

Time and Motion Study: Traditional Tool for the Modern Retail Outlet

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Abstract

The Study is about the activities that take place in the distribution centre of a group of retail chain located at twin cities of Hyderabad and Secunderabad. There are two important activities that take place in the distribution centre – the receipt of goods coming from the vendor and sending the goods to the store and the splitting of the bulk into desired quantities. (Vendor vehicle receiving efficiency, Picking efficiency, Bulking packing efficiency and repacking efficiency.) The objective of this study is to measure the efficiency of these two activities using standards given by retail chain.

Work study means the application of systematic analysis to the work of men and machines so as to improve methods and establish time values for that work. It is the systematic and analytical study of work processes and work methods to improve productivity. Work study helps to increase productivity through standardization and simplification of work. The technique of work study is used to evaluate the performance of tasks in an enterprise and to determine the corresponding level of performance. The objective of the study is to provide the management of a group of retail outlets an idea of the efficiency of the processes that take place in the distribution centres and subsequently in the store. The study found delays, the length of the delays, where, and why, these delays are happening. These findings will enable supply chain management to plan and operate the means and methods of reducing inefficiencies, implement processes in the cheapest and most effective and efficient manner.

The term supply chain management was coined by Keith Oliver of the strategy consulting firm Booz Allen Hamilton in 1982. Supply chain management (SCM) is the term used to describe the management of the flow of materials, information, and funds across the entire supply chain, from suppliers to component producers to final assemblers to distribution (warehouses and

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retailers), and ultimately to the consumer.¹ It is the integration of key business processes from the end user through to the original supplier that provides products, services and information that add value for customers and stock holders.²

Supply Chain Management and Competitive Advantage

Many retailers now realize that actions taken by one member of the chain can influence the profitability of all others in the chain.³ This made them realise that SCM is a new source of competitive advantage. This is being achieved by focusing on the key areas of SCM, leading to specific decisions which are as below.⁴

- Minimizing Uncertainty
- Reducing Lead Time
- Minimizing the Number of Stages
- Improving Process Quality
- Managing Demand and
- Initiatives at an Industry level⁵

The Physical Flow of Merchandise – Logistics

As firms successfully streamline their own operations, the next opportunity for improvement is through better coordination with their suppliers and customers. The costs of poor coordination can be extremely high. In the Italian pasta industry, consumer demand is quite steady throughout the year. However, because of trade promotions, volume discounts, long lead times, full-truckload discounts, and end-of-quarter sales incentives the orders seen at the manufacturers are highly variable (Hammond (1994)). Infact, the variability increases in moving up the supply chain from consumer to grocery store to distribution center to central warehouse to factory, a phenomenon that is often called the *bullwhip effect*.⁶

1. Merchandise flows from vendor to distribution center
2. Merchandise goes from distribution center to store
3. Alternatively, merchandise can go from vendor directly to stores⁷

Objective of This Study

The objective of the study is to time the processes (receiving process, bulk splitting process and the repacking process) that are taking place in the distribution centre so as to determine the actual time that is taking for the process to finish. Subsequently, this study aims to find out the problems that are behind the inefficiencies if any in the processes and tries to determine the causes and possible solutions to these problems.

Vehicle Receiving Efficiency

Receiving is the process of recording the receipt of merchandise as it arrives at a distribution center. Checking is the process of going through the goods upon receipt to make sure they arrive undamaged and that the merchandise ordered was the merchandise received.

Activity Flow chart of the Receiving Operations of the Distribution Centre

- Step 1 Vendor Vehicle Arrival and guard at the gate.
- Step 2 Entry of Vendor Name, vehicle number and Vehicle entry time by the security inside the premises
- Step 3 Allotment of serial number to each of the bills bought by the Vendor.
- Step 4 Vendor goes to the EDP (Electronic Data Processing) Department for GOODS INWARD NOTE (GIN)
- Step 5 After the GIN number is written on the Bill, the vendor comes back to the security supervisor to obtain PASS IN SLIP (PIS) from him.
- Step 6 The vehicle is then brought to the receiving area and is reported to the Receiving Supervisor.
- Step 7 The receiving supervisor allots a space for the vendor to unload the goods at the receiving floor.
- Step 8. The Vendor unloads the goods with the supervision of either the Receiving Assistant or the Receiving supervisor.
- Step 9. The Receiving Assistant or the Receiving supervisor Checks the goods brought against the purchase order given by the buyer Department of Retail outlet 's. Invoice, quantity brought, MRP, European Numeric Code, Barcode, Manufacturing Date, Free Gifts etc. are checked to match the Purchase Order. The Goods are also checked for any damages.

- Step 10. The registers are then checked to see if there are any damaged or expired goods to be returned back to the vendor that have come back from the stores (GOODS RETURNED TO WAREHOUSE)
- Step 11. If there are any returnable goods, Security Supervisor makes Non Retainable Gate Pass (NRGP) and it is entered in the NRGF Register.
- Step 12. Acknowledgement is given to the Vendor for the receipt of goods and it is entered in the Receiving register.
- Step 13. GOODS RECEIVED NOTE (GRN) Generation process starts at EDP Department.

In total, the pattern of the average time taken per vehicle in all the 7 days is as follows

Table 1: Average Time Taken Per Vehicle

DATE	NO OF VENDORS	Average time Taken per vehicle in mins
2 nd May	10	183mins
3 rd May	18	177min
5 th May	17	189mins
6 th May	20	182mins
7 th May	12	167mins
8 th may	12	221mins
9 th May	20	185mins
Total	109/7= 16	186mins

From the data that was collected to find out the vehicle receiving efficiency, it was found that the Average time taken to receive vendor vehicles per day varied from a minimum of 2.79 Hours to a maximum of 3.64 Hours per vehicle. The target set by the management of Retail outlet is of a maximum of 1.5 Hrs. By comparison, it is found out that the actual is much higher than the standard.

The step that consumes the maximum time in the vehicle receiving process is GIN preparation and allotment of space by the supervisor for receiving.

Another interesting thing that comes out from the data is that major vendors such as HUL take the longest time to receive even if they come earlier than other vehicles. These big vehicles are not received and are postponed till late at night.

Problems Identified

- Upon close scrutiny, it is found that usually the maximum time is taken at the time of GIN preparation and for the bill to come out of the EDP Department to the security again for PIS. This is unduly taking a lot of time since the task is just of some minutes. This creates delay in the receiving process as it cannot start before PIS is made for each bill.
- Another step that is taking the maximum time is the allotment of space by the receiving supervisor and the unloading of materials from the vendor vehicle into the receiving area. This is taking such long time due to the overcrowding of vehicles at the receiving entrance. There is only one receiving area, which becomes overcrowded at peak time. This leads to arguments among the vendors demanding to take the vehicles off.
- There is more number of supervisors than assistants. Receiving is the function of an assistant and not the supervisor, but, due to the shortage of manpower, the supervisors are forced to receive the vendor vehicles. Many assistants have moved from the receiving section to the EDP Section. This has led to a shortfall in the manpower in receiving front.
- The CSAs and the CSSs are relatively free in the morning hours but are overburdened after the lunch hour i.e. after 2.30 PM. This leads to overcrowding of vendors and delay in receiving of vendors.
- Attendance on time is a major problem. The general shift starts at 9.30 AM but, the supervisors usually come at 11.30 or 12.30 AM. The result is that the vendors are kept waiting till that time. The workers are on time but the assistants and the supervisors are on time.
- There are no specific standards on the time limit for each stage of the receiving process.

- The loading starts from 4.00 pm onwards at which point the receiving process should ideally come to a close. As the loading time approaches, the receiving process slows down due to lack of personnel. So, the vendor whose goods have not been received till the loading of trucks to various stores starts, has to wait till the loading process is complete which takes a minimum of a few hours.
- The employees are taking a lot more time than the allotted break time for them. As a result, the vendors are kept waiting.

Picking Efficiency

In this the goods received note is generated and only if this generated the further packing of the goods can take place.

Activity Flow Chart of the Picking Process at the D.C.

- Step 1. GRN (Goods Received Note) is generated at the EDP Department.
- Step 2. Division Sheet (Picking Sheet) is generated by the EDP department, which gives the details of how the goods brought by a single vendor are to be distributed among all Retail stores in Hyderabad according to their requirement.
- Step 3. Each Division Sheet is allotted to one picker by the Picking Supervisor.
- Step 4. Picking starts as per the Division Sheet. Goods are sorted and separated in cartons.
- Step 5. The goods are placed at the appointed place for each store according to the Division sheet.
- Step 6. The division sheet is handed over to the EDP Department for making Transfer-Outs for each retail store, which give the total list of goods going to each store per day from the distribution center.

Table 2: Picking efficiency

Date	No of Vendors	NO. OF SKUs	Total time in minutes	Average time taken in minutes
02-05-09	4	38	990	26.05
03-05-09	9	64	2220	34.69
05-05-09	10	155	4160	26.84
06-05-09	6	108	2360	21.85
07-05-09	10	143	4095	28.64
08-05-09	7	63	4010	63.65

From the above data it can be understood that the average time taken for SKU is differing each day.

Table 3: Vehicles not Receiving GRN on Day of Arrival

Date	No of vehicles not receiving GRN
03-05-09	11
05-05-09	12
06-05-09	11
07-05-09	4
08-05-09	6
09-05-09	16
Total	60

The data that has been collected for picking efficiency shows that there is a drastic delay in the GRN making process. It is being delayed unnecessarily. The data shows that Average number of vendors which are delayed every day $60/6 = 10$.

Problems Identified

- The process of GRN, which is sophisticated and SAP enabled, shouldn't take more than 4-5 Min to generate. This is however taking an abnormally long time to generate.
- While some of the GRNs for the bills that come on that particular day are generated there itself, some of the bills take a large time, amounting to weeks and even months.
- While some of them are genuine problems like that in the bill or MRP or Invoice etc, others are kept unduly for 3 to 4 days, without solid reasons. This increases the picking time of the goods since division sheet is generated for a particular bill only after the GRN is generated.
- Due to this reason, there are stock-out situations, which are not genuine in nature. This is because the goods which are delayed for picking due to the non generation of GRN keep lying around in the D.C and when the need for the stock arises, the stocks cannot be sent

to the stores immediately since they haven't been picked up, although they have been delivered by the vendor and are available in the D.C.

Bulk Packing Efficiency And Repacking Efficiency

Once the bulk goods are received from different vendors according to the requirements of individual retail store transfer –outs are generated and goods are packed. During this packing careful packing reduces the damage done to goods.

Activity Flow Chart of Bulk Packing Process at D.C.

- Step 1. Receipt of Bulk Goods from the vendor
- Step 2. Transfer – Outs are generated for each store according to the requirement that sent by each store manager through mail to the bulk packing supervisor.
- Step 3. The bulk is split according to the generated T.Os manually. They are poured into packets, weighed carefully using an electronic weighing machine, and sealed using a sealing machine and barcodes are stuck to the packets.
- Step 4. The packed goods are sealed into gunny bags with appropriate codes for each destination stores as per the T.O generated for it.
- Step 5. The bags are put on the pallets of each respective store at the place allotted to each store for them to be transported to each destination store.

Table 4: Average Productivity per Worker

Date	Average Time taken per packet	Average Productivity (packet per worker)
15-05-08	18.6 Sec	275.45 Packets
16-05-08	31.8 Sec	156.8 Packets
17-05-08	30 Sec	142.7 Packets
18-05-08	46.2 Sec	73.7 Packets
19-05-08	20.4 Sec	160.9 Packets
20-05-08	21 Sec	160.25 Packets

In the bulk packing section, the Average time taken per packet ranges from 18.6 sec per packet to a maximum of 46.2 sec per packet.

The average productivity per worker per day ranges from a minimum of 73.7 packets per worker to a maximum of 275.45 packets per worker.

Repacking Process at the D.C

Repacking essentially means packing the goods (staples) whose packing has been damaged or whose expiry date is exceeded. When the packing of the staples is damaged or when the expiry date is exceeded, the goods are sent back to the distribution centre. These goods are referred to as GRWH (Goods Returned to Warehouse).

After these goods are received, all the packets are opened individually and are checked for their condition. If the condition of the goods is too bad, the goods are sent to the scrap section where later, they are sold as scrap at a lower price. If the condition is good, the goods are sent for fumigation treatment in the D.C. where they are treated for any pests and insects and then the goods are repacked again after cleaning and further refining.

Table 6: Average Productivity Per Worker for Repacking

Date	No. of Packets	No. of Workers	Average Productivity Per Worker
19-05-09	658	6	109.7 Packets Per Worker
20-05-09	3112 Packets	18	172.9 Packets Per Worker Per Day.
21-05-09	3039	17	178.8 Packets Per Worker Per Day.

In the damaged and expired goods repacking section, the average productivity per worker per day ranges from a minimum of 109.7 packets per worker per day to a maximum of 178.8 packets per worker per day.

Problems Identified

- Retail outlets uses manual labour for cleaning, weighing, filling the packets, sealing them and then bar-coding them. This takes a long time.

- Due to shortage of staff, some of the workers have to go for picking the goods whenever required, this disrupts the flow of the process and prolongs the time for packing or repacking.
- The cleaning of various items (Whenever required) is done at the time of packing itself. This prolongs the period of packing, resulting in the wastage of time of other workers until some portion of the staple is cleaned for it to be filled in packets.
- Retail outlet is not currently packing all the bulk staples in the distribution centre. It allocates some of the bulk to be pre-packaged by the vendors themselves for Retail outlet under its brand name. This results in increased cost.
- The process loss due to manual work is greater than that would have been through mechanized equipment.

Back End Activities of a Store

After the goods are picked and placed at the appropriate places allotted to each store according to the division sheet, Transfer orders for each individual store per day is generated at the D.C. From each store, an assistant comes to the D.C for the audit of the stock that is to be sent to the respective store that day. He checks that stock against the requirement that has been sent by the store manager to the D.C and rectifies any discrepancies. Then, the goods are loaded in trucks in FIFO method, i.e. the store at which the truck would arrive first would be loaded last and store at which the truck would arrive the last would be loaded first, separated by partitions. After the trucks reach the store, no further checking is done. They are unloaded in the receiving area of the store and are dumped. The goods are then segregated and they are finally placed in the respective shelves where they are to be stored and the excess quantity is kept in the store room. The goods that are damaged are kept aside, which are sent back either once a week or once every two weeks to the D.C.

The activities that are going on now in the store are being done in an efficient manner. However, there are some problems which are depicted below.

Problems Identified

- The goods that come from the distribution centre are dumped at one place which causes damages in the packets which have to be sent back to the D.C

- The handling of the goods after the unloading is rough which causes damages.
- The work when done manually like placing the appropriate goods on the shelves take more time than when done with the help of power equipment.

Recommendations and Discussions

Vehicle Receiving and Picking: The various ways in which Retail outlet's retail can increase the efficiency of the Vehicle receiving process are as follows:

- Multiple receiving areas should be introduced instead of only one. This would help in distributing the crowd and would help in sending each vendor early.
- It has been observed that large vendors such as HUL etc. are kept for the last so as to finish with the smaller vendors first. This leads to long hours of waiting for the vendors and the receiving stretches to late night. And if two or more large vehicles arrive on the same day, the receiving of some of them has to be postponed to the next day. To tackle this problem, a separate receiving section for large vendors can be arranged; a large vendor could be decided by the supervisor according to the number of SKUs and the quantity.
- One of the reasons of the reduced efficiency is the lack of personnel in the receiving section. The section should be adequately staffed. There should be separate teams for each receiving section consisting may be of one receiving supervisor, two receiving assistants and a group of pickers, who would pick the products received by the group as soon as the GRN arrives after the receiving of the goods.
- To reduce the burden of the CSAs and the CSSs in the afternoon session, a system can be implemented where each vendor can be given a time slot for arrival at the distribution centre along with the delivery date. In this way, the vendors can be distributed evenly in the morning and afternoon sessions.
- To tackle the problem of late attendance, strict rules should be implemented like cut of one day of pay after 3 days of late coming etc. Smart card system can also be implemented, which will record the arrival time of the employees and the pay can be based on the recorded data. This would ensure the on-time arrival of the employees.
- Standards should be set for each phase of the receiving process, which would ensure the speedy receiving of the vendor vehicles and the speedy completion of the after processes.

- There should be specified targets and guidelines in the time limit within which all the bill problems should be solved so that the GRN is made, the division sheet is generated and picking is done for the received items within the targeted number of days.
- There is a need of greater supervision for the pickers, which would reduce the wastage of time by them in other activities.

Bulk Packing and Repacking

To improve the efficiency of the bulk packing and the damaged and expired goods repacking, the following methods can be adopted.

- A lot of time is wasted in filling, measuring, sealing etc. All these activities can be mechanized, which would ensure accurate and speedy packing of the bulk. This would ensure minimum process loss.
- All the items which are required to be cleaned before packing are cleaned before the packing of the individual items. This increases the idle time of the other workers since they have to wait for the material to be cleaned before they can pack it. So, all the cleaning should be done prior to start of packing.
- The above mentioned recommendations are process-specific. There are some general recommendations which would help improve the overall performance of the distribution centre. These are as follows:
 - The communication of information in the present situation is very difficult and a lot of time is wasted just to inform or find a particular person in the large space of D.C. For this reason, there should be a central sound system with mikes in every department.
 - The working conditions aren't good in the receiving area and picking area. There are no fans when the conditions get extremely hot. The general working conditions such as more water coolers, fans etc. Should be provided to the workers to avoid dissatisfaction.
 - An incentive scheme for exceptional performance can be introduced to encourage the employees and workers further.

Store Back End Activities

The possible ways to increase the efficiency of the back end processes of the store are as follows:

- The handling of the goods should be done carefully so that there is minimum damage possible.

- The packing materials such as the gunny bags, plastic bags etc. in which bulk materials are packed sometime are of inferior quality due to which they tear up and goods are spilled. Therefore quality of the packing material should be improved.
- More power equipments such as Fork-lifts etc. can be used for placing the goods faster in their appropriate place.

Conclusion

Supply chain management is an exploding field, both in research and in practice. Our focus was on four areas related to distribution center and in all the four areas it was found that there is room for further improvement. One common implementation perhaps is mechanization which reduces lot of waste of man hours and movements of the labor from one place to another, along with the minimization of the damaged items while handling. If first come first serve basis is implemented some of the other problems can also minimize to some extent.

1. Much of the material in this article is based on Chapter 12 of Silver, Pyke, & Peterson (1998) and Johnson & Pyke (2000a).
2. Lambert, Doughla M, and James R.Stock, Strategic Logistic Management, Fourth end, McGraw-Hill International Edn, Marketing/Advertising Series, p54.
3. Certain industries use other terms in place of SCM. For example, many grocery industry executives are pursuing efficient consumer response (ECR), the equivalent of just-in-time distribution or "continuous replenishment." We consider initiatives such as ECR to be aspects of supply chain management.
4. Logistics 1999-2nd International Exhibition and Conference on Logistics Management, confederation of Indian Industry.
5. Piyush Kumar Sinha, Dwarika Prasad Uniyal, *Managing Retailing*, Oxford University Press, 1st Edition, pp 260-275
6. http://mba.tuck.dartmouth.edu/pages/faculty/dave.pyke/case_studies/supply_chain_or_ms.pdf (10-09-08)
7. Michael Levy, Barton A.Weitz and Ajay Pandit, *Retailing Management*, Tata McGraw-Hill Publishing Company Ltd, 1st Edition, pp.324-328