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Appendix A

A- Feasibility study

A.1 Economic feasibility

Hardware Requirement

- Two new pc's with following features
- P IV machine, speed 2,8 GHz, 1 GB Ram, 80 GB Hard Disk
- 2 hand held scanners
- 20 IP scanners
- 20 Display boards (Can be use existing display boards)
- 1 Network Switch
- 1 Application Server with O/S (Can use existing application server in the Contourline)
- 1 Bar Code Printer

Software requirement

- JDK 1.5
- SQL Server 2000 (Can use existing licensed copy)
- JCO connector (Can download as open source)
- JDBC-ODBC connection (provided free of charge)

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Task WWW.l1b.mrt.ac.l	Days	Daily rate/Rs	Cost/Rs	
Requirement definition	25	2,000.00	50,000.00	
System & Software design	30	4,000.00	120,000.00	
Implementation & unit testing	30	5,000.00	150,000.00	
System integration & testing	20	5,000.00	100,000.00	
System installation	10	3,000.00	30,000.00	
User training	7	2,000.00	14,000.00	
Total Hardware Cost			464,000.00	
• Two pc's				
HP machines with license	Rs 6500	00.00 X 2	= Rs.130,00	0.00
• 2 Hand held Scanners	Rs. 3	30,000 X 2	= Rs. 60,000	.00
• 20 IP Scanners	Rs. 4	40,000 X 20	= Rs.800,000	.00
• 1 Network Switch	Rs. (65,000 X 1	= Rs. 65,000	.00
• 1 Bar Code Printer Rs. 125,000 X 1		125,000 X 1	= Rs.125,000	.00
Total Cost			,	

Rs.1,180,000.00 (one million and fifty five thousand LKR only)

A.2 Technical feasibility

- o Java All developers has the knowledge in development
- SAP All developers has the knowledge in development

A.3 Legal feasibility

Company is having SQL server 2000 licensed version. All the other software using to the projects are open source.

A.4 Alternative feasibility

In MAS Active current production confirmation system operates by confirming Line IN/OUT bundles. Bundle may contain 10~20 pieces of garments. So the confirmation process tracks the bundle in/out by scanning each bundle ID (Barcode). By thinning the size of bundle we can get close to track single peace flow.

Disadvantages of using existing production confirmation system:

- It generate huge no of bundle IDs (Barcodes) and required to confirm operation 10 and 20 (Line In/Out) for each bundle.
- That will generate huge burden to current SAP system and printing barcodes for each garment is no way benefited in terms of cost.
- Needs lot of man hours to generate, print barcodes.
- Adds unnecessary sorting, handling and movements due to barcodes.
- Cost of printing and maintenance of barcode printers will goes up
- Gathers unnecessary records directly in SAP system.
- Need more resources than existing process. anka
- No way of locating issues with in the bundles and alarm system for

issues www.lib.mrt.ac.lk

Advantaged

• Tested and proven system.

Cost benefit and analysis

- Enables to find the real production process in Contourline
- More specific reports can be generated for the user levels.
- Sophisticated decision making ability due to correct and sensitive data
- Remove the staff from report generation and use them in a productive work.
- Reduce manual data entry work

Appendix B

B-Existing system use cases and descriptors

B.1 Use cases

B.1.1 Bundle guide creation



Figure B.1 Bundle guide creation current system.

B.1.2 Material requisition/ Picklist generation



Figure B.2 Material requisition current system

B.1.3 Sewing /Packing RM issue



Figure B.3 Sewing / Packing RM issue current system

B.1.4 Lien In confirmation



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B.1.5 Line out confirmation



Figure B.5 Line out confirmation current system

B-2 Use case descriptors

B.2.1 Bundle guide creation use case descriptor

Name	1. Bundle Guide Creation(Sewing Production Order)
Actor	Plant Planner, Stores Officers
Pre-Condition	Cut Fabric + RM has been received to plant according to
	Cut docket/Requirement
	Line wise daily requirement should be pre identified
Post-Condition	Bundle Guide should be generated
Flow	Plant Planner Creates Bundle Guide Base on Cut Docket
	,Production Capacity and daily requirement for the
	respective Sewing Modules
Exception	

Table B.1 Bundle guide creation use case descriptor

Name	2. Material Requisition/Picklist Generation
Actor	Plant Planner/Merchant, Stores Officer
Pre-Condition	Valid Bundle Guide
	RM has to be in-house
Post-Condition	A material Requisition with all the sewing/packing
	materials and quantities required for the order
Flow	Against the bundle guide (production order) Merchant
	generates the bundle guide.
	During the generation period he disregards and removes
	all general items.
	And if there are alterations happens and which are not
	maintain in the BOM he alters those materials in MR
	Save the MR
Exception	

B.2.2 Material Requisition /Picklist generation use case descriptor

Table B.2 Material requisition/ Picklist generation use case descriptor

Name	3. Sewing / Packing RM Issue
Actor	Stores officer
Pre-Condition Unit	A valid Material Requisition Lanka
(G) Flee	No Sewing/Packing RM issues happens against the same
Lice	Bundle Guide (Sewing Production Order)
Post-Condition	All the materials in Material Requisition should be issued
	against the Sewing Production Order (Bundle Guide)
Flow	Stores officer receiving the Material Requisition
	Stores officer then check the availability of all the
	materials in MR
	Then issues all the sewing and packing materials against
	the MR (Sewing Production Order)
Exception	If there is a any shortage of a any material he does not
	issue single material from the Material Requisitions.

B.2.3 Sewing / Packing RM isuee case descriptor

Table B.3 Sewing / Packing RM Issue use case descriptor

Name	4. Line In Confirmation
Actor	Line In Recorder
Pre-Condition	A valid Bundle Guide
	All the RM has to be issued against the Material
	Requisition
	This bundle guide (Sewing Production Order) has not
	been confirmed for Line In operation
Post-Condition	Full quantity of the bundle guide has to be confirmed as
	Operation Line In
Flow	Line In Recorder enters the bundle guide No (Sewing
	Production Order) to the system.
	Confirm the whole quantity for the Line In operation
	against the allocated sewing line.
Exception	

B.2.4 Line In confirmation use case descriptor

Table B.4 Sewing / Packing RM Issue use case descriptor

Name [Univ	5. Line Out Confirmation Tri Lanka
Actor	Flect	Line Out Recorder
Pre-Condition	1000	Line In operation should have been done for the bundle
	NWN	guide (Sewing Production Order)
		Total quantity of Line Outs should be less than Line In
		quantity
Post-Condition		Line Out operation for the bundle guide (Sewing
		Production Order) has to be confirmed.
Flow		Line Out Confirmation for good garments against the
		bundle guide (Sewing Production Order)
Exception		When there are rejects it should also confirmed as rejects
		against the bundle guide (Sewing Production Order)

B.2.5 Line out confirmation use case descriptor

Table B.5 Line out confirmation use case descriptor

Appendix C

C- Proposed system use cases and descriptors

C.1 Use case diagrams for the proposed system



C.1.1 Bundle guide maintenance use case

Figure C.1 Bundle guide maintenance use case

C.1.2 Bar code creation and UPC assignment use case



Figure C.2 Bar code creation and UPC assignment use case

C.1.3 Line in confirmation use case



Figure C.3 Line in confirmation use case

C.1.4 Line out confirmation use case



Figure C.4 Line out confirmation use case

C.1.5 Reject update use case



Figure C.5 Reject update use case

C.2 Use case descriptors for the proposed system

Name	1. Bundle Guide Creation
Actor	Production Planner, Stores Officers, Plant Recorder, SAP
	System
Pre-Condition	Cut Fabric + RM have been received to plant according
	to Requirement
	Line wise daily requirement should be pre identified.
	Sewing Module wise efficiency should be considered.
	Sewing Production Order and Packing Production Order
	has to be created
	Material Requisition can only be generated after the
	respective Bundle Guide is Created.
	Material Requisition can only edited before the bundle
	guide is confirmed for the Line In Operation
Post-Condition	Bundle Guide should be generated
	Material Requisition should be generated based on
	Bundle Guide.
Flow	1. Insert Sales order and Line Item by Production
	Planner.
Univ	2. System will display created Sewing and Packing
(E) Flee	Production orders.
LICC	3. Prod. Planner selects both Sewing and Packing Orders.
www	4. Base on the Sewing Production Order System display
	size wise order break down.
	5. Size wise quantities are adjusted if required Cannot
	exceed the given quantities.
	6 Key in Sewing Module No
	7.Save
	8. System Generates and display the Bundle Guide No
	9. Bundle Guide No has to be insert to Create the
	Material Requisition
	10. Created Material Requisition can be edited if the
	relevant bundle is not confirmed for the Line In
	Operation.
Exception	

C.2.1. Bundle guide creation

ExceptionTable C.1 Bundle guide creation

Name	2. Bar Code creation and UPC sticker Assignment
Actor	Plant Recorder, SAP System
Pre-Condition	Valid Bundle Guide
	All the UPC stickers has to be in-house
	UPC stickers have not been introduced for the Sales
	Order by this time
Post-Condition	Valid Line In Bar Code Sticker
	System can identify relevant UPC Stickers for the Sales
	Order Line Item
Flow	For Bar Code Generation
	1. Insert the Bundle guide No
	2. System should display the content of Sticker
	3. Print the Sticker
	For UPC stickers
	1. Input the Sales Order and Line Item
	2. Display all sizes and UPC (if already been Assigned)
	for the Sales Order Line Item
	3. For the sizes that doesn't have UPC codes, UPC
	stickers has to be updated
	4. Save.
Examples	

C.2.2 Bar code creation & UPC assignment

 Exception

 Table C.2 Bar code creation rsity of Moratuwa, Sri Lanka.

C 2 31	ine in	confirmation	
U.4.J	ыне ш	commination	

Name	3. Line In Confirmation
Actor	Line In Recorder, SAP System
Pre-Condition	A valid Bundle Guide
	All the RM's and semi finished goods has to be in-house.
	Line In Bar Code generated from Bundle Guide.
Post-Condition	All the materials in Material Requisition should be issued
	against the Sewing Production Order (Bundle Guide)
	Full quantity of the bundle guide has to be confirmed as
	Operation Line In.
	Display Boards should be updated with Line in quantities.
Flow	1. Scan the Bundle guide Bar Code Sticker.
	2. It picks the Sales Order, Line Item, Sewing Order,
	Sewing Modules and size wise Line In Quantities.
	3. Save and confirm the Line In.
	4.Automatically issue all the sewing RM's
	5. Update Display Boards with Cumulative qty for each
	Sewing module.
Exception	

Table C.3 Line in Confirmation

C.2.4 Line out confirmation

Name	4. Line Out Confirmation
Actor	Line Out Recorder, SAP System, Schedule Uploader
Pre-Condition	Line In operation should have been done for the bundle
	guide (Sewing Production Order)
	Total quantity of Line Outs should be less than Line In quantity
Post-Condition	Line Out operation for the bundle guide (Sewing
	Production Order) has to be confirmed.
	All the Packing RM's has to be issued against Bundle
	Guide
	Display Boards should be updated with Line out
	quantities.
Flow	1. IP Scanners Read the UPC stickers and write it to a
	Line Out Entry table with UPC code Scanner IP and
	system date/time.
	2. Read entries from Line Out Entry table according to
	schedule
	3. Schedule uploads to SAP after sort & club records in
	Line Out entry table.
	4. SAP records upload data and save to the Upload table.
	5. Pick available Bundle Guides and Confirms the Line
	Out for the bundle guide Sewing Order
	6. Packing RM's are issued for the Packing Order in
	Electronic Lines & Dissidiations with the original
and the second	7. Display Boards should be update with Line Out
Exception	If any error accurs in schedule unload then the date will
Exception	If any error occurs in schedule upload then the data will be leaged for post inspection
	be logged for post inspection

Table C.4 Line out confirmation

Name	5. Rejects Confirmation
Actor	Rejects Recorder, SAP System
Pre-Condition	A valid Bundle Guide
	Module wise Reject garments
Post-Condition	Rejects has to be uploaded against the Bundle guide
Flow	1. Recorder has to insert the UPC code and module.
	2.System load the available bundle guide
	3. Check the bundle guide validity
	4. Then insert the size wise rejects with reject types
	5. Save.
Exception	

Table C.5 Reject confirmation

Appendix D

D- Proposed system activity diagrams

D.1 Activity diagrams for the proposed system.

D.1.1 Bundle guide creation activity diagram



Figure D.1 Bundle guide creation activity diagram new system



D.1.2 Bar code creation & UPC assignment activity diagram.

Figure D.2 Bar code creation and UPC assignment activity diagram



D.1.3 Line In confirmation activity diagram.

Figure D.3 Line In confirmation activity diagram



D.1.4 Line Out confirmation activity diagram.

Figure D.4 Line Out confirmation activity diagram

D.1.5 Reject confirmation activity diagram.



Figure D.5 Reject confirmation activity diagram

Appendix E

E- Test cases

E.1 Material Requisition and UPC assignment

Test Case ID		2			
Tested Component		Material Requisition & UPC assignment			
Teste	ed Area	Functionality			
Purp	ose	Maintain the materials to be selected to Material Requisition (MR) and UPC stickers introduce to system for sizes.			
Prere	equisites	Valid Bundle Guide All the UPC stickers has to be in-house UPC stickers have not been introduced for the Sales Order by this time			
	— ~	Test Case Descrip	otion	D 1	
No.	Test Case	Test data	Expected output	Result	
1	Load RM's and sizes Insert sales order, line item Press enter Universi	Sales order: 40677 Line item :10	All the RM's & description to be load to the left hand side list. All the sizes to be load to the right hand side list	Pass	
2	Check Left hand side list for RM's to be picked for material requisition(MR) As default all the RM's are selected. If wants to omit particular RM have to unclick the check box against material	ic Theses & D mrt.ac.lk	Sociations Then the check box will appear without mark sign	Pass	
3	In right hand side table Update the UPC stickers Place the cursor in the text box in front of the size and scan or key the UPC sticker	Size M : 826218908279 Size XL: 826218910869 Size S: 826218907951 Size XXL: 826218910876	UPC sticker should match with the size in the screen. Then the UPC code should display against the size	Pass	
4	Save		Press save button. Save message comes in the bottom of the screen.	Pass	
	Test Results :		Pass		

Table E.1 Material requisition and UPC assignment test case.

E-2 Line In test Case

Test	Case ID	3		
Teste	ed Component	Line In operation		
Teste	ed Area	Functionality		
Purp	ose	Line In confirmati	on by recording the bar code	
Prere	equisites	A valid Bundle Gu All the RM's and s Line In Bar Code g	iide semi finished goods has to be in-h generated from Bundle Guide.	ouse.
		Test Case Description		
No.	Test Case	Test data	Expected output	Result
1	Scan the Line In bar code	Barcode : 04067701000110	System will picked sales order, line item and sewing plant	Pass
2	Save		System gives the successfully save message in the bottom of the screen	Pass
	Test Results :		Pass	

Table E.2 Line in test case

E-3 Reject update. Theses & Dissertations

Test	Case ID	4		
Tested Component Rejects confirmation				
Teste	ed Area	Functionality		
Purp	ose	To update and con process	firmed the rejects found in the se	wing
Prere	equisites	A valid Bundle Gu Module wise Reje	iide ct garments	
	- ~	Test Case Descript		
No.	Test Case	Test data	Expected output	Result
1	Give the Module No which reject found Scan the UPC in reject garment Select the reject type form the list	UPC id : 826218908279 Module : SLK 07 and press Enter key	System will load the sales order, line item size, UPC code, material to the	Pass
2	Reject type	Reject type : 'SEW' from the drop down list in	Display the selected reject type in the same line where UPC code display	Pass

		the 6 th column in the table		
3	SAVE : Press save button		Display the successful save of the reject in message in the bottom of screen	Pass
	Test Results :		Pass	

Table E.3 Reject confirmation test case



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Appendix F

F- Data dictionary

Term	Abbreviations	Meaning
Sales Order	Sal. Ord	Sales Order is the word use in SAP in
		handling specific customer order
Line Item	LI,	In a one sales order there can be several
		combinations of colors and so on
Production Order	Prd. ord	The unit which SAP use to pass the
		demand to a specific operation
Bundle	Bnd.	After fabric cut they are packed in to
		10~15 packs contains all the components
		required to create garment
UPC sticker	UPC	All the NIKE garments contains UPC
	iversity of Mor	sticker. It is unique for a sal.ord /line item/size
MOS WI	vw.lib.mrt.ac.lk	Mass Operating system
Line In		Fabric cuts insert into sewing operation
Line Out		Stitched/ packed garments are falls out of
		production
Material Requisition	MR	List of Row materials and required
		quantities for particular operation
Raw Material	RM	

Appendix G

G- MOS/TPS Concepts Overview

What is lean?

"It is an embedded culture of understanding the customer's needs, continually striving to reduce waste and optimising the performance of process, people and infrastructure."

- Improves business performance using simple, practical tools and techniques to enhance quality, cost, delivery and people contribution.
- Exposes the wastes in the system
- People have to change their long standing work practices and ideas
- Senior management will have to drive lean principles forward with total commitment to its success
- Not a "bolt on" technique, more a way of life leading to a total change in culture



Lean Definitions

What is WASTE?

"Anything that takes time, resources or space but does not add to the value of the product or service delivered to the customer"

Four Pillars of TPS Model.



14 Principals of Toyota Production System

- Principal 1: Base management decisions on a long term philosophy, even at the expense of short-term financial goals.
- Principal 2: Create a continuous process flow to bring problems to the surface.
- Principal 3: Use Pull systems to avoid overproduction.
- Principal 4: Level out the workload (*heijunka*). (Work like the tortoise, not the hare)

- Principal 5: Build a culture of stopping to fix problems, to get quality right the first time.
- Principal 6: Standardized tasks and processes are the foundation for continuous improvement and employee empowerment.
- Principal 7: Use visual control so no problems are hidden.
- Principal 8: Use only reliable, thoroughly tested technology that serves your people and processes.
- Principal 9: Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.
- Principal 10: Develop exceptional people and teams who follow your company's philosophy.
- Principal 11: Respect your extended network of partners and suppliers by challenging them and helping them improve.
- Principal 12: Go and see for yourself to thoroughly understand the situation (*genchi genbutsu*).
- Principal 13: Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly (*nemawashi*).
- Principal 14: Become a learning organization through relentless reflection (*hansei*) and continuous improvement (*kaizen*).

Appendix H

H- User manuals

USER PROCEDURE

(1)

Activity	Bundle guide creation	
Scenario		
Details	Bundle guide details should enter to the system and then au it is generated by picking required details from sales order.	tomatically
Menu Path		ZBUN

1.	Enter Sales order, line item and press 'Enter'.
2.	Enter the module number in the Module field and press 'Enter'.
3.	In the Sewing order field the relevant order/orders are displayed and select
	the correct order number from drop down list and press 'Enter'.
4.	Enter Size, cut no, set no and quantity. DISSCILLIONS
5.	Enter all other details; I.D. number, care label, main label and other
	relevant information such as prepared by, issued by etc.
6.	Save
7.	Bundle guide number will display in the 'bundle guide' no field.
	Bundle Guide No 35784010004
8.	To get the print-out of the bundle guide, press enter and click on the
	Print button.
	Or else copy the no (Ctrl+C) and click on edit button and paste (Ctrl+V) the
	bundle guide no and press enter. Then click on the entry button.
9.	It can be edited by clicking on <i>Edit</i> or it can be deleted by clicking on
	Delete buttons.
10.	
	To create new bundle guide click on reasonal button and enter details.

USER PROCEDURE

Activity	Material requisition form creation (MRF)	
Scenario		
Details	This is automatically created based on the bundle guide deta initial BOM in the system	ils and the
Menu Path		ZMRF

1.	Enter Bundle guide number and press 'Enter'.
2.	Select the correct sewing order and packing order from the drop down list.
3.	Enter other details; Requested by, authorized by etc.
4.	Save
5.	It will give the MR number in the field.
	Material Reg No 1046210002
6.	To get the print-out of the MR click on the Print button. Or else copy the no (CtrI+C) and click on edit button and paste (CtrI+V) both MR number and BG number and click on the Print button.
7.	It can be edited by clicking on <i>Edit</i> or it can be deleted by clicking on Delete buttons.
8.	To create new MRF click on button and enter details.

USER PROCEDURE

Activity	Print reference sticker (RS)	
Scenario		
Details	RS consists with a barcode which is used for the line-in opera is automatically created in the system based on the bu	ation and it ndle guide
Menu Path		ZMRF

1.	Raise the MRF by putting bundle guide number and save it.
2.	To get the barcode printout click on Print RS button.





USER PROCEDURE

Activity	Line-in Confirmation			
Scenario				
	Line-in is entered to the system by scanning the reference sticker. If			
Details the sales order is new to the scanning process, UPC stickers r				
	introduced size-wise to the system.			
Menu Path		ZLIN		

Steps:

1.	Scan RS and the number will be picked in the relevant field.					
	Bundle Guide No					
2.	Press enter. (Sales order, line item will be displayed. If the sales order has					
	been utilized before the UPC details also will be displayed)					
3.	Scan UPC stickers which are not initialized to the system and click on					
	Save UPCs Jniversity of Moratuwa, Sri Lanka.					
	UPC Sticker Noectronic Theses & Dissertations					
	www.lib.mrt.ac.lk					
4.	Click on 📙 button in the main menu to save the Line-in confirmation.					
	(At the same time CKs will be issued to the production order and the sewing					
	trims and packing materials with regard to the MRF will be issued					
	automatically).					

USER PROCEDURE

(5)

Rejects records
Reject garments are entered to the system by scan the UPC against the
module and facility is there to select the reject type.
Once save the data, reject stocks will be converted to block stock stage
at the same plant location.

Menu Path		ZLORJ
-----------	--	-------

1	Enter number of the module from which the garment was rejected.									
2	Press enter									
3	Scan the rejected UPC and press enter (it picks relevant information for the following screen)									
4	4 Then, select the reason for the rejection from drop down list.(It shows the specific reject types which plant consider) Reject Details									
	Sal: Ord:	L/I	Material	Size	UPC Sticker	Reason				
			niversity of the	Moratuwa,	Sri Lanka.	FAB COL SEW CUT EMB PRT RUN STN				
5	5 After scan and enter the reason for rejects for the particular module, click on									
6	To clear all	the de	tails or enter n	ew data, click	on Clear All	button.				