

Effective Cost Analysis Model For Apparel Industry

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Abstract

Cost of manufacturing a garment is dynamic as the cost is influenced by factors that are dynamic in nature. Cost of the Garment price is arrived at the time of sample development based on the prevailing cost of raw material and other overheads. Price of the garment is negotiated with the Buyers based on the price arrived at in sample development. Manufacturing cost is not always the same as predicted. Garment Industry is looking for a sustainable cost analysis solution which can provide actual cost finished goods and to identify whether the industry gained profit out of a particular style or not. Even though many products are available for analysing product cost industry in looking at a simple solution that can clearly identify profit made in each style. Therefore in this study, it is suggested to have modifications on to the existing ERP software as an add on model to cater specific requirements of the apparel industry such as Cost analysis model. This Proposed Cost analysis model can work independently as a module or it can be integrated to existing ERP application as add on module by creating an interface to existing information. This module enables the apparel industry to capture the information relating to production thus helps to compare the expenditure incurred in making each style with the order price to arrive at the actual profit made out of each style manufactured in the industry.

Keywords: Apparel Industry, **ERP implementation**, Garment Costing, , ERP plug in mode.

Introduction

In a business process every organization collects and distributes information. Information once gathered are compiled and regrouped according to the requirement. Enterprise Resource Planning provides a complete technological solution to integrate and streamline the organisation processes and ensure a smooth flow of information. It bridges the information gap across the organisation and facilitates to integrate the resources of the business. The ERP provides a solution to eliminate issues related to material management, productivity, customer service, cash flow, finance management, quality, inventory, delivery and so on.

Apparel manufacturing process is as good as any manufacturing processes such as automobile, pharmaceutical, steel manufacturing etc. Apparel Manufacturing has set of processes which are interrelated and share vital source of information from one another.

Nearly 200 apparel industries where ERP system implemented has been identified in the proportion of 50 in Chennai, 100 in Tirupur and 50 in Bangalore. The questionnaires were distributed among these industries and only 117 industries were responded. The response rate is 58.5%. Out of 117 companies 27 industries were from Bangalore, 69 industries from Tirupur and 21 industries from Chennai.

The finding analysis reveals that there is a need for an add on solution to number of issues that are not addressed by the ERP software solutions providers especially on Merchandising, Production Planning, Analytics and Business Strategy fulfillment. The ERP users were expected to have add on solutions which are plug in type that does not disturb the existing ERP solutions.

Cost of manufactured product is not always the same as it was projected at the sample level. Various factors can influence cost of manufacturing a product which is dynamic in nature. These dynamic factors can influence cost of manufacturing on a single day which can create a remarkable impact on your daily production and cost of the product. Majority of the apparel industry feel that it is essential to have modification on garment cost analysis, especially for finished products.

Therefore in this study, it is suggested to have modifications on to the existing ERP software as a plug in model to cater specific requirements of the apparel industry. They are

- Calculation of Manufacturing cost
- Cost Analysis Report

Literature Survery

Skinner (1974)¹ first suggested that the choice of competitive priorities includes cost, quality, delivery, and flexibility. Other studies (Hill, 2000;² Wheelwright and Bowen, 1996³) have since added various dimensions of competitive priorities such as service

and innovation. Price, Cost, Quality Delivery promises and flexibility are various competitive priorities that have been commonly adopted in industry (Hayes and Wheelwright, 1984; ⁴Krajewski and Ritzman, 2001⁵).

Other possible decisions of implementation practices include process standardization (Bingi et al., 1999)⁶, package customization (Glass 1998⁷; Hong and Kim, 2002⁸), degree of information sharing and centralization, accessibility to ERP information, and the degree of centralization (Markus et al., 2000⁹). Those are practices believed to be critical the success of implementation (Jacobs and Bendoly, 2003¹⁰).

Cost Analysis System For Finished Goods

Garment cost plays pivotal role in determining organisations existence. Calculating the Total investment made on manufacturing a Garment is called Garment manufacturing cost. Cost of manufacturing is arrived at the times of sample development with numbers which are arrived at with general manufacturing parameters such as raw material cost (fabric, trims, accessories), Manufacturing over heads(Processing, finishing, packing) , administrative over heads, cost of shipping and the profit. Generally cost is projected on prevailing market prices of the raw material and overheads which are based on experience. 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.

There are more factors that influence Garment Manufacturing cost which are Yarn Cost, Knitting or weaving cost, cost of dyeing, finishing cost, cutting cost, sewing cost, printing cost, direct and indirect labour cost, factory over heads, Sales over heads, shipping and transport, profit etc. Most of the cost is fluctuating like yarn price, Power consumption influence waving and knitting, Factory over heads, availability of labour determines labour overhead, Change in fuel price and mode of shipment changes.

Industry finds it extremely difficult to identify and arrive at exact profit made from a particular order or style. In order to identify the actual manufacturing cost and compare it with the cost projected and identify the areas which exceeded the cost projected for each order and style.

Even though many products are available in the industry to analyze manufacturing cost, a simple solution is expected by the industry to analyse the exact amount spent on manufacturing the product. Industry looks at a solution to find the actual profit made out of each order and Style.

Process Flow Diagram for Garment Cost Analysis System






The Garment Cost Analysis System of process comprises of five level processes. They are

- Master Data
 - Woven Fabric
 - Knitted Fabric

- Trims and Accessories
- Colour
- Employee Designation and Cost
- Style Data
 - Fabric
 - Trims
 - Colour
 - Size
 - Garment Costing
- Daily production information updation
- Actual cost updation / calculation

Company can use this product for woven and knit products and combination of both. Primarily the master information's are captured in the system such as Fabric [Woven / Knitted], Trims and Accessories, Colours used and style information.

Fabric Master List

Fabric Code	Name	Fabric Type	Count	Construction	Dyeing Type	Printing Type	Finishing Type	Width(in inches)	Rate	Updated Date	Status	
<input type="checkbox"/> Denim02	Denim	Woven	40s	62X38	Yarn Dye	NA	Denim	48	210.00	02-04-2014	ACTIVE	
<input type="checkbox"/> Fab001	Shirting	Woven	40s	2X40	Yarn Dye	NA	NA	36	90.00	02-04-2014	ACTIVE	
<input type="checkbox"/> Fab002	Shirting	Woven	40s	2X40	Yarn Dye	NA	NA	36	85.00	02-04-2014	ACTIVE	
<input type="checkbox"/> Fab03	Polyester Crepe	Woven	40s	2X40	Yarn Dye	NA	Silk	48	125.00	01-04-2014	ACTIVE	
<input type="checkbox"/> Den001	Denim001	Woven	30s	62 X 38	Yarn Dye	NA	Denim	48	230.00	02-04-2014	ACTIVE	

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








Figure 2: Cost Analysis System process flow diagram – Woven Fabric Master

Knitted Fabric List

Fabric Code	GSM	Width	Yarn Price	Knitting Charges	Greige Cost	Dye Cost	Weight Cost	Fleeco/Peach	Print Loss	Yarn Margin	Dye Fab Cost	
<input type="checkbox"/> SJ001	180	20.00	180.00	12.00	192.00	5.00	3.94	0.00	3.94	10.24	409.76	
<input type="checkbox"/> DJ001	200	32	160.00	12.00	172.00	12.00	3.68	3.68	3.68	9.75	390.08	

Figure 3: Cost Analysis System process flow diagram – Knitted Fabric Master













Trim Detail List

Trim Code	Trim Name	Make	Trim Type	Updated Date	Status	
<input type="checkbox"/> BUT004	BUTTON	PLASTIC	BUTTON	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> BUT005	BUTTON	PLASTIC	BUTTON	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> BUT001	BUTTON	PLASTIC	BUTTON	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> BUT003	BUTTON	PLASTIC	BUTTON	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> BT002	BUTTON	JACKS	BUTTON	2/4/2014 12:00:00 AM	STATUS	
<input type="checkbox"/> ZIP01	ZIPPER	CHAINA	ZIPPER	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> ZIP02	ZIPPER	CHAINA	ZIPPER	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> ZIP03	ZIPPER	CHAINA	ZIPPER	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> ZIP04	ZIPPER	CHAINA	ZIPPER	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> ZIP05	ZIPPER	CHAINA	ZIPPER	4/1/2014 12:00:00 AM	ACTIVE	
<input type="checkbox"/> T0101	ZIPPERS	YENKE	ZIP	9/9/2014 12:00:00 AM	ACTIVE	

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Figure 4: Cost Analysis System process flow diagram – Trims and Accessories Master

Color List

Color Code	Name	Partno	Updated Date	Status	
<input type="checkbox"/> BL001	BLUE	003399	02-04-2014	ACTIVE	
<input type="checkbox"/> BL002	DEEP BLUE	0033FF	02-04-2014	ACTIVE	
<input type="checkbox"/> GR01	GREEN	008033	02-04-2014	ACTIVE	
<input type="checkbox"/> GR002	BOTTLE GREEN	008000	02-04-2014	ACTIVE	
<input type="checkbox"/> RED01	RED	CC0033	02-04-2014	ACTIVE	
<input type="checkbox"/> NAV01	NAVY BLUE	000080	02-04-2014	ACTIVE	
<input type="checkbox"/> PK01	PINK	FF33CC	01-04-2014	ACTIVE	
<input type="checkbox"/> OR01	ORANGE	FF8000	01-04-2014	ACTIVE	
<input type="checkbox"/> GRE01	GREY	CCCCCC	02-04-2014	ACTIVE	
<input type="checkbox"/> WH01	WHITE	FFFFFF	01-04-2014	ACTIVE	
<input type="checkbox"/> BLA01	BLACK	000000	02-04-2014	ACTIVE	
<input type="checkbox"/> SKY01	SKY BLUE	00CCFF	18-06-2014	ACTIVE	

ADD DELETE EDIT

Figure 5: Cost Analysis System process flow diagram – Colours Master

Style Details

STYLE DETAILS | FABRIC DETAILS | TRIMS AND ACCESSORIES | COLOR SHEET | SIZE DETAILS | GARMENT COSTING SHEET

STYLE DETAILS

Style No:

Description:

Date:

Season:

Country:

Age Group:

Classification:

Type:

Style Image(Front): No file chosen

Style Image(Back): No file chosen

Designer:

Fitting:




Fabric [Woven / Knitted] Consumption Details

STYLE DETAILS | FABRIC DETAILS | TRIMS AND ACCESSORIES | COLOR SHEET | SIZE DETAILS | GARMENT COSTING SHEET

Fabric Details

Fabric Type: Fabric:
 Consumption: Amount:

	sno	style_no	fabric_type	fabi_code	rate	consumption	amt	
Update	Delete	1	KID002	Kot	DJ001	380.08	0.80	234.05
Total :							234.05	

[Next](#) [Save](#)

Trims and Accessories consumption details

STYLE DETAILS | FABRIC DETAILS | TRIMS AND ACCESSORIES | COLOR SHEET | SIZE DETAILS | GARMENT COSTING SHEET

Trims And Accessories

Trims: Material Type: Uom: Rate: Required units: Amount:

	sno	style_no	trim_code	trim_type	rate	req_unit	amt	
Update	Delete	1	KID002	ZIP01	ZIPPER	0.00	1.00	0.00
Update	Delete	2	KID002	BUT004	BUTTON	15.00	1.00	15.00
Total :							21.00	

[Next](#) [Save](#)

Colour Specification

STYLE DETAILS | FABRIC DETAILS | TRIMS AND ACCESSORIES | COLOR SHEET | SIZE DETAILS | GARMENT COSTING SHEET

Color Specification

Color Code: Color Name:
 Pantone: Color Chip:

	sno	col_code	style_no	name	pantone
Update	Delete	1	GR001	ORANGE	FF6600
Update	Delete	2	BL002	DEEP BLUE	0033FF
Update	Delete	3	WH01	WHITE	FFFFFF
Update	Delete	4	GR002	BOTTLE GREEN	008000
Update	Delete	5	GRE01	GREY	CCCCCC

[Next](#) [Save](#)

Size specification details

STYLE DETAILS | FABRIC DETAILS | TRIMS AND ACCESSORIES | COLOR SHEET | SIZE DETAILS | GARMENT COSTING SHEET

Size Details

Size Code:
 Type:
 S1:
 S2:
 S3:
 S4:
 S5:
 S6:
 S7:

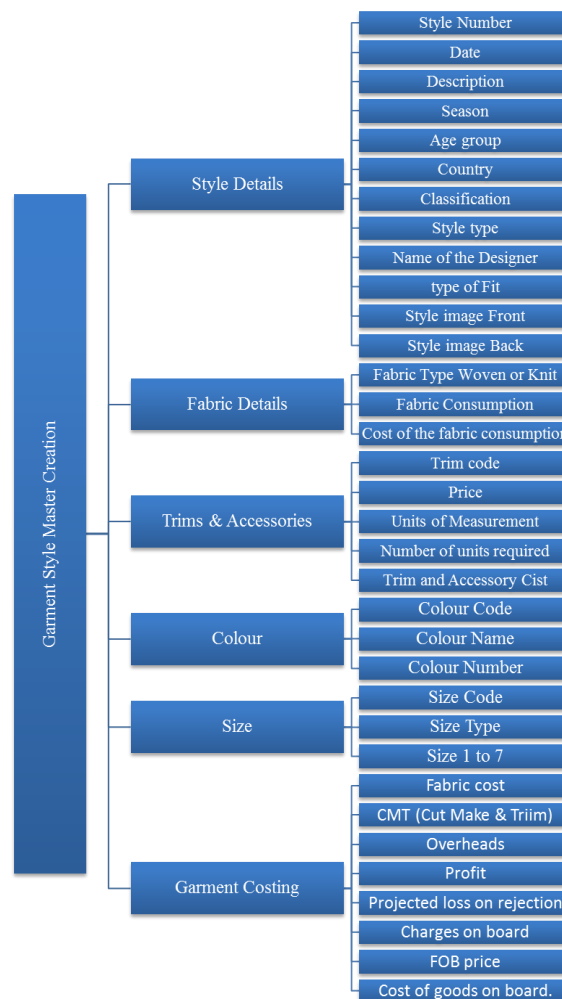
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Garment Costing

GARMENT COST SHEET			
Fabric Cost			224.05
CMTD Charges			
Stitching:	10.00		
Cutting:	2.00		
Finishing:	8.00		
Packaging:	8.00		
Embellishment:	2.00		
Trims	21.00		
Sub Total			90.00
Overhead cost:	0.00	%	10.00
Margin(after overhead)	0.00	%	12.00
Rejection	0.00	%	10
Charges for On Board			5.00
Total price of a apparel:			394.18
FOB price : Rupee		Rate : 1.00	INR 394.18
Internal Price FOB			394.18

Figure 6: Cost Analysis System process flow diagram – Style Master

Process Flow Diagram for Garment Cost analysis



Garment style master information is created with information relating to style such as Fabric used, Trims and accessories, Colours size and cost of the garment derived from materials used.

- Woven Fabric Master :- To store information relating woven fabric such as Fabric Code, Name of the Fabric, Count, Construction, Dyeing, Printing, Finishing, width of the fabric and rate. There is a provision to store the fabric swatch in the form.
- Knitted fabric master : - To store information relating Cost of Knitted fabric such as Fabric Code, Name of the Fabric, GSM, Width, Yarn price, knitting charges, average dyeing cost, weight loss on dyed fabric, fleece brushing charges, loss incurred in printing and interest on yarn price helps to arrive at dyed fabric cost. There is a provision to store the fabric swatch in the form.
- Trims and Accessories Master: - This form has a provision to upload information relating to trims and accessories. Information relating to trims such as Trim code, type of trim, Name of Trim, Make, Unit of measurement, rate and the image of the trim.
- Colour Master: - This form stores information relating to the colours which include colour code, name of the colour and Colour picker option to store colour with colour number.
- Style Master: - A style master Stores information about Style Details, Fabric Details, Trims and Accessories details, Colour Details, stores information about the size and style costing. Information stored in each of these heads are mentioned below.
 - ✓ Style Master :- This form captures information about 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 this form also stores Style image with Front and Back
 - ✓ Fabric Details: - This form captures information about the fabric used in the style. Details of the fabric such as Woven or knits is obtained based on this the data is obtained from woven fabric and knit fabric tables. Once the Fabric is chosen the cost of the Fabric comes from the Fabric master. As the Consumption details are entered the cost of fabric appears on the screen. There is a provision to use number of fabrics for the same style.
 - ✓ Trims and Accessories Details :- This form captures 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. Once number of units required for one garment is entered the price appears automatically. We can use number of trims and accessories for one Style.
 - ✓ Colour Sheet Details: - In this form information relating to colour way is stored. Provision to store number of colours is available in the

- system. It displays colour code, Colour number and displays the colour.
- ✓ Size Details :- This form stores information about the size details of the garment such as size code, size type (numeric / alphabetic) and the sizes.
 - ✓ Garment Costing Sheet:- Cost of Making a garment is calculated based on the projected Fabric cost, CMT(cut, make and trim) which include Stitching, Cutting, Finishing, Packaging, Embellishment, Trims. Other overheads such as administrative and factory over heads, Profit, projected loss on rejection, and charges on board are added as %, Profit. FOB price is defined a US\$, Euro, Pounds and Rupee with conversion rate to arrive at cost of goods on board.

Process

Daily production details: Manufacturing cost is arrived from daily production cost and the material cost incurred in manufacturing and other overheads. Daily production cost of a style is captured from number of employees involved in making the product on a particular day in a particular line in a factory.

Designation List captures data relating to the cost manpower used in manufacturing and the cost per day per line is stored. In case the company wants to incorporate other costs involved in running the particular line such as electricity consumption, administrative over heads etc.

Designation List

SNO	Designation	Daily Rate (Per Line)	OT Rate Per Hr.	Remarks	Status
1	General Manager	1000.00	50.00		A
2	Production Manager	750.00	50.00		A
3	Floor Incharge	600.00	50.00		A
4	Line eSupervisor	410.00	50.00		A
5	QA Manager	410.00	50.00		A

ADD DELETE EDIT

In daily production cost sheet number of employees used in manufacturing in each scale is captured.

Daily Production Cost Sheet

Designation: Sewing Machine Operators

No of employee used: 6

Daily Rate: 200.00

Total Salary: 1200.00

Overtime Rate: 40.00

Overtime in Hours: 0

Overtime Salary: 0.00

Net Salary: 1200.00

Update Cancel

Manufacturing cost is arrived from daily production cost and the material cost incurred in manufacturing and other overheads. Daily production cost of a style is captured from number of employees involved in making the product on a particular day in a particular line in a factory.

Daily Production Cost Sheet

Style: Kids Casual
 Factory: Warsaw Internationak
 Line No: Line-1
 Production Date: 07/10/2014
 Production (in pcs): 1000

ADD

SNO	DESIGNATION	NO OF EMPLOYEES	DAILY RATE	TOTAL SALARY	OVERTIME(HRS)	OVERTIME RATE	OVERTIME TOTAL SALARY	NET SALARY
1	General Manager	1	1000	1000	0	50	0	1000
2	Helpers	2	172	344	0	50	0	344
3	Press Man	1	200	200	0	50	0	200
4	Line Supervisor	1	410	410	0	50	0	410
5	Quality Checker	2	200	400	0	50	0	400
6	Sewing Machine Operators	6	200	1200	0	40	0	1200

Total no of employees used: 13
 Total Salary Amount: 3554.00
 Total Over time (Hours): 0.00
 Total Over time Salary: 0.00
 Net Amount: 3554.00 **CALCULATE**

Submit

Figure 7: Cost Analysis System process flow diagram – Daily Production Details

Actual information relating to production is captured such as actual fabric, trims and accessories consumed in manufacturing a style, cost of the fabric, trims and accessories are updated here. As the calculate button is pressed the manufacturing cost is updated from the daily production details along with number of pieces manufactured in the style

Actual Production Cost

Style Code: KID002

Fabric Code	Fabric	Rate	Consumption	Actual Cost	Actual Consumption	Total Cost
DJ001	Knit	390.08	0.60	0.00	0.00	0.00

Trim code	Trims	Rate	Requirement	Actual Cost	Actual Requirement	Total Cost
ZIP01	ZIPPER	6.00	1.00	0.00	0.00	0.00
BUT004	BUTTON	15.00	1.00	0.00	0.00	0.00

Calculate Profit

Fabric Cost :	<input type="text" value="234"/>
Trims Cost :	<input type="text" value="13.5"/>
Number of pieces :	<input type="text" value="2400"/>
Manufactured Cost (per piece) :	<input type="text" value="002.81"/>
Margin (%) :	<input type="text" value="0.00"/> <input type="text" value="0.00"/>
Rejection(%) :	<input type="text" value="0.00"/> <input type="text" value="0.00"/>
Charges on board :	<input type="text" value="0.00"/>
Total Cost(per piece) :	<input type="text" value="253.12"/>
Estimated cost :	<input type="text" value="234.05"/>
Profit/Loss :	<input type="text" value="19.07"/>
Production Completed Status :	<input type="text" value="-Select-"/>
Date Of Completion :	<input type="text"/>

Figure 8: Cost Analysis System process flow diagram – Daily Production Update

Information relating to Percentage of Margin, rejection has to be updated along with charges on board. Information relating to production completion status and date of completion has to be updated. Actual cost project is shown and system shows whether the organization made profit or loss in that particular style.

Daily Production Cost Sheet

SNO	STYLE	FACTORY	LINE NO	PRODUCTION DATE	PRODUCTION (PCS)	TOTAL EMPLOYEE USED	TOTAL NET SALARY	REMARKS	
<input type="checkbox"/>	1	Kids Casual	Warsaw Internatonak	Line-1	01/10/2014	1000	10	3172.00	Summer collection
<input type="checkbox"/>	2	Kids Casual	Warsaw Internatonak	Line-1	03/10/2014	1000	10	3172.00	Summer collection
<input type="checkbox"/>	3	Kids Casual	Warsaw Internatonak	Line-1	07/10/2014	1000	13	3554.00	
<input type="checkbox"/>	4	Kids Casual Girls	Warsaw Internatonak	Line-2	01/10/2014	1200	11	3372.00	Summer Girls
<input type="checkbox"/>	5	Kids Casual Girls	Warsaw Internatonak	Line-2	03/10/2014	1200	11	3372.00	Summer Collection Girls
<input type="checkbox"/>	6	Party Wear	NEELANKARAI FACTORY	Line-1	06/10/2014	500	9	2544.00	
<input type="checkbox"/>	7	Party Wear	NEELANKARAI FACTORY	Line-1	07/10/2014	500	11	3372.00	
<input type="checkbox"/>	8	Party Wear	NEELANKARAI FACTORY	Line-1	08/10/2014	500	11	3372.00	

Daily Production Report

From Date: To:

Select by:

SNO	Style No	Factory	Line	Production Date	Quantity Produced	Total Employees	Total Salary	Total O/T(hrs.)	Total Net salary	Remarks
1	SA10101	NEELANKARAI FACTORY	Line-1	10/7/2014	500	11	3372.00	0.00	3372.00	
2	SA10101	NEELANKARAI FACTORY	Line-1	10/8/2014	500	11	3372.00	0.00	3372.00	
3	SA10101	NEELANKARAI FACTORY	Line-1	10/6/2014	500	9	2544.00	0.00	2544.00	
8	KID001	Warsaw Internatonak	Line-1	10/7/2014	1000	13	3554.00	0.00	3554.00	
4	KID001	Warsaw Internatonak	Line-1	10/1/2014	1000	10	3172.00	0.00	3172.00	Summer collection
5	KID001	Warsaw Internatonak	Line-1	10/3/2014	1000	10	3172.00	0.00	3172.00	Summer collection
6	KID002	Warsaw Internatonak	Line-2	10/1/2014	1200	11	3372.00	0.00	3372.00	Summer Girls
7	KID002	Warsaw Internatonak	Line-2	10/3/2014	1200	11	3372.00	0.00	3372.00	Summer Collection Girls

Figure 9: Cost Analysis System process flow diagram – Daily Production Report

System Test For Warehouse Management Model

This plug in model were implemented in few real time situation and has given satisfactory output to the expectations of the Apparel Industry. The plug in model the following hardness test has also been considered while implementation.

- CPU TEST
- Memory Test
- Disk Space Test
- Network Test

CPU TEST: CPU test was undertaken and the output screen shot is shown below

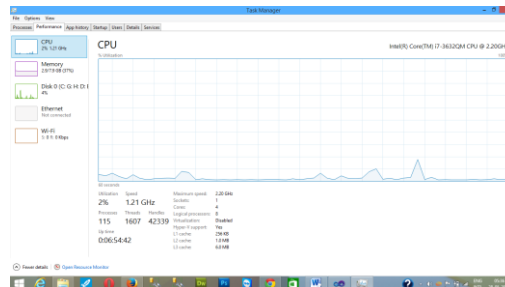


Figure 9 CPU Test

CPU memory utilisation is 2%, Speed is 1.21 GHz, Process 115 Thread 1607. Uptime is 0.065442

MEMORY TEST: Memory test was undertaken and the output screen shot is shown below.

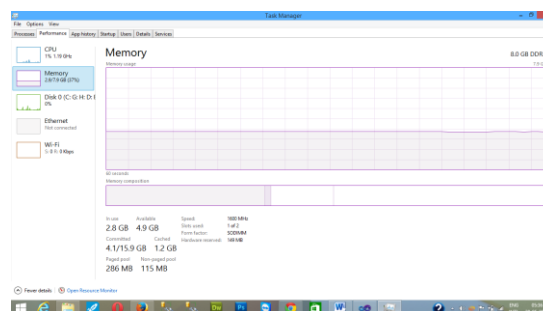


Figure 10: Memory test

Memory usage 2.8 GB , Committed 4.1 GB, Cache 1.2 GB Paged Pool 286 MB

DISK SPACE TEST: Disk space test was carried out and the output screen is shown below.

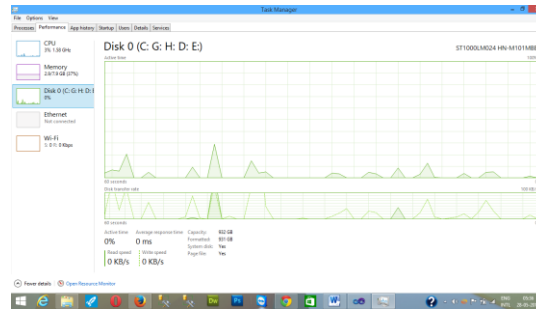


Figure 11: Disk Space Test

NETWORK TEST: Network test was carried out and the output screen is shown below.

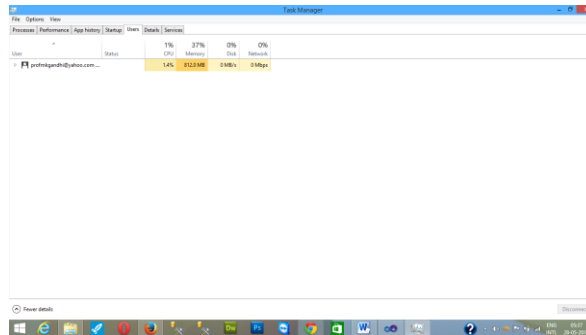


Figure 11: Network Test

Conclusions

This add on plug in model effectively helps the organization to calculate the exact profit made out of each style. This add on model can be attached to any ERP software that are running in the system without making any change in the existing ERP software used in the Apparel industry.

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