losses.

11) Mathew(2013) have shown that. The main problem of procurement is related to schedule delays and lack of specified quality for the project. To prevent this situation it is often necessary to dedicate important resources like money, personnel, time, etc. To monitor and control the process. A great potential for improvement was detected ifstate of the art technologies such as, electronic mail, electronic data interchange (EDI), and analysis were applied to the Procurement process

2.1. Objectives of the Study.

- 1) To survey different residential construction companies for studying and analyzing the present practices of material management.
- 2) To examine how many construction industries use SAP system for material management.
- 3) Apply & analyze the effect of SAP System on Material Management.
- 4) To compare conventionaland SAP System applied for material management process.
- 5) To apply concept of Value engineering & its manifestation for cost reduction in construction projects.

2.2. Methodology



3. Survey Details of Construction Companies.

Sr. No	Name of the company	MM process
1	Millennium Engineers. & Contractors Pvt Ltd.	Conventional
2	Supreme Universal Pvt. Ltd	ERP
3	Kalpataru Ltd.	SAP
4	Kolte-Patil Construction Ltd	SAP
5	Relicon	Conventional
6	Elite Landmarks.	Conventional
7	Steiner India Ltd.	Conventional

Table No 1

3.1. Site selection for detail study.

- 1) Site:- Kalpataru Jade Residences Baner, Developer:-Kalpataru Limited, Type of Project:-Residential Material Management Technique: - SAP
- 2) Site:- Kalpataru Jade Residences Baner, Developer:-Millennium Engineers & Contractors Pvt. Ltd, Type of Project:-Residential Material Management Technique: - Conventional.

4. SAP Method Of Material Management.

4.1. SAP - System Application & Products.

(SAP) is basically designed to create a common centralized database for all the applications running in all the departments in an organization. The kind of application you can manage includes –

- Logistics & Material Management
- Finances
- Reporting, HR etc

The original name for SAP was System, Anwendungen, Produkte (In German). The system comprises of a number of fully integrated modules, which covers virtually every aspect of the business management. It eliminates the duplication and redundancy in data.Increases productivity, efficiency and better management of resources. Improves customer service through better customer interaction.

4.2. SAP Structure in Materials Management.

The Organizational Structure in MM is made up of followingOrganizational Levels:

- Client.
- Company Code.
- Plant.
- Storage Location.
- Purchasing Organization.
- Purchasing Group.

4.3. SAP MM CYCLE

- Purchase Requisition (PR)
- Purchase Order (PO)
- Goods Receipt (GRN)
- Store Stock
- Material Issue Slips (GI)
- Inventory Stock

4.4 LIST OF TRANSACTION CODE REQUIRED FOR MM IN SAP.

- ME51N – Create Purchase Requisition.
- ME5A – Purchase Requisition List Display.
- ME23N - Display Purchase Order.
- ME2N – Purchase order by PO no.
- MIGO – Goods Movement.
- MB1A – Goods Withdrawal.
- MB25 – Reservation List.
- CJ20N – Project Builder.
- MB52 – List of Warehouse stock on Hand.
- ZMM_INV – Inventory Report.

4.5 MOVEMENT TYPES FOR MM

- 103 – Gate Entry.
- 105 – Goods Receipt.
- 106 – Goods Receipt Reverse.
- 541 – Material Transferred to Contractors Stock.
- 542 – Material Reverse from Contractors Stock.
- 281 – Goods Withdrawal (Consumption).
- 282 – Consumption Reverse.
- 301 – Stock Transfer from Plant to Plant.

5.1. Conventional Material Management Cycle

- Purchase Requisition (PR).
- Purchase Order (PO).
- Goods Receipt (GRN).
- Store Stock.
- Material Issue Slips (GI).
- Inventory Stock.

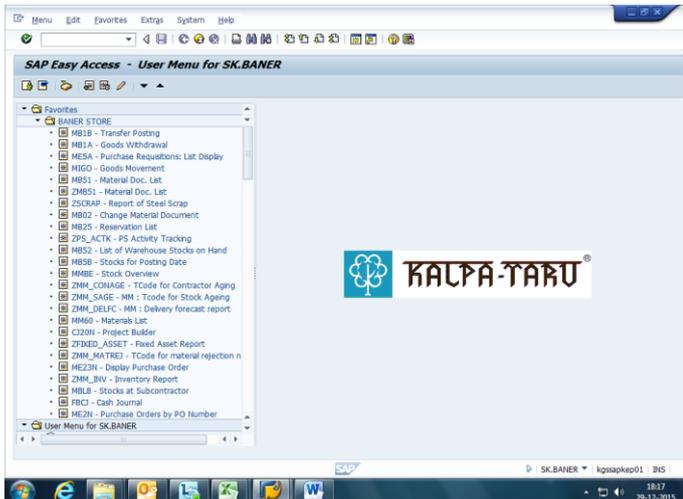


Image 1- Home Page of SAP

4.6 Advantages of material management by SAP

- Can easily find out exact consumption of materials
- Can easily get stock of materials and locations of materials.
- Accuracy increases.
- By only one click, one can easily get all details.
- It can be useful in planning and procurement of materials.
- Wastage of materials get reduced.
- Work becomes easy.
- Manual errors get reduced.
- Time can be reduced for management of materials.

4.7 Disadvantages of material management by SAP

- High initial cost.
- Need technically skilled workers.
- Estimation department is to be required Strong.
- Not affordable for small construction companies.

5. Conventional Method of Material Management

Conventional method of material management is an old/traditional method used for management of material.

- In this method total working is carried out manually.
- Requirement of manpower is more.
- Time required for managing Material is more.
- Max. No of activities as mentioned below were carried out manually.
- Time required for posting GR & GI is more.
- More Paper Work.



Image 2 - Conventional M.M.

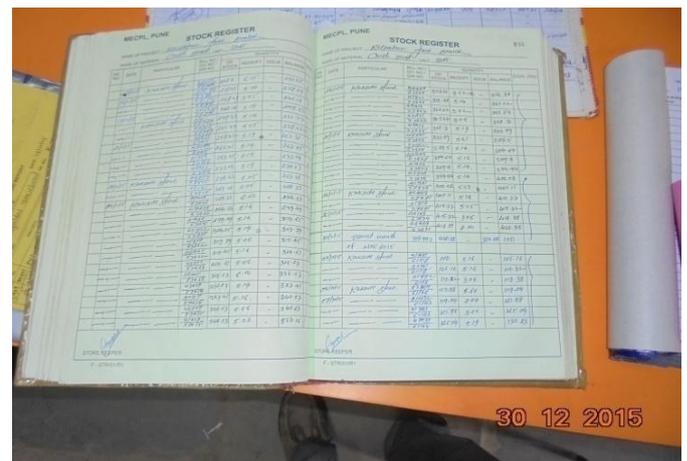


Image 3 - Stock Register Maintained For M.M.

5.2. Advantages of Conventional material management process.

- For small site it is beneficial.
- In Construction Company if only one project is going on than it is beneficial.
- Unskilled workers or non-technical person can carry out.
- Less cost.
- It is easy to understand.

5.3. Disadvantages of Conventional material management.

- Paper work increases.
- Manually error occurs.
- Difficult to find details.
- Not easy to find updates.
- Missing of papers occurs.
- Requires more Manpower.
- Time required for maintaining register's is more.

6. Comparison between Conventional Material Management SAP Processes.

Sr. no	Conventional MM	SAP MM
1.	Manually Oriented	System Oriented
2.	Possibilities of Human Error	Operation is Error Free
3.	Process is tedious	Process is fast.
4.	Requires more time for approvals.	Requires less time for approvals.
5.	Computer knowledge illiterate person can work.	Computer Knowledge Literate person required.
6.	Accuracy is less.	Accuracy is high.
7.	Min staff required is 3 No.	One staff required.
8.	Requires more time for finding details.	On a single click details are obtained
9.	Less initial cost.	High initial cost up to 2 Cr.
10.	Affordable for small construction companies whose turnover is below 100 Cr.	Affordable for construction companies whose turnover is above 100 Cr.
11.	Difficult to track inventory	Easy to track inventory.
12.	Wastage of papers.	No wastage of papers.
13.	Data is remotely stored	Data is centralized.
14.	58 % Construction companies adopt CMM.	28 % Construction companies adopt SAP.

Table No 2

7. Discussion

Material management is very important branch for any construction company. Generally material management is carried out manually in construction companies. But to achieve a profit there is need to change process of material management. As construction material constitutes more than 60% of the total cost of the project, so every construction company carries material management process. Each company does not use advanced technique but at least they carry out material management by conventional method. Among the 7 surveyed companies mentioned in Table no 1, in pune only Supreme Universal Pvt. Ltd was using ERP and Kalpataru Ltd and Kolte-Patil Construction Ltd were using SAP for material management and remaining all were carrying material management by conventional method. To adopt such software for material management the companies turn over must be more than 100 cores. Then only it becomes economical. Among surveyed companies 28. % companies are using SAP, 14 % companies are using ERP for material management and 58 % companies carry material management manually. For their existing material management process Kalpataru Ltd, Elite Landmarks, Relicon were satisfied were as Millennium Engineers and contractors Pvt Ltd, Kolte-Patil Construction

Ltd, Supreme Universal Pvt. Ltd, and Steiner India Ltd were not satisfied.

8. Conclusion

In survey it was found that every construction company carries material management. Many of construction firms were using traditional material management method. When we compare the material management by traditional method and by SAP application, the SAP application saves considerable cost, when we calculate for the whole project. By implementing SAP Technique in material management we can effectively minimize human errors. SAP reduces administrative time considerably and helps for planning of material procurement effectively. Initial cost for setting up SAP Technique for material management is high which may lead to higher material management cost as compared to traditional methods such as maintaining material. SAP technique proved to be simpler than maintaining number of musters.

But to achieve a profit, there is need to change process of material management from conventional to Advanced Techniques. By using SAP technique on a single click exact consumption of material, stocked material, and location of material can be obtained till higher management level. Management can also track the Inventory stock available on site. SAP reduces the manual error and also it does not allow anyone to make any changes in the system as it has different authorizations at different levels. It is easy to communicate. In Pune, there are rare construction companies which have adopted SAP technique for material management. The main barriers of implementation of SAP are its high initial cost of up to 2 Cr. and lack of agreement amongst all the board of directors. Implementation of SAP is feasible for construction companies whose turnover is above 100 Cr. SAP saves approximately 65 % cost on manpower resources & reduces 80 % Time with respect to material management.

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