CHAPTER 5

RESULTS AND FINDINGS

5.1 RESULTS AND FINDINGS OF THE RESEARCH

A pilot study was conducted with the sample data collected from 21 companies in order to assess the effectiveness of ERP implementation in the apparel industry. The results were analysed on the basis of the data interpretation. Subsequently the questionnaire was modified and developed to suit the laid objectives. The revised version of the questionnaire was finally administered.

The well prepared questionnaire was distributed among 200 apparel industries where ERP software is in practice. Of these industries, only 117 have responded. On the whole the response rate is 58.5%. Out of 117 companies, 27 are from Bangalore, 69 from Tirupur and 21 based at Chennai. Data collected through the questionnaire had been analyzed along with the hypotheses framed and fulfil the stated objectives. For this purpose, SPSS software package had been used. Statistical analysis techniques such as frequency distribution, percentage analysis, weightage arithmetic mean and standard deviation were employed depending upon the nature of data collected from the respondents.

In order to ascertain the effective ERP implementation in the Apparel Industry, data collected from all the 117 industries was analyzed under broad outlines like ERP Implementation, ERP Technical information, ERP success factors – Organisational perspective, Human Resource perspective, Technology Environment, ERP Failure analysis, CRUX in ERP
implementation and other related factors. The results of the analysis are shown in Appendix (ii).

Out of 117 industries, 70.08% (82) have implemented the ERP software. ERP implementation was progress in the remaining 29.92% (35) industries. All the industries were motivated by technical, strategic, financial, and functional aspects of the business firms. The industries expected reduced inventory level and return on investment followed by increase in overall productivity which leads to supplier-customer satisfaction and reduced cycle time. Major ERP players are Reach ERP, World Fashion eXchange, Now(Data Tex), Fast React, Microsoft Dynamics and Stage, in addition to the In-house software developed. The Product Evaluation was undertaken by the Industries concerned. In the Selection Criteria, moderate importance was given to software scalability option and lesser importance to Brand name. Significant importance was given to the existence of the product and interestingly majority of the industries preferred the technically sound software.

All these industries use Marketing and Merchandising, Manufacturing, Material Management and Production Planning and Control modules. Most of them are using Human resource, Finance and Maintenance. Few of them use Supply Chain, Product Life cycle and Customer relations management. According to the survey conducted, most of the industries re-engineered their processes either prior to the implementation or as part of ERP implementation or post Implementation.

Difficulties: The organisation encountered various problems at the time of ERP software implementation. They are Project Cost overrun, Project delays, Conflicts with business strategy, Employee resistance to change, Conflicts with consultants, internal conflicts and Conflict with
vendors. 88 (75.21%) industries carried-out the customization. Industries encountered technical problems such as Integration with the existing system, Integration with other applications, Integration with new business software, Data migration, Customization and Security aspects. Nearly 20 industries took more than 24 months to complete the Implementation. All the industries followed the three approaches namely, Parallel approach, Phased approach and Big bang approach. Few industries deployed pilot approach as methodology for implementation. 32% of the industries spent 10% to 20% of the project cost towards training.

More than 85 (75%) industries agreed that ERP implementation led to supplier and customer satisfaction, Increase in the overall productivity, reduction in cycle time, Inventory levels were reduced and Return on investment was realized in time. Further, the industries experienced marginal resistance from operator level, shop floor level, middle level and top level. Most of the industries agreed that ERP implementation played a significant role in improving employee performance. 82% of industries use web based applications. Though the industries had budget allocation for purchase of ERP software, still there is no budget allocation for implementation, training, and maintenance. 35% of companies overshot the Budget allocation for software purchase, 30% exceeded in license cost and all of them exceeded in implementation cost, 71% on training, 51% in technology, 62% exceeded in infrastructure and 63% industries exceeded the budget allocation for maintenance.

5.2 CRUX IN ERP IMPLEMENTATION

More than 80% of companies expressed their dissatisfaction over the features available on product based manufacturing cost calculation and cost analysis. More than 90% of respondents are not satisfied with warehouse
management and stock tracking features available in the ERP application, apart from stock handling features and physical stock analytics.

This indicates that there is a crux in the existing ERP software used in the apparel industry and there is a vast scope to look into the following areas:

- Calculation of Manufacturing cost
- Cost Analysis Report
- Warehouse Management
- Stock Management

5.2.1 Crux in calculating the manufacturing cost

Most of the Industries where the ERP in practice indicated that the package does not provide the exact calculation of manufacturing cost. The Cost of manufacturing is calculated on SAM (Standard Average Minute) value per operation and the number of units manufactured. However, it does not conceive the fixed and variable expenditure distributed for the particular style while calculating the cost of manufacturing a style.

5.2.2 Crux in cost analysis between the actual cost and projected manufacturing cost

In the case of Cost analysis report generated by analysing the actual and projected cost, most of the industries implemented ERP software indicated that the software does not provide the accurate analysis by mapping the manufacturing cost and the cost projected at the time of order confirmation.
5.2.3 Crux in Warehouse management

Most of the industries met with problems with warehouse management as the existing products have separate module which is expensive. The industry is looking for a simple and cost effective warehouse management solution and not as the entire Supply Chain Management (SCM) module.

5.2.4 Crux in Stock management

Similarly, most of the industries located in all the above mentioned three cities have agreed that the features available for stock tracking or stock management at the warehouse are not adequate. A new feature to tract down surplus production and dead stock management was expected from the warehouse management feature.

The results and findings have been arrived on the basis of the data analysis which helps to identify the factors that influence ERP implementation in the Apparel industry. They are project planning and due diligence, preparation of Request for Proposal (RFP), software selection, vendor selection, customization, architectural design, cost of software, Service Level Agreement (SLA), data management, preparing for the venture and implementation methodology. Industries depends on consultants for the implementation projects primarily due to the non-availability of internal expertise. The study also found out that the industry requires clear guidelines for ERP implementation from planning stage to post-implementation stage. Suitably, two solutions were drawn for ERP implementation in the Apparel industry. They are:-
a. Road map for the effective ERP implementation in the apparel industry

b. Road map for the Sustainable model for ERP implementation.

The first solution is provided for new ERP ventures and second one is offered for the industries which have already implemented ERP application.

5.3 ROAD MAP FOR ERP IMPLEMENTATION

A Road map for ERP implementation is the first solution proposed for the apparel industries which are planning to implement ERP application. Various factors which influence the ERP implementation were seriously considered inorder to provide this solution.

5.3.1 Factors Influence in ERP Implementation

Enterprise Resource Planning provides a complete technological solution to integrate and streamline the business process and ensure a smooth flow of information the entire organization. ERP bridges the information gap across the organization and helps to integrate the resources of the business and thus improves the operational as well as business efficiency. High failure rates are attributed to the risks involved in implementing ERP application in the apparel industry with huge financial implication, manpower involved, quality time invested and investment in technology. There are number of factors which influence ERP implementation in an organization. They are listed below:-
5.3.2 Project Planning – Due diligence

The implementation of ERP is an initiative taken by an individual or group of individuals or management in an organization. An organization has to identify its objectives and the need for implementing the ERP systems in line with the organization’s goals. ERP implementation does not yield the expected results, if the objectives are not clearly defined. These objectives must be defined in keeping the parameters such as existing business needs, the processes and future expansion plans. The organization need to identify a team of technical experts who can understand the business processes to define the requirements of the automation process. The experts team must study the existing ERP products available in the Industry and the software used by peer groups (competitors). The ERP will not yield the expected results unless the existing processes of the organization are not mapped and defined by the experts team by preparing an AS-IS document. It’s also equally important for an organization to categorically define what the future processes (to be processes) are in TO-BE document.

5.3.3 Request for the Proposal

In order to comprehensively carry-out due diligence, organizations generally call for Expression of Interest from the vendors and Implementing partners to understand the vendor, products and its features. Organizations also solicit software vendors to participate in a bidding process inorder to provide a fair chance to participate in the process with Request for Proposal. Software vendors are expected to submit a proposal with technical and financial bid after ascertaining the requirements of the organization from AS-IS document and TO-BE document. The Technical bid consists of all the technical requirements including hardware, software and infrastructure
requirements in-addition to software architecture, technology, pre-requisites, projected time line for implementation and level of customization.

5.3.4 Software Selection

Product selection plays a key role in ERP implementation. Successful implementation is determined by the product selection which determines the future course of business. The technical team plays an anchor role in software selection. The team must be transparent, critical, analytical and should function with complete freedom of expression. The software should be flexible to meet the changes in business, scalable to grow with the company, less complex, user-friendly, affordable to the organization and compatible with the internal culture of the organization. The software should also use the latest technology available in the industry. The software selection should not be influenced by an individual or a group, popularity or brand name and should not be biased.

5.3.5 Vendor selection

Vendor selection is also a key factor for the successful project implementation. The technical team has to analyse the existence of the product in the market and the experience of the vendor by analysing the number of successful installations, turnover, experience in developing and implementing. Technical expertise of the vendor’s implementation team or the agency hired for implementation is an key for implementing ERP in an organization. Many ERP implementations failed primarily due to poor vendor selection and lack of post implementation support.
5.3.6 Customization

The ERP software are not ready to use products; They require minor changes inorder to make them functional and to meet the complete requirements of the organization. The technical team in association with the experts of the external implementation team must determine the level of customization required by keeping the parameters as given below:-

(a) Ready to use features of the software by understanding the existing business processes of the organization

(b) The technical team identifying the Gaps that needs to be bridged; So that the organization’s practice becomes similar to ERP environment. *GAP Analysis* would determine the depth of restructuring required in an organization and provide necessary suggestions such as new reports, analysis and better features. This process is inevitable even though it is expensive and time consuming.

(c) *Re-engineering* needs organizational restructuring and change in the processes which helps in enhancing the productivity and oust the processes which are not required. Re-engineering the processes must be taken to match the requirements of the software and for a better process controls.

(d) The product must be user-friendly.

Most of the implementation delays are caused by excessive time taken for customization. Misunderstanding the level of customization required or the clear understanding of the organization processes also result in unnecessary delay at the implementation stage.
5.3.7 Architectural Design

Technical requirements of the organization determine the architectural requirements. Technical requirements include the number of modules which required including e-commerce applications.

Architectural design is the backbone of ERP implementation. The implementation team must identify the number of user locations, entry points, access points, report centres and determine the architectural requirements such as Hardware, Software, Firewall and other infrastructure facilities. Also, the team must decide the security levels to be provided to the users in terms of read, write and execute. Any ambiguity in the architectural design may complicate and delay the implementation process.

5.3.8 Cost of the software

Proper investment plan with a clear cut budget allocation is a key element for the successful implementation of ERP. Vendors never disclose the complete investment plan which includes (a) product pricing (including number of licenses), (b) hardware infrastructure, (c) technology, (d) training and implementation and (e) maintenance. Inadequate fund flow will also lead for delayed implementation. A clear agreement must be signed with complete plan of action by giving scope for deviations such as delay in implementation and accountability factors on both sides.

5.3.9 Service Level agreement

The Service Level agreement between the implementing agency (service provider), Vendor, and the Client plays a pivotal role in ERP implementation. The Service Level Agreement has to categorically define
the roles and responsibilities of all the stake holders, deliverables with clear cut time lines and pre-requisites, accountability for non-deliverance and penalty clauses arise, if any. SLA has to define the scope of the project, financial implications including product cost, development and customization cost, training upgradation, hosting, deployment, maintenance, support etc. Time schedule for development, deployment, customization, training period, warranty period, maintenance, cost of upgradation, cost of additional training are the few special aspects to be considered before signing the service level agreement.

5.3.10 Data Management

Capturing the right data at the right point is the key to scientific implementation which includes elimination of duplicate and redundant data, and capturing indirect data through data mining. The success of ERP implementation is determined by the use of existing data stored in the organization in various formats by using a data conversion method. Cost of data migration is significant in determining the ERP project cost. Identifying the volume of data to be migrated from legacy system has to be determined to identify the cost of data migration.

5.3.11 Preparing for the Venture

The ERP implementation team must ensure the participation from all stake holders such as technical experts, top and middle level management, end users and finance department. The wrong selection of implementation methodology could lead to ERP implementation a failure. The organisation should ensure clear budget allocation, periodical fund flow and availability of required infrastructure. Preparation of blue print for the implementation is based on the functional requirement which is mandatory with defined time
lines. It is also mandatory to define the roles and responsibilities of individual stake holders along with accountability. The organization should mobilise for awareness training programme among the employees about the ERP implementation and its advantages so as to avoid resistance to change.

5.3.12 Implementation

Prior to the commencement of ERP implementation the organization must provide the right Information Technology (IT) infrastructure prescribed by the implementation team. Non-availability of infrastructure and technology leads to unnecessary delay of the project implementation.

ERP implementation does not yield the expected results in time due to improper installation, configuration, customization, critical testing with real time data, training of trainers and end users. A conflict of interest between internal and external experts and resistance to change by the employees may result in delaying the ERP implementation.

5.4 ROADMAP FOR SUCCESSFUL ERP IMPLEMENTATION IN THE APPAREL INDUSTRY

The Data analysis further revealed that many of the ERP implementations suffered delay in implementation as well as exceeded the project cost primarily due to poor product selection and inadequate expertise in ERP implementation. This study also brought out the need for effective directions and guidelines for successful ERP Implementation in the Apparel Industry. An appropriate road map for ERP implementation has been prepared and presented in Table 5.1.
Table 5.1 Road Map for Successful ERP Implementation

Vision for ERP implementation

- Identify and justify the need for ERP Implementation
- Defining the Realistic Expectations
- Defining the Scope for ERP implementation
- Business Strategy
- Smart use of technology
- Planing and Plan for Change
- Identifying Technical Team
- Third Party consultant in case the organization does not have expertise

Process Identification and Definition

- Identify the Process owners
- Process Mapping (AS-IS)
- Request for the Purpose (RFP)
- Contract Agreement with vendors for implementation
- Identifying the TO BE Processes

Product Vendor Analysis

- Flexibility to meet the changes
- Scalability to grow with the organization
- Ease of use (User friendliness)
- Technological edge
- Financial viability

Product Vendor Selection

- ISV Vs. IP (Independent Software vendor Vs. Implementation Partner)
- Market Presence
- Technical Expertise
- Technology used
- Successful implementations
- Market Credentials
- Customer testimonials
Best Business Model

- Distinguish between FUD (fear, uncertainty, and doubt) and reality
- GAP Analysis
- Customization not to exceed 15%
- Business Process Re-engineering
- Prepare to – be Document
- Preparation of Blue Print

Finance Planning

- Budgeting (Hardware, Software, Technology, Human Resource,)
- Forecasting (ERP software pricing complexities, Training, Upgradation, Fixed, Recurring)
- Managing
- Analyse risk factors
- Support and Maintenance
- Service Level Agreement with vendor
- Warranty / Guarantee
- Maintenance not to exceed 12% of project cost
- Chargeable services

Approach & Schedule

- Big Bang
- Parallel Approach
- Phased Approach
- Pilot Approach
- Hybrid
- PERT
5.5 SUSTAINABLE MODEL FOR ERP IMPLEMENTATION IN THE APPAREL INDUSTRY

Ever growing needs of the market and dynamics of the business increases the desire to add more features in the ERP solutions used in the apparel industry. In order to achieve operational excellence and get the best on “Return on Investment”, it is mandatory for an apparel manufacturing
company to change the features of the ERP application. Dependency level on the ERP vendors and implementing partners in the ready to use ERP application forces the organization to sign in the maintenance contracts and spend huge sum in customization. As the organisations needs are ever growing; it is not possible to upgrade the ERP software quite frequently.

In-addition to the above, the apparel industry needs to re-engineer its processes in order to adopt best practices, new techniques and innovations to excel and compete in the business. So as to carry-out its processes, reengineering and cope up with the changes, organizations make changes in the ERP application by customizing the existing ERP application as per the growing needs of the organizations. Dependency Level of the organization with software vendors and the implementing agency does not permit adequate provision to make changes in the application quite often as customization requires time, money, testing, training, and deployment

Software up-gradation is an alternate to accommodate changes in the ERP application which has its own limitations. Software vendors release newer versions of their ERP application which are upgradable. In order to upgrade, the organization has to overcome intricacies related to IT infrastructure, Project management and Business strategy. Here again the upgraded version of the ERP software does not cover the customized portion of the ERP application used by the clients. During the up-gradation process, the client has to upgrade the customized portion of the ERP application already implemented in the organization. The newly upgraded version has to be tested, and deployed simultaneously to ensure smooth transition. Additional training is required in the new version for adapting to upgraded version.
There is a general belief that the new release of ERP software provides opportunities to have a measurable business impact in the areas of operational excellence and business strategy, protects IT investment, mitigates risk, ensuring sustainability and reducing TCO (Total Cost of Ownership). However the upgradation comes with a price tag.

In order to overcome these difficulties, a sustainable model is proposed as add-on model for the existing ERP application used in the apparel industry. In this proposed model, the organization should have the cost of ownership of the software along with access to source code and database. With cost of ownership and the dedicated team, the product can be customized as per the requirements and growing needs of the organization concerned.

5.5.1 Prerequisites for a Sustainable Model

The add-on module proposed for sustainable ERP implementation focuses on the enhancement of existing processes. Pre-requisites for sustainable models are defined in three different phase's primarily, functional enhancement phase, strategic enhancement phase and technical enhancement phase.

5.5.1.1 Functional Enhancement Phase

This functional enhancement phase is directed towards business benefits. This phase focus on increasing the business value by implementing the most valuable functions of the new software and laying the foundation for future business ventures and improved process automation. During this phase, ERP software modifications and custom developments are replaced with (new) standard ERP software functions. Operational excellence is
improved by picking and implementing "low-hanging fruit" - functions which offers the highest business benefit with minimum effort. Even though this phase can be combined in a single project with technical upgradation, statistics show that more than 80% of ERP customers approach this second phase as a separate project, to be conducted after a technical upgradation is completed and overall stability is achieved.

5.5.1.2 Strategic Enhancement Phase

This strategic enhancement phase involves implementing new and optimized business processes and scenario which fully exploit new ERP functions and enable enterprise SOA (Service-Oriented Architecture). It may also include implementing other software systems or components and is very much depending on the business needs of the organization. Enterprise SOA enables the organization to shorten the application innovation life cycles and implement the strategic business enhancement at its own speed.

5.5.1.3 Technical Enhancement Phase

This particular phase involves a technological upgradation whose major aim is to implement the new software release as the foundation for all subsequent improvements. The impact of this phase on the business and business processes is very limited:

- Business functions that are previously used were retained
- Changes and customization were reduced inorder to optimise the complexity and cost of operation.
- Standardised code conversions were given predominance.
- The technical up-gradation simply creates the basis for functional and strategic enhancement.
5.5.2 Road Map for Sustainable Model ERP Implementation

The proposed model for Add-on solution to sustainable ERP application in the apparel industry is drawn with 5 stages namely (i). Requirement identification, (ii). Strategic planning, (iii). Design, develop & deploy, (iv). Go live and (v). Post deployment and support and the same is depicted in Fig 5.1

Figure 5.1 Framework for Add-on solution to Sustainable ERP Application in the Apparel Industry

5.5.2.1. Identify the Requirement

Requirement identification is the first phase for this process which needs defining the objectives, analysing the actual situation, clearly identifying the requirements, preparing a project plan, organizational preparedness and conducting a feasibility study for project viability. New
requirements projected should result in enhancing the existing processes, improving quality, productivity and performance of the processes which are already in place.

5.5.2.2. Strategic Planning

Based on the requirements identified, the organization should draw a strategic plan which includes the clearly defined blue print with the system and components that are going to be affected. It should also include the newly defined business processes that require new information to be captured in addition to the existing business data. At this stage, a backup strategy has to be developed to meet the contingency with the scope for down time.

5.5.2.3. Design, Develop & Deploy

In this phase user-design, coding, verification and validation should be incorporated. The design phase is inclusive of the end user interface and structural design. The solution described in this design is developed and deployed in a test environment. This creates a pilot system landscape, in which the processes and all their interfaces to be mapped individually and tested on par with the functional parameters. At this stage, the realisation of the objectives planned needs to be measured in-addition to testing the software for quality.

5.5.2.4. Go live

The next phase in the process is deploying in a real time environment followed by Training. Necessary precautionary measures to be undertaken to minimize the risks which are monitored by a detailed project
planning and deployment. This process has to be carried-out as a parallel process to the existing system inorder to avoid downtime and data loss. Necessary corrections also to be carried-out after the real time testing and deployment based on the end user certification.

5.5.2.5. Post Deployment and Support

Post-processing activities and solving typical problems during the initial operation phase are to be addressed at this stage. Quality of the software developed has to be checked for the deliverables and compared with the functional parameters defined inorder to understand the effectiveness. Scope for Post-deployment support and maintenance has to be clearly drawn to ensure the sustainability. Add-on is expected to complete the task within two to three months. This again depends upon the scope and complexity and also includes various other factors that depend upon the system of the ERP package under use and on the individual organisation.

5.6 DESIGN OF ADD-ON SOLUTION IN ERP FOR THE APPAREL INDUSTRY

The findings of the analysis reveals that there is a need for an add-on solution to cater to the needs of the issues which are not addressed by the general ERP software solution especially, on merchandising, manufacturing, analytics and business strategy fulfilment. The ERP users expect an add-on solution to function as bolt on model that does not disturb the existing ERP solution. Majority of the apparel industries are of the opinion that it is essential to have modification on garment cost analysis, warehouse management systems particularly for finished products.
So as to cater to the requirements of the inferences identified in the analysis, two add-on solutions were developed which can run simultaneously with the existing ERP software used by the apparel industries. These modules can also function independently as a standalone model by using the data which are captured from the existing processes as,

a. Garment Cost Analysis Model

b. Warehouse Management Model

These add-on modules are designed in a unique manner in which the module can cater to the needs of the retail and export market. Many of the ERP applications are oriented to product classification such as knits and woven since the processes and cost factors are different. This module is designed in a unique pattern in which cost analysis of both woven and knitted products are carried-out. This also has provision to create a product with the combination of Woven and knitted fabrics. These modules were developed on the basis of the pilot study conducted in M/s. Stalwart, a sourcing and manufacturing unit based at Tirupur and M/s. Design Classics a leading retail brand based at Chennai.
The process flow diagram of costing process is shown in Fig 5.2.

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<th>Style Creation</th>
<th>Fabric Master Creation [Woven / Knitted]</th>
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<td>Trims and Accessories Master Creation</td>
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<td>Manufacturing</td>
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<td>- Inventory Management (Materials)</td>
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<td>- Invoice</td>
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<td>- Despatch</td>
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**Figure 5.2 Process flow diagram of Costing Process**
5.7 GARMENT COST ANALYSIS

Garment cost analysis plays a pivotal role in determining an organization’s existence. Calculating the total investment made on manufacturing the Garment is called Garment manufacturing cost. Cost of garment is projected at the time of sample development with numbers which are arrived with general manufacturing parameters such as raw material cost, manufacturing overheads, administrative overheads, cost of shipping and the profit margin. Generally, it is calculated on the prevailing market price of raw materials and other overheads. The product cost arrived at the time of sample development is projected to a potential buyer and negotiated with the buyer for placement of orders.

5.7.1. Factors influence the cost of Manufacturing

There are more factors that influence Garment Manufacturing cost which include cotton price, Yarn price, Knitting or weaving cost, cost of dyeing, finishing cost, cut, make and Trims (CMT) cost, printing cost, direct and indirect labour cost, factory overheads, Sales overheads, shipping and transport, profit etc.

Manufacturing cost is finalised between the supplier and the buyer at the time of order confirmation. The prevailing market price of raw materials are taken into consideration and additional buffer is added to the prevailing market price before projecting the manufacturing cost. Some of the factors that influence cost of manufacturing are cotton prices, fabric cost, dyeing and printing cost, raw material consumption, manufacturing overheads, duties, taxes, levies and transportation cost. Raw material consumption is the most important constituent of garment industry and it represents around 40-60% of total manufacturing cost of the Garment. Raw material consumption
is primarily identified with the measurement and dimensions of various components used with the fabric width. The actual Fabric consumption is arrived only after the Lay marker is prepared and cutting process is completed. CAD software assist to arrive the fabric consumption well in advance; However, this data is not directly captured by most of the ERP applications. Even a small increase or decrease in the consumption has an impact on profit of the style. Garment Cost analysis add-on module is an effort to find out the exact cost of manufacturing a style and compare it with the order price to arrive the profit made out of the particular style. This process also enables the manufacturers to find out the areas where the cost of the product has exceeded the projected value and improve upon the same to avoid loss in future.

5.7.3 Process flow diagram of Garment Cost Analysis

The Add on model on Garment cost analysis has 3 options primarily master data capturing option, process, and reports generated out of it. Information related to style is captured in master and in the process the manufacturing information is covered along with product costing. Reports are generated to prepare a cost analysis and to find out the exact profit made out of each style. Process flow diagram for Add-on module for the cost analysis for the ERP software is shown in Fig. 5.3.
5.7.3.1 Master Data

The garment style master information is created by using information relating to style such as fabrics used (woven or knitted), trims and accessories, colours, size and cost of the garment derived from the materials used in the style along with the cost factors involved in manufacturing the style such as manufacturing overheads, profit margins, transport etc. The woven fabric masters possess all technical information related to the woven
fabric including count, construction, finishing, width, and rate along with the fabric image. There is a provision to store the fabric swatches.

The Knitted fabric master consists all the technical information pertaining to the knitted fabric including fabric code, name of the fabric, GSM, width, yarn price, knitting charges, average dyeing cost, weight loss on dyed fabrics, fleece brushing charges, loss incurred in printing and interest on yarn price helps to arrive the dyed fabric cost. There is a provision to store the fabric swatch in the database. Trims and accessories master help to store the complete technical specifications of the trims and accessories used for making a garment. This include trim code, type of trim, name of the trim, make, unit of measurement, rate etc. There is a provision to store the image of the trim or accessory in the database. Colour master captures information about the colour which includes colour code, name of the colour and colour picker option to store colour with colour number.

5.7.3.2 Style Master

A style master stores information about style details, fabric details, trims and accessories details, colour details and stores information about the size and style costing. Information stored in each of these heads is mentioned below:-

a. Style Master :- This form contains information about the Style number, date, description, season, age group, country, classification (Men’s / Women’s / Kids), style type (traditional, formal, semi-formal, casual, ethnic, party wear), name of the designer, type of fit (Regular / Slim). In-addition to this, the form also stores the style image with front and back portion.
b. Fabric Details: - This form carries information about the fabric used in the style. Details of the fabric such as woven or knitted are drawn from the data stored in the woven fabric and knit fabric tables. Once the fabric is chosen, cost of the fabric comes from the fabric master. Soon the fabric consumption details are updated, the cost of fabric used in the style is arrived with the fabric cost which is derived from fabric master. There is a provision to use the number of fabrics for the same style.

c. Trims and Accessories Details: - This form consists information pertaining to trims and accessories used in the style. As the trim code is selected, the trim information appears on the screen with its price and Units of Measurement (UOM). Once the number of units required for one garment is entered, the price appears automatically. More trims and accessories can be used in the same style.

d. Colour Sheet Details: - In this form, information related to colour is stored. Provision to store the number of colours is available in the system. It displays colour code, colour number and also displays the colour chip.

e. Size Details: - This form stores information about the size details of the garment such as size code, size type (numerical / alphabetical) and the sizes.

f. Garment Costing Sheet: - Cost of making a garment is calculated on the basis of the projected fabric cost, CMT (cut, make and trim) which include stitching, cutting, finishing, packaging, embellishment, trims and accessories. Other overheads such as administrative and factory overheads, profit, projected loss on rejection and charges on board are added as percentage (%), in-addition to profit. FOB price is defined in USS, Euro, Pounds and Rupees with conversion rate to arrive the cost of product.
Process flow diagram depicting the style master creation is presented in Fig. 5.4.

**Figure 5.4 Process diagram for Garment Style Master Creation**
5.7.4 Worksheet generated by Garment Cost Analysis

Cost of the style is arrived at the time of style creation based on the rates prevail at the time of developing the style or confirming the order. Parameters such as cost of the fabrics, average consumption, rate of trims and accessories used and its cost, manufacturing cost consisting cutting, stitching, finishing, packaging, embellishment etc. In-addition to this, factory overhead cost margin and rejection is added as percentage(%). On board charges per piece is added to arrive at the total price of the garment.

5.7.4.1. Woven fabric costing

The woven fabric master stores information related to the name of the fabric, type such as plain fabric, yard dyed checked fabric, denim fabric, twill fabric, oxford fabric, flannel fabric, printed fabric, grey fabric, sheeting fabric, doby fabric, brushed check fabric etc. In-addition to count, construction details, dyeing type, printing type, finishing type, width (in inches), rate, date are updated along with image of fabric swatch. This information is created as master data when the style is created with a kind of fabric used in samples and the costing is arrived on the basis of the quote received from the supplier. Cost of the fabric used is determined by the type of fabric, style, pattern, fabric used or consumed for making a style and width of the fabric.

5.7.4.2. Knitting Cost Sheet

(grams per square meter), width, yarn price per kilogram, knitting charges, average dying cost, loss due to various processes and finally dyed fabric cost along with the knitted fabric image are also stored. This information is created as master data when the style is created with a kind of fabric used in the sample and the costing is arrived on the basis of the quote received from the supplier or prevailing market prices for knitted fabric.

5.7.4.3. Trims and Accessories

Trims and accessories master stores information related to the name of the trim, make, trim type, unit of measurement, rate, updated date and image of trim or accessory. This information is created as master data as the trim or accessory is received or order is placed by the purchase department. This option has provision to store various trims and accessories used such as main label, wash care label, tag, thread, fusing, twill tape, mobilon tape, zipper, patch label, button, packing materials such as tissue, board, hanger, tags, poly bag, blister, carton, label logo, embroidery, applique, lace, rib etc. Style master captures the information related to various trims and accessories used in making the style. However, prices of these trims and accessories are taken as quote from the suppliers or from the existing market price.

5.7.4.4. Style Creation Master

Style master comprises of various components of the style which include style, fabric, trims and accessories, colour, size and garment cost sheet. Unique features are included in this module such as making garments with woven, knitted and denim fabrics.
Style is primarily created with an identity in the form of a code and a description and date of creation. Style is prepared as per seasons and countries, targeted to a particular age group in a society. With details such as style images details of style, kind of fit and designers name. Style is created with the Fabric which can be woven, knitted or Denim. In the fabric details the designer can choose the type of fabrics such as woven or knitted or denim to view the list of fabrics which is stored in the master database along with the price. For the same garment, different kinds of fabrics can be used. As the consumption is mentioned, the system displays the value of the fabric based on the value stored in the database.

Trims and accessories are used in the garment which is captured in this phase. Trims and accessories such as Button, Thread, zipper, fusing, packing materials, poly bags, hangers are stored in the database. The designer has to choose the trims and accessories used in the style. Value of the trims stored in the database appears as the units are chosen for the actual value of trim and accessories used are displayed. Information on number of colour combos in which the sample is prepared is stored in this part with colour code and name of the colour. Size details show the sizes in which these styles are created. Sizes are primarily numeric or alphabetic based on the type of garment. These sizes are used for manufacturing the products in the defined ratios.

Garment cost is arrived here. The fabric cost is arrived from the details of fabrics used. Trim details are obtained from details of trims stored. CMTP charges are obtained here such as stitching, cutting, finishing and packing charges. Overhead rejection and profit is added as percentage to the manufacturing cost along with charges on board which gives the total apparel cost. Based on currency and conversion rate, the FOB price is fixed. Once the price of the style is arrived, then the merchandising team starts with
marketing process. Based on the prices proposed in the style master, orders are confirmed with the buyers. A Sample cost sheet is shown in Table 5.2.

**Table 5.2 Sample Garment Cost sheet Information**

<table>
<thead>
<tr>
<th>Style Master</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Style Number</td>
<td>QS010101</td>
</tr>
<tr>
<td>Season</td>
<td>Spring Summer</td>
</tr>
<tr>
<td>Country</td>
<td>Norway</td>
</tr>
<tr>
<td>Colour</td>
<td>BL-GR-NB-OR</td>
</tr>
<tr>
<td>Classification</td>
<td>Menswear</td>
</tr>
<tr>
<td>Size</td>
<td>36-38-40-42-44</td>
</tr>
<tr>
<td>Type</td>
<td>Casual</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fabric Type</th>
<th>Fabric</th>
<th>Rate</th>
<th>Consumption</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woven</td>
<td>FAB0117</td>
<td>240</td>
<td>1.60</td>
<td>384</td>
</tr>
<tr>
<td>Denim</td>
<td>Den 001</td>
<td>230</td>
<td>0.10</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total Fabric Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td>407.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trims Type</th>
<th>Trim</th>
<th>Rate</th>
<th>Consumption</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUTTON</td>
<td>BUT004</td>
<td>15.00</td>
<td>1</td>
<td>15.00</td>
</tr>
<tr>
<td>Wash Care Label</td>
<td>LBL002</td>
<td>1.50</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Size Label</td>
<td>SIZLBL001</td>
<td>1.50</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Label Set</td>
<td>ML002</td>
<td>13.00</td>
<td>1</td>
<td>13.00</td>
</tr>
<tr>
<td><strong>Total Trims Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td>31.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CMTP Charges</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stitching:</td>
<td>22</td>
</tr>
<tr>
<td>Cutting:</td>
<td>12</td>
</tr>
<tr>
<td>Finishing:</td>
<td>8</td>
</tr>
<tr>
<td>Packaging</td>
<td>14</td>
</tr>
<tr>
<td>Embellishment</td>
<td>5</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td>499.00</td>
</tr>
<tr>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Overhead cost</td>
<td>15</td>
</tr>
<tr>
<td>Margin(after overhead)</td>
<td>25</td>
</tr>
<tr>
<td>Rejection</td>
<td>5</td>
</tr>
<tr>
<td>Charges for On Board</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total Cost of the Garment</strong></td>
<td>754.26</td>
</tr>
</tbody>
</table>
Calculation of the estimated cost in the traditional model is shown in Table 5.3.

**Table 5.3 Estimated Costs in the Traditional Model**

<table>
<thead>
<tr>
<th>Expression</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_F(0) = P_F(0) \cdot A(0)$</td>
<td>Cost of Fabric = Price per Meter / Unit * Amount of Consumption</td>
</tr>
<tr>
<td>$C_T(0) = P_T(0) \cdot A(0)$</td>
<td>Cost of Trims = Price per Unit * Amount of Consumption</td>
</tr>
<tr>
<td>$C_P(0) = \sum(S_{TI}(0) + C_{UT}(0) + F_{IN}(0) + P_{ACK}(0) + E_{ML}(0))$</td>
<td>Cost of Production = Stitching + Cutting + Finishing + Packing + Embellishment</td>
</tr>
<tr>
<td>$C_M(0) = \alpha \cdot (C_F(0) + C_T(0) + C_P(0))$</td>
<td>Margin = % * (Cost of Fabric + Trims + Production)</td>
</tr>
<tr>
<td>$C_{OH}(0) = \beta \cdot (C_F(0) + C_T(0) + C_P(0))$</td>
<td>Overheads = % * (Cost of Fabric + Trims + Production)</td>
</tr>
<tr>
<td>$C_R(0) = \gamma \cdot (C_F(0) + C_T(0) + C_P(0))$</td>
<td>Rejection = % * (Cost of Fabric + Trims + Production)</td>
</tr>
<tr>
<td>$C_{OB}(0) = O(0)$</td>
<td>On board = X Value</td>
</tr>
<tr>
<td>$C = C_F(0) + C_T(0) + C_P(0) + C_M(0) + C_{OH}(0) + C_R(0) + C_{OB}(0)$</td>
<td>Estimated Cost = Cost of Fabric + Cost of Trims + Cost of Production + Margin + Overheads + Rejection + Onboard</td>
</tr>
</tbody>
</table>
5.7.4.5 Manufacturing cost – Daily Production

As mentioned in the Garment manufacturing process, Fabric is issued to the spreading and cutting room where the fabric is converted into pieces which are in cut patterns. These cut patterns are bundled and sent to the production facility where they are assembled in lines. In the production facility, same style is run in different lines or different styles are run in different lines based on the order volume. The assembled pieces are checked for quality, ironed, finished and packed in boxes and sent to the warehouse. This labour intense process is carried-out by a set of labour in various categories. Manufacturing cost is arrived from the daily production cost, material cost incurred in manufacturing and other overheads. Daily production cost of a style is arrived from a Fixed cost, variable cost and Labour cost incurred in making a particular style. Labour cost is arrived from the number of employees engaged in making the product on a particular day in a particular line in a factory. Daily Production Cost calculation Process is presented in Fig 5.5
Figure 5.5 Daily production Cost Calculation Information

Fixed cost can also be stored in the database such as Rent, Maintenance, Electricity etc. These expenditures per day has to be divided into a number of Lines functional in a factory and stored in the database.

All variable expenditures are captured in the system such as raw materials, labour, consumables, overheads, rejection etc. In the case of the employee the cost of employee is stored per day per line. Cost of the Employees working in a line are directly maintained. However, cost of common resources are divided by number of functional lines.
While capturing the data of employees used for the production, the rates defined in the database is drawn for calculating the manufacturing cost of the style in a line. The process calculates the cost of all the employees working in the line including over time charges. The total manufacturing cost is then divided by the number of units produced by the particular line which is cleared by the quality control department to arrive at the cost per piece. Details of each employee who is involved in making the style and cost per day per line is also stored. In case they work overtime, the overtime charges are calculated and added with the production cost.

Once the production information is updated in the system, the amount spent on manufacturing the number of pieces is calculated on the basis of the number of employees involved in manufacturing the style on a particular day and in a particular line. The manufacturing expenditures are captured in the expenditure heads master where all the fixed expenditure, variable expenditure, cost of labour and other costs involved in the manufacturing is stored.

In order to reach the daily production cost of a style, the details of direct labour engaged in the line for manufacturing the style is captured. In addition to the direct labour, there are supervisory and managerial level employees who work in the shop floor to monitoring the production like supervisors, production managers, general manager, quality control managers, pattern masters, employees of the cutting and finishing departments. Even though they work in the manufacturing process, they are not specifically attached to a specific line. The salary paid to these employees are proportionately taken into consideration while calculating the daily production cost of the line and style. For example, the Production Manager who draws a salary of Rs. 90000 per month, and manages 5 lines in the factory, his cost per line is calculated as Rs. 600 per day (90000 / 30
days / 5 lines). Similarly the over time charges per hour per line is defined and stored in the database. In the case of a direct labour, the total salary is divided into number of days and per day salary is calculated. Process flow showing the details covered for defining the cost of each employee is given in Fig 5.6

![Process Flow Diagram](image)

**Figure 5.6 Expenditure Information Capturing**

The system stores daily production information relating to the style, factory in which the style is manufactured, details of line, number of units manufactured along with number of employees engaged for manufacturing and the total cost involved in manufacturing includes other fixed and variable expenditures incurred in the line.

Total expenditure incurred in the line for manufacturing a particular style is added which includes fixed expenditure, variable expenditure and manufacturing expenditure. This also includes the over time charges paid and expenditures incurred during the extra hours. Cost of manufacturing a garment is arrived from the total manufacturing expenditure incurred on a particular style and the number of garments produced. This process also provide options to calculate the expenditure incurred in each line, each factory in making a particular style.
5.7.6. Cost variance analysis – Classical Model

The cost variance analysis is prepared by comparing the costing sheet prepared at the time of developing the style or order confirmation with the actual cost incurred in manufacturing a particular style. Here the actual manufacturing cost is calculated for each style. As the style is picked, the estimated cost used for costing appears on the screen with details like cost of fabrics and trims which are primary raw materials in manufacturing a garment. As actual consumption is entered along with actual rate at which the raw material was procured, the cost of raw materials is derived automatically. The application displays fabric cost, trims cost, total number of pieces manufactured etc. In addition to this, the application also displays the cost of manufacturing each piece which was derived from the daily production data. In case of any change in the percentage of overheads, cost on board, margin and rejection has to be updated in the application. The application instantly shows variance in each component. The application enables the organization to find out whether they are able to make profit in manufacturing a style, whether there is any variation in the prices estimated and actually incurred. The process flow for Actual Cost analysis is presented in Fig 5.7.
Figure 5.7 Actual Cost Analysis
Classical approach for traditional costing model is given in Table 5.4

**Table 5.4 Classical approach for Traditional Costing Model**

<table>
<thead>
<tr>
<th>t</th>
<th>Product Cost Unit / Line / Style / Day / Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_F(t) = P_F(t) \cdot A(t)$</td>
<td>Cost of Fabric = Price per meter / unit * Amount of consumption</td>
</tr>
<tr>
<td>$C_T(t) = P_T(t) \cdot A(t)$</td>
<td>Cost of Trims = Price per unit * Amount of consumption</td>
</tr>
<tr>
<td>$C_P(t) = e(t) / N_0(t)$</td>
<td>Cost of Production = Total expenditure / Number of units produced</td>
</tr>
<tr>
<td>$C_M(t) = \alpha \cdot (C_F + C_T + C_P)$</td>
<td>Margin = % * (Cost of fabric + trims + production)</td>
</tr>
<tr>
<td>$C_{OH}(t) = \beta \cdot (C_F + C_T + C_P)$</td>
<td>Overheads = % * (Cost of fabric + trims + production)</td>
</tr>
<tr>
<td>$C_R(t) = \gamma \cdot (C_F + C_T + C_P)$</td>
<td>Rejection = % * (Cost of fabric + trims + production)</td>
</tr>
<tr>
<td>$C_{OB}(t) = O(t)$</td>
<td>Onboard = X Value</td>
</tr>
<tr>
<td>$C_{ost} = \sum C(t) = [C_F+C_T] + \sum C_P(t)$ + [$\alpha \cdot (C_F+C_T) + \alpha \cdot \sum C_P(t)$] + [$\beta \cdot (C_F+C_T) + \beta \cdot \sum C_P(t)$] + [$\gamma \cdot (C_F+C_T) + \gamma \cdot \sum C_P(t)$] + $C_{OB}(t)$</td>
<td>Style Cost per unit = Cost of Fabrics used + Cost of Trims Used + Cost of Production per unit + Margin (% on COF+COT+COP) + Overheads + Rejection + Cost on Board per unit</td>
</tr>
</tbody>
</table>
5.7.6. Analysis Reports

This add on solution provides greater flexibility in terms of creating several cost analysis reports which are dynamic in nature. These reports are periodical based on a style or a factory or order.

5.7.5.1. Cost Analysis Report

Cost analysis report is generated for a particular period. This report provides details on individual or various styles manufactured during the period in all the factories. This report can be seen for all styles or a selective style. This report also provides details of style estimated cost per unit, actual cost, and number of units produced along with the total estimated price and total cost of manufacturing. The report also indicates whether the organization has made profit out of that particular style or not. Particulars of cost analysis report is shown in Fig 5.8.

<table>
<thead>
<tr>
<th>Style No</th>
<th>Description</th>
<th>Estimated Cost (per unit)</th>
<th>Actual Cost (per unit)</th>
<th>Quantity Produced</th>
<th>Estimated Price</th>
<th>Actual Price</th>
<th>Profit / Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>KDD001</td>
<td>Kids Casual</td>
<td>437.06</td>
<td>373.69</td>
<td>3150</td>
<td>1376730.00</td>
<td>1175233.56</td>
<td>Profit</td>
</tr>
<tr>
<td>QS01H01</td>
<td>Quick Silver</td>
<td>678.10</td>
<td>594.69</td>
<td>2510</td>
<td>1759641.00</td>
<td>1550574.00</td>
<td>Profit</td>
</tr>
<tr>
<td>KDD003</td>
<td>Kids casuals</td>
<td>396.09</td>
<td>319.35</td>
<td>1000</td>
<td>396000.00</td>
<td>312500.00</td>
<td>Profit</td>
</tr>
<tr>
<td>A00190101</td>
<td>Spring summer 2017</td>
<td>342.13</td>
<td>315.12</td>
<td>500</td>
<td>191562.80</td>
<td>175467.20</td>
<td>Profit</td>
</tr>
<tr>
<td>RC-LAB 024</td>
<td>Short sleeve BHRT</td>
<td>564.14</td>
<td>376.32</td>
<td>1175</td>
<td>662664.50</td>
<td>442176.00</td>
<td>Profit</td>
</tr>
</tbody>
</table>

Figure 5.8 Actual Cost Analysis Report

5.7.5.2 Cost Analysis Report – Factory

This Cost analysis report is similar to the report generated earlier for a particular period. This report provides details of individual style
manufactured during the period in various factories. This report also can be used for all styles or a selective style. This report also provides details of style Estimated cost per unit, actual cost, and number of units produced along with the total estimated price and total cost of manufacturing. The report further indicates whether the organization has made profit out of that particular style or not. This report also throws insight on making comparison between factories manufacturing a particular style is indicated in Fig 5.9.

**Cost Analysis Report - Factory Wise**

<table>
<thead>
<tr>
<th>Style No</th>
<th>Description</th>
<th>Estimated Cost (per unit)</th>
<th>Actual Cost (per unit)</th>
<th>Quantity Produced</th>
<th>Estimated Price</th>
<th>Actual Price</th>
<th>Profit / Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>A00010101</td>
<td>Spring summer 2017</td>
<td>342.13</td>
<td>315.12</td>
<td>560</td>
<td>101502.80</td>
<td>176467.20</td>
<td>Profit</td>
</tr>
<tr>
<td>AQ15CARLA01</td>
<td>TUNE SP</td>
<td>1176.39</td>
<td>762.57</td>
<td>2975</td>
<td>350571.25</td>
<td>235840.25</td>
<td>Profit</td>
</tr>
<tr>
<td>GS010101</td>
<td>Quick Silver</td>
<td>678.10</td>
<td>546.85</td>
<td>4360</td>
<td>2855516.00</td>
<td>2358542.00</td>
<td>Profit</td>
</tr>
<tr>
<td>RD.LBS.024</td>
<td>SHORT SLEEVE SHIRT</td>
<td>594.14</td>
<td>376.32</td>
<td>1175</td>
<td>602864.50</td>
<td>442178.90</td>
<td>Profit</td>
</tr>
</tbody>
</table>

**Figure 5.9 Factory wise Production Analysis Report**

5.7.5.3 Analysis Report – Factory – Line Production Report

Same style of garment is manufactured in different lines in the same factory or different factories on any given day. In this analysis report, the number of units manufactured in each line is captured in a given style to enable the factory to compare the efficiency of each line and to arrive the total number of units manufactured on a particular day. This report also provides a comprehensive overview of the style manufactured in different lines of the factory, contributions of each line in executing the orders. An analysis on the comparison of daily production between the lines is pointed out in Fig 5.10.
5.7.5.4 Analysis Report – Factory – Line Productivity

In this analysis report, the number of units manufactured in each line is captured along with the number of employees involved in manufacturing the given style. Further, this report enables the factory to compare the efficiency of each line and arrive at the total number of units manufactured on a particular day by engaging number of employees. Number of units produced in different lines is compared here to identify the efficiency levels of each line, identify gaps, deficiencies, and improve upon to enhance the productivity. Report showing line efficiency is found in Fig 5.11

![Figure 5.11 Line efficiency report - Employee](image)

5.7.5.5 Analysis Report – Factory – Line Efficiency

In this analysis report, the number of units manufactured in each line is covered along with the cost involved in manufacturing a given style to enable the factory to compare the efficiency of each line. This report also
helps to find at the total number of units manufactured on a particular day and total cost involved in terms of employees used in manufacturing. Cost of each unit produced in different lines is compared here to identify the efficiency levels of each line, identify gaps, deficiencies and improve to enhance efficiency. Format of report showing the line efficiency is shown in Fig 5.12.

<table>
<thead>
<tr>
<th>Date</th>
<th>Factory</th>
<th>Line1 Quantity</th>
<th>Line1 Manufacturing Expense</th>
<th>Line2 Quantity</th>
<th>Line2 Manufacturing Expense</th>
<th>Line3 Quantity</th>
<th>Line3 Manufacturing Expense</th>
<th>Total Quantity</th>
<th>Total Manufacturing Expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/12/2014</td>
<td>NEELANKARAI</td>
<td>1200</td>
<td>7832</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1200</td>
<td>7832</td>
</tr>
<tr>
<td>16/02/2015</td>
<td>NEELANKARAI</td>
<td>600</td>
<td>10624</td>
<td>600</td>
<td>10424</td>
<td>625</td>
<td>10824</td>
<td>1775</td>
<td>31872</td>
</tr>
<tr>
<td>17/02/2015</td>
<td>NEELANKARAI</td>
<td>550</td>
<td>10624</td>
<td>600</td>
<td>10424</td>
<td>590</td>
<td>11024</td>
<td>1810</td>
<td>33271</td>
</tr>
<tr>
<td>18/02/2015</td>
<td>NEELANKARAI</td>
<td>725</td>
<td>19024</td>
<td>750</td>
<td>19024</td>
<td>760</td>
<td>19024</td>
<td>2235</td>
<td>57072</td>
</tr>
</tbody>
</table>

**Figure 5.12 Line efficiency report – Manufacturing Expenditure**

5.7.6. **Cost Comparative Analysis**

Cost Analysis report option facilitated in identifying the exact profit made from a particular style. Here the estimated cost of garment is updated first; It includes Cost of fabrics used, Trims and accessories used, CMTP charges (Manufacturing cost), Overheads, Margin, Rejection and Cost on Board. Actual cost of manufacturing a garment in a style is derived from actual cost of fabrics used, trims used, Cost of production is taken from the daily production information, actual rejection is obtained from production line and margin and actual Cost on board is obtained. Cost of each component is compared between the estimated cost and actual cost is compared and variation in each component is analysed to enhance the profitability. Details of cost comparative analysis are shown in Table 5.5
5.8 **ADVANTAGES OF COST ANALYSIS MODEL**

Some of the main advantages of the new classical model cost analysis system are presented here:

- Actual profit or loss made from each style is analyzed.
- Deviation from the projected cost [Existing model] and actual cost [Proposed model] in each component [Cost of Fabrics, Fabric
Consumption, overheads, Rejection, Margin, Cost on Board] is identified.

- Productivity of each Line manufacturing the style is measured.
- Productivity of each factory manufacturing the style is measured.
- The cause of deviation can be analyzed.

5.9 WAREHOUSE MANAGEMENT SYSTEM FOR FINISHED GOODS

Although numbers of warehouse software are available in the industry for managing warehouse, still a simple solution is expected by the industry to analyse the space utilisation in the warehouse. As the real estate market prices boomed with fringe margin, the industry is forced to look at cost cutting measures from various corners. One such option is the effective utilization of floor space in the warehouse. The industry looks at a solution to find the optimum floor space utilization.

Similarly, industry encounters issues related to piling of stock which not only occupies space in the warehouse, but also blocks the money invested. Most of the time, the stock accumulated due to surplus production, rejection and unsold goods which can be sold in the market to liquidate the money invested. An Add-on module is developed as part of the enhanced ERP module to effectively manage the warehouse space and stock. Managing dead stock or unused stock not only provide liquid cash, but also space to manage the inventory of the finished goods. Warehouse management process is carried-out in four phases primarily defining the warehouse, receiving the goods manufactured by the factories, storing them in the warehouse and re-distributing the stock stored in the warehouse against orders to the customers. The process flow diagram of warehouse management system for finished goods is shown in Fig 5.13
Figure 5.13 Process flow diagram for Warehouse Management System
5.9.1 Process Flow Diagram for Warehouse Management System

The warehouse Management System process comprises of five level processes. They are

- Initial phase
- Warehouse/ Building, Floor
- Floor level-block level
- Rack level-Row level
- Rack level-Row level – Box level

A Company can operate number of warehouses and each warehouse consists of number of blocks or buildings; Each block has number of floors and number of racks are kept in each floor to store the finished goods. Each rack is divided into number of storage space which can accommodate boxes in each row. Capacity of the rack means capacity to store the number of boxes.

Figure 5.14 Initial phase
Diagram showing the space availability in a floor in the warehouse is shown in Fig 5.15

![Diagram showing the space availability in a floor in the warehouse](image)

**Figure 5.15  Warehouses / Building / Floor**

Diagram showing the capacity of block and building in a warehouse is shown in Fig 5.16

![Diagram showing the capacity of block and building in a warehouse](image)

**Figure 5.16 Floor level-Block level**

Diagram showing the space availability in a rack and each row in the warehouse is shown in Fig 5.17.
5.9.2 Process Flow Diagram of Goods Received in the Warehouse

This add-on module is designed in a unique way that the warehouse can handle goods received against the existing orders received from the customers or open stock produced against future orders. This is primarily designed to cater to the needs of domestic (retail) as well as the international (export) market, as most of the export houses diversifying into the retail market with the same manufacturing facility. Finished goods with packing list are sent to the Warehouse from the factories. Received goods are classified into goods received against orders and goods received against future orders. In case of goods received against order, the consignment is checked for order number, style, colour, size and price with packing list provided. In case of goods received against order, the consignment is checked for style, colour, size and price with the packing list provided.

In the warehouses finished goods are grouped under the product categories such as menswear, women’s wear, kids wear, shirts, trousers, knitted garments [T-shirts] etc. sometimes it is categorized based on the customer, or country of origin or based on the storage policy of the company. Once the inspection process is completed, the space availability is checked in the warehouse for storing the number of boxes received. In case of non-availability of space, the existing stock is rearranged to make space
for the new goods arrived. The entire consignment can be moved to a new location if the volume of consignment is huge. Process flow diagram warehouse goods received option is depicted in Fig 5.18

![Process Flow Diagram - Warehouse Goods Received](image)

**Figure 5.18 Existing Process flow diagram - Warehouse Goods Received**
Proposed Algorithm for warehouse space allocation

### Proposed Algorithm for space allocation in warehouse management is based on end user constraint

| Input TAG, TAS, FI [Total Available goods, Total Available Space, Floor Information] Ascend FI based on space [as per the constraint] IF (TAG=TAS) |
| { Initialize with the flash, available goods [Boxes] equal to space available. } IF (TAG>TAS) |
| { Initialize the flash, indicating the amount of goods [Boxes] exceeding the available space Based on the flash, the other precautions has to be taken by the warehouse Possibilities  
  i. Extra space has to be arranged  
  ii. Provide indication to allocate goods to the space available and retail the remaining in buffer space. } IF (TAG<TAS) |
| { Initialize the flash, indicating the amount of goods [Boxes] is less than the available space Based on the flash, other precautions has to be taken by the warehouse Possibilities  
  i. Extra goods shall be accommodated  
  ii. Provide indications to allocate goods to the space available } |
5.9.4 Process Flow Diagram for Packing list preparation

Packing List is prepared on completion of finishing and packing process. Packed goods are sent to warehouses from the factories. Information gathered such as Carton Box number, Dimension of the box, Style Number, Colour, size and pieces. Order number is selected in case the goods are manufactured against the order received. Information relating to total number of prices, price per unit, gross weight, and net weight of the carton is stored. These carton boxes are then moved to the warehouse. Diagram showing the packing list preparation process is shown in Fig 5.19
5.9.5 Proposed Algorithm for Packing

<table>
<thead>
<tr>
<th>Proposed Algorithm for packing of Garments for its Best Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: Collecting information relating to the order with style particulars and specifications like colour and size.</td>
</tr>
<tr>
<td>Step 2: Check the availability for the order quantity and specifications in the warehouse</td>
</tr>
<tr>
<td>Step 3: If the specified quantity is not available, flash the information that the Specified garments need to be manufactured for that particular order. On completion of manufacturing process, goods are sent to the packing Process loop.</td>
</tr>
<tr>
<td>Step 4: If the specified quantity is available [Packing loop]</td>
</tr>
<tr>
<td>Step 5: Collect information about the dimension of the box, date and timing</td>
</tr>
<tr>
<td>Forenoon or afternoon</td>
</tr>
<tr>
<td>AM =&gt; Packing on the current day</td>
</tr>
<tr>
<td>PM =&gt; Packing on the Next day</td>
</tr>
<tr>
<td>Step 6: If the dimension of the box cannot accommodate the garment Choose the box with different dimension, or else pack the units as per the specifications (Colour and Size ratio)</td>
</tr>
<tr>
<td>Step 7: Place the pieces of the garments in the box as per the specifications mentioned in the order such as style, colour and size ratio.</td>
</tr>
</tbody>
</table>
5.9.6 Process Flow Diagram of Goods Issued from the Warehouse

Goods are issued from the warehouse against the order received by the organisation. Sometimes the goods also manufactured against the orders received from the customers. In the retail scenario, goods are produced for a season and orders are received subsequently and goods are issued against these orders. Warehouse disposes surplus production and dead stock in smaller volumes against small orders. Where the goods need to be repacked and the inventory has to be maintained for stock available in the warehouse. This process takes care of both issuing goods against the orders received as well as issuing goods for fresh orders inorder to effectively manage the inventory levels at the warehouse.

Goods are packed in the cartons while keeping the order quantity in consideration for the existing orders. Surplus pieces are manufactured against these orders are packed separately and placed along with the ordered quantity to meet out any contingency. While issuing the goods against these orders the actual quantity is issued and the surplus is retained in the warehouse.

In case the new order requires re-distribution of goods from a box in case of small volume orders, the removed pieces are moved into temporary boxes and subsequently numbered while packing the goods. Invoice is prepared and goods are then despatched. This process also ensures space management as goods are rearranged once the goods are despatched. The process diagram showing goods issued from the warehouse is shown in Fig 5.20.
Figure 5.20 Process flow diagram - Warehouse Goods Issued
5.9.7 Proposed algorithm for repacking

<table>
<thead>
<tr>
<th>Proposed Algorithm for collective styles</th>
</tr>
</thead>
</table>

Step 1: If the order contains various styles, colours and size with smaller volumes.

Step 2: Identify the quantity required in each style, each colour and each size from the order.

Step 3: The quantity has to be drawn from the existing boxes by opening the boxes and re-packed in new boxes.

Step 5: Collect information about the dimensions of the box, date and timing

- Forenoon or afternoon
- AM => Packing on the current day
- PM => Packing on the Next day

Step 6: If the dimension of the box cannot accommodate the garment,

- Choose box with different dimensions, or else pack the units as per the specifications (Colour and Size ratio)

Step 7: Place the pieces of the garments in the box as per the specifications mentioned in the order such as Style, Colour, and size ratio.

Step 8: Arrive at the balance quantity available in each box after Re-distribution.

5.9.8 Process Flow Diagram for space Allocation in the Warehouse – Prototype Developed

The warehouse receives finished goods from the factories. On receipt of goods, space requirement is identified. Most cases warehouses receive intimation in advance to carry out planning for space requirement and check the availability. Allocation is carried-out in 2 modes. Primarily manual mode
in which the carton boxes are selected and allocated blocks in the space available in the warehouse. The automated option system shows the space availability along with options for placing the cartons in the space available. If the allocation proposed by the software is acceptable, then the space allocation is carried-out automatically. Space allocation process is shown in Fig. 5.21.

Figure 5.21 Process flow diagram - Warehouse Space Allocation
5.9.9 Space Management in the Warehouse

Space availability is derived from capacity and the goods already stored. Each rack capacity is stored against the number of rows occupied is shown along with the vacant positions as described in Table 5.6 and Fig 5.22.

**Table 5.6 Warehouse Space Utilization**

<table>
<thead>
<tr>
<th>Warehouse Space Utilization</th>
<th>Rack Space</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occupied</td>
</tr>
<tr>
<td>Rack 1</td>
<td></td>
</tr>
<tr>
<td>Row 1</td>
<td>50</td>
</tr>
<tr>
<td>Row 2</td>
<td>20</td>
</tr>
<tr>
<td>Row 3</td>
<td>15</td>
</tr>
<tr>
<td>Row 4</td>
<td>40</td>
</tr>
<tr>
<td>Row 5</td>
<td>10</td>
</tr>
</tbody>
</table>

**Figure 5.22 Rack level Capacity Utilization**
Similarly, the warehouse space utilization chart for each floor states the space utilised in each floor and space available in each floor. Most of the garment manufacturing units set aside specific floor or a building in the warehouse for different product categories for classifying the warehouse space. Sample chart showing the space utilization in Fig 5.23

![Warehouse Space Utilisation Floor 1](image)

**Figure 5.23 Floor level Capacity Utilization**

The warehouse space utilization chart for each building in a warehouse and space available in each building is identified. Sample chart showing the space Utilization in a building is given in Fig 5.24.
Figure 5.24 Building Level Capacity Utilization

The warehouse capacity utilisation with respect to space available in each rack, each floor, each block and the overall warehouse space utilisation is shown in Fig. 5.25
Figure 5.25 Warehouse Level Capacity Utilization

5.9.10 Working process - Warehouse Management System Master

The warehouse master contains information relating to different warehouses used by the company by defining the warehouse, information relating to buildings / blocks, number of floors in each building / block and the storing system such as racks in each floor with the capacity of each rack in terms of number of boxes stored in each row.

- **Warehouse Master** stores information relating to location, warehouse name, type of warehouse like finished goods, raw materials, fabrics etc. In-addition, the numbers of blocks in the warehouse contact information such as phone no, email ID, area, complete address and name of the warehouse in-charge.

- **Blocks master** stores information relating to name of the block and number of floors in each block along with warehouse name and its location.
• **Floor Master** stores information relating to the floor, name of the block and number of racks available in each floor along with warehouse name and its location.

• **Rack Master** captures information relating to the starting rack number, ending rack number, number of rows (partition) in each rack, capacity of each rack in terms of number of boxes that could be stored in each row. Information about the floor, name of the block and rack number along with warehouse name and its location.

• **Customer Master** captures information about the code, company name, contact person, street, area, city, state, pin code, tax registration no, tin no, email ID, telephone number, mobile number, fax number and web Url of the customer.

• **Factory Master** consists of information relating to factory code, name of the factory, contact person, street, area, city, state, pin code, tax registration no, tin no, email ID, telephone number, mobile number, fax number, and web Url of the factory.

**Process**

• Packing: Goods once manufactured are packed in boxes based on the product category, size and colour. Information pertaining to style number, factory, colour, number of pieces in each size, price per unit (MRP), gross weight and net weight is captured. Each carton box bears a number which is updated in the goods received note sent to the warehouse.

• Order Master - This form is used for storing information relating to the order received from the buyers. Information captured are, with order number, customer code, order date, expected date of delivery
and authorised person. As the customer code is selected the customer data such as, company name, contact person, email ID, address, city, country and pin code. Information related to style, colour, and number of pieces in each size is captured here. Total number of pieces in a style and colour is multiplied with unit price and price for that particular style and colour. The order comprising number of styles and various colours and its sizes. when total number of prices arrived, total order value, freight (in case any), duties, other charges, currency, conversion rate and total order value is calculated.

- Goods Received - Finished goods products are received from the factories located in various places. These finished goods are received against the orders received from the customers or the products developed, be sold in the market based on the projected market demand.

- Here, information relating to the reference number, goods received date, delivery challan no and date are considered as primary information. Carton box number, style number, colour, size, units of measurement and number of units stored in each carton are stored. Price is taken from the style master or order Master.

- These received goods are then stored in the warehouse based on the space availability and product categorisation in different rows in the racks placed in the warehouse.

**Storing System**

- Manual Allocation: In the Goods Received Note the number of Boxes received in each consignment is shown. In manual allocation the system displays the number of boxes received and provision for
allocating space manually is provided. As the Box number is selected the system shows the vacant locations in the warehouse and the operator can choose the location where the box has to be placed.

- **Automatic allocation option** by using the best fit algorithm as per the algorithm proposed. Based on the requirements identified from Goods Received Note system showcases the space availability status in each floor.

- **Option a.** As per the algorithm proposed, if the goods received from the factory is equal to the space available in the particular floor the space is allocated to the consignment once the floor is selected. If the consignment received is more than the space available, the software indicates that the space is insufficient. Extra space has to be created to accommodate the incoming Goods.

- In case the space requirement is less than the space available in a floor, the space availability may be analysed by selecting a particular floor. In case the space availability meets the requirement on a single click, the space is allocated to all the boxes received in the GRN. The Boxes are stored in First cum first serve basis as per the category of the product. Space is allocated to each consignment on the basis of space required and space available. For example, 20 boxes received in one consignment and the entire rack is free with a capacity of 100 boxes, first row at the bottom is used to store these 20 boxes from Left to Right option.

- In case of non-availability of continuous space to accommodate all the 20 boxes, the best Fit algorithm is followed where the existing space availability is calculated and stored separately and the requirement is compared with space available and the available
space is re-distributed on Best Fit method to effectively manage the space allocation.

1. Re-arranging option (Fragmentation): In this option, the system will provide list of options to optimise the space Utilization like fragmenting the space available. This option is created primarily to create additional space for new orders which flow in for seasons.

2. Re-packing and distribution: Some of the styles are prepared for future orders and stored in the cartons. On specific orders which are small in quantity, these Cartons are opened and garments are taken out and repacked in new cartons and then distributed. As mentioned in the proposed algorithm for collective styles, repacking and re-distribution method is adopted here.

**Goods Issued**

- Finished goods products are issued to the customers based on the order received from them. Sometimes an entire consignment is made against an orders received from the customer or the customer places orders against the goods which are already available in the warehouse.

- In case of Goods manufactured against an order received from a customer, the entire consignment is issued. With Goods issued from the warehouse reference number, date, DC no, DC date, order reference number, order date, customer name, type of shipment and carton boxes details etc. As and when the goods are issued, the space occupied by the stock is vacated and shown as space available.
In case of Goods issued against the orders received after the product is manufactured, the order is received from a customer, products are picked up from the boxes and repacked in new boxes. Simultaneously the inventory is adjusted in the boxes from where the products are taken by using the algorithm proposed for repacking.

Products are sent on First in - First out method. Here information relating to the issue reference no, date / order reference number, order date, goods issued date, delivery challan no and date are captured as primary information. Carton box number, style number, colour, size, units of measurement and number of units stored in each carton are stored. Price is taken from the style master or order master.

With this system, the manufactures are in a position to identify the following:-

1. Value of the Physical stock available in the warehouse
2. Identify the location of the physical stock in individual pieces
3. Warehouse Space Management
4. Warehouse Space Utilization
5. Warehouse space planning

5.9.11 Warehouse Space Management Reports

Some of the reports available in the Warehouse management system module are :-

a. Warehouse Configuration
b. Warehouse Space Availability and Utilization report
c. Warehouse capacity Utilization report

d. Occupancy report Block-wise, Floor-wise and room-wise

The warehouse capacity status report depicts the capacity of the warehouse which include blocks, floors in each block and racks. Details of the report is presented in Fig 5.26.

Figure 5.26 Warehouse Space Availability report
Report showing the warehouse vacancy position is projected in Fig 5.27.

Figure 5.27 Warehouse Space Availability report - option

Report showing the vacancy in each block is projected in Fig 5.28.

Figure 5.28 Warehouse Space Availability report – Block-wise

Report showing the floor vacancy position is revealed in Fig 5.29.
Figure 5.29 Warehouse Space Availability report Floor wise

Report showing the rack-wise vacancy position is reflected in Fig 5.30.

Figure 5.30 Warehouse Space Availability report – Rack-wise

Report showing the rack wise vacancy position is presented in Fig 5.31.
Figure 5.31 Warehouse Space Availability report – Row-wise

Report showing the rack wise Carton box position is projected in Fig 5.32.
5.9.12 Stock Management Reports

This system provides a comprehensive report to identify the stock available in each warehouse, in each style, each colour, each size and in each box how many pieces are available. Details are given in Fig 5.33.

**STOCK AVAILABILITY REPORT**

<table>
<thead>
<tr>
<th>RU WAREHOUSE</th>
<th>STYLE NO</th>
<th>STYLE NAME</th>
<th>CATEGORY</th>
<th>SEASON</th>
<th>COLOR</th>
<th>SIZE</th>
<th>SIZE 2</th>
<th>SIZE 3</th>
<th>SIZE 4</th>
<th>SIZE 5</th>
<th>SIZE 6</th>
<th>SIZE 7</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AY102CARA</td>
<td>TUNIC</td>
<td>Women</td>
<td>ARY15</td>
<td>Natural</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>AY102CARA</td>
<td>TUNIC</td>
<td>Women</td>
<td>ARY15</td>
<td>Green</td>
<td>10</td>
<td>15</td>
<td>25</td>
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<td>10</td>
<td>0</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>AY102CARA</td>
<td>TUNIC</td>
<td>Women</td>
<td>ARY15</td>
<td>Nature</td>
<td>10</td>
<td>15</td>
<td>25</td>
<td>15</td>
<td>10</td>
<td>0</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>AY102CARA</td>
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<td>Women</td>
<td>ARY15</td>
<td>Green</td>
<td>10</td>
<td>15</td>
<td>25</td>
<td>15</td>
<td>10</td>
<td>0</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>AY102CARA</td>
<td>TUNIC</td>
<td>Women</td>
<td>ARY15</td>
<td>Green</td>
<td>10</td>
<td>15</td>
<td>25</td>
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<td>10</td>
<td>0</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>AY102CARA</td>
<td>TUNIC SP</td>
<td>Women</td>
<td>ARY15</td>
<td>Deep</td>
<td>Pink</td>
<td>15</td>
<td>20</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>AY102CARA</td>
<td>TUNIC SP</td>
<td>Women</td>
<td>ARY15</td>
<td>Deep</td>
<td>Yellow</td>
<td>15</td>
<td>20</td>
<td>30</td>
<td>20</td>
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<tr>
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<td>TUNIC SP</td>
<td>Women</td>
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<td>15</td>
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<td>20</td>
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<td>20</td>
<td>10</td>
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</tr>
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<td>15</td>
<td>20</td>
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<td>100</td>
</tr>
<tr>
<td>12</td>
<td>AY103LM169</td>
<td>FULL SLEEVE SHIRT</td>
<td>Men</td>
<td>ARY15</td>
<td>Deep</td>
<td>Blue</td>
<td>10</td>
<td>20</td>
<td>25</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>50</td>
</tr>
</tbody>
</table>

**Figure 5.33 Warehouse Stock availability report**

The system also provides a comprehensive report on stock available in each style. This includes number of pieces available in each colour, each size and each box. Details are available in Fig 5.34.

**STYLE WISE STOCK AVAILABILITY REPORT**

<table>
<thead>
<tr>
<th>STYLE NO</th>
<th>STYLE NAME</th>
<th>CATEGORY</th>
<th>SEASON</th>
<th>COLOR</th>
<th>SIZE</th>
<th>SIZE 2</th>
<th>SIZE 3</th>
<th>SIZE 4</th>
<th>SIZE 5</th>
<th>SIZE 6</th>
<th>SIZE 7</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Quick Silver</td>
<td>Men</td>
<td>Summer</td>
<td>Bottle Green (5555)</td>
<td>36-40-42-44-46</td>
<td>80</td>
<td>125</td>
<td>205</td>
<td>205</td>
<td>125</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>Quick Silver</td>
<td>Men</td>
<td>Summer</td>
<td>Grey (8888)</td>
<td>36-40-42-44-46</td>
<td>100</td>
<td>160</td>
<td>260</td>
<td>260</td>
<td>160</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>Quick Silver</td>
<td>Men</td>
<td>Summer</td>
<td>Navy Blue (9999)</td>
<td>36-40-42-44-46</td>
<td>100</td>
<td>160</td>
<td>260</td>
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</tr>
<tr>
<td>4</td>
<td>Quick Silver</td>
<td>Men</td>
<td>Summer</td>
<td>Sky Blue (8888)</td>
<td>36-40-42-44-46</td>
<td>90</td>
<td>135</td>
<td>225</td>
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<td>945</td>
<td>945</td>
<td>590</td>
<td>360</td>
<td>360</td>
</tr>
</tbody>
</table>

**Figure 5.34 Warehouse Stock availability report –Each Style**
The system provides a comprehensive report on Dead stock (unused Stock) stored in the warehouse for defined number of days. With this report the company can find out the stock lying in the warehouse for more than 30 days, 60 days, 90 days, 180 days and so on. This report is available for the entire warehouse and style wise also. This gives a clear picture on the value stock unused stock which will give the organization liquid cash by disposing the goods. This also provides scope for clearing the space occupied by dead stock. Details are shown in Fig 5.34

**STYLE WISE DEAD STOCK REPORT**

<table>
<thead>
<tr>
<th>SNO</th>
<th>STYLE NO</th>
<th>STYLE NAME</th>
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**STYLE WISE DEAD STOCK REPORT**

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*Figure 5.35 Warehouse Dead Stock report – Each Style*
5.9.13 Advantages of the Warehouse Management Model

Some of the advantages of using the warehouse management system are presented as follows:

- Space utilization visibility.
- Effective space management.
- Re-packing of the goods and reallocation of Goods.
- Stock availability reports.
- Dead stock identification.
- Caters retail and export market.
- Inventory management (Unit-wise)

5.10 SUMMARY

In this Chapter, framework for the add-on module for the Apparel Industry is showcased. Prototype design for cost analysis to calculate the actual cost incurred in manufacturing the garment is identified. On the other hand, the warehouse management model is showcased to point out the effective ways of managing the warehouse space and identifying the dead stock in the organisation. In order to statistically prove the proposed model on cost analysis is better than the existing model; A performance analysis is carried-out by using simple and multiple linear regression in the Chapter 6.