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LIST OF APPENDICES

Annex A1.1 - Functionality of the Merchandising Department
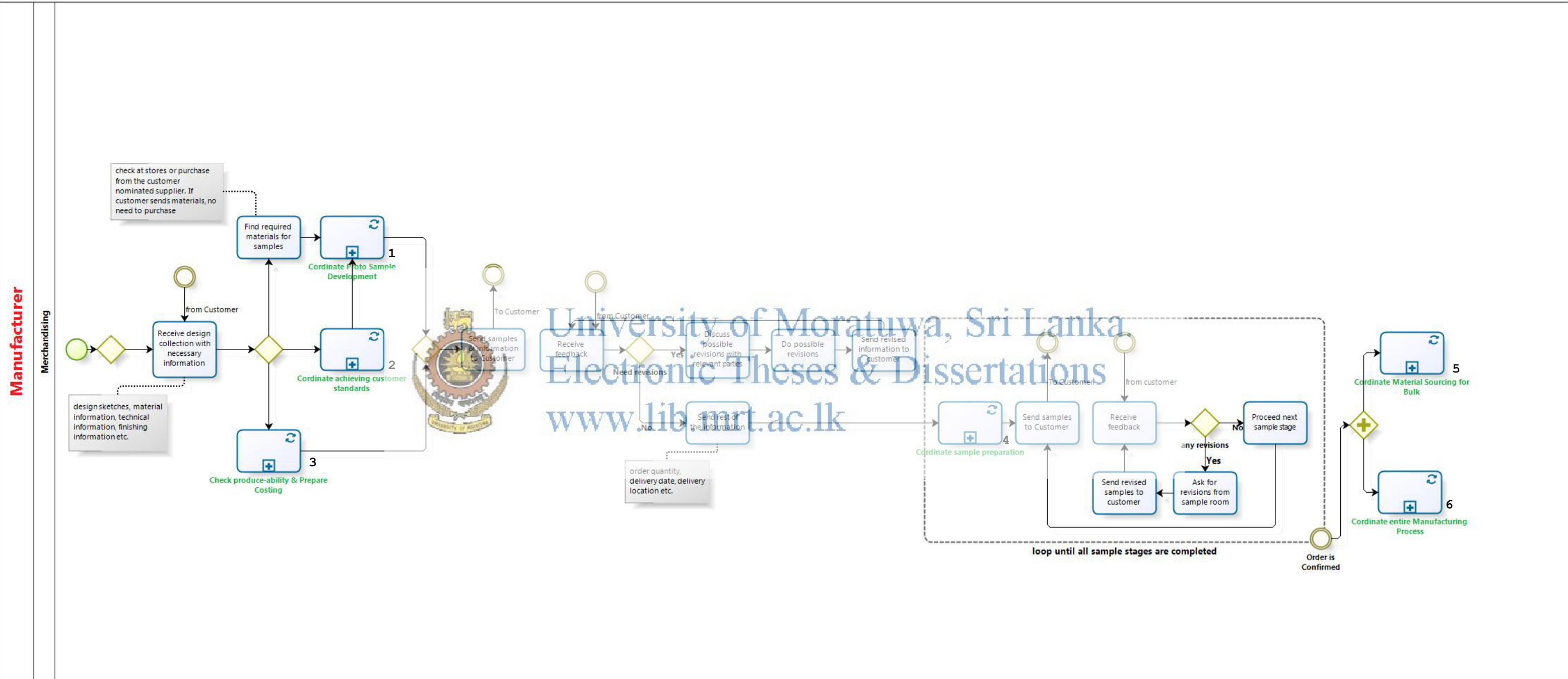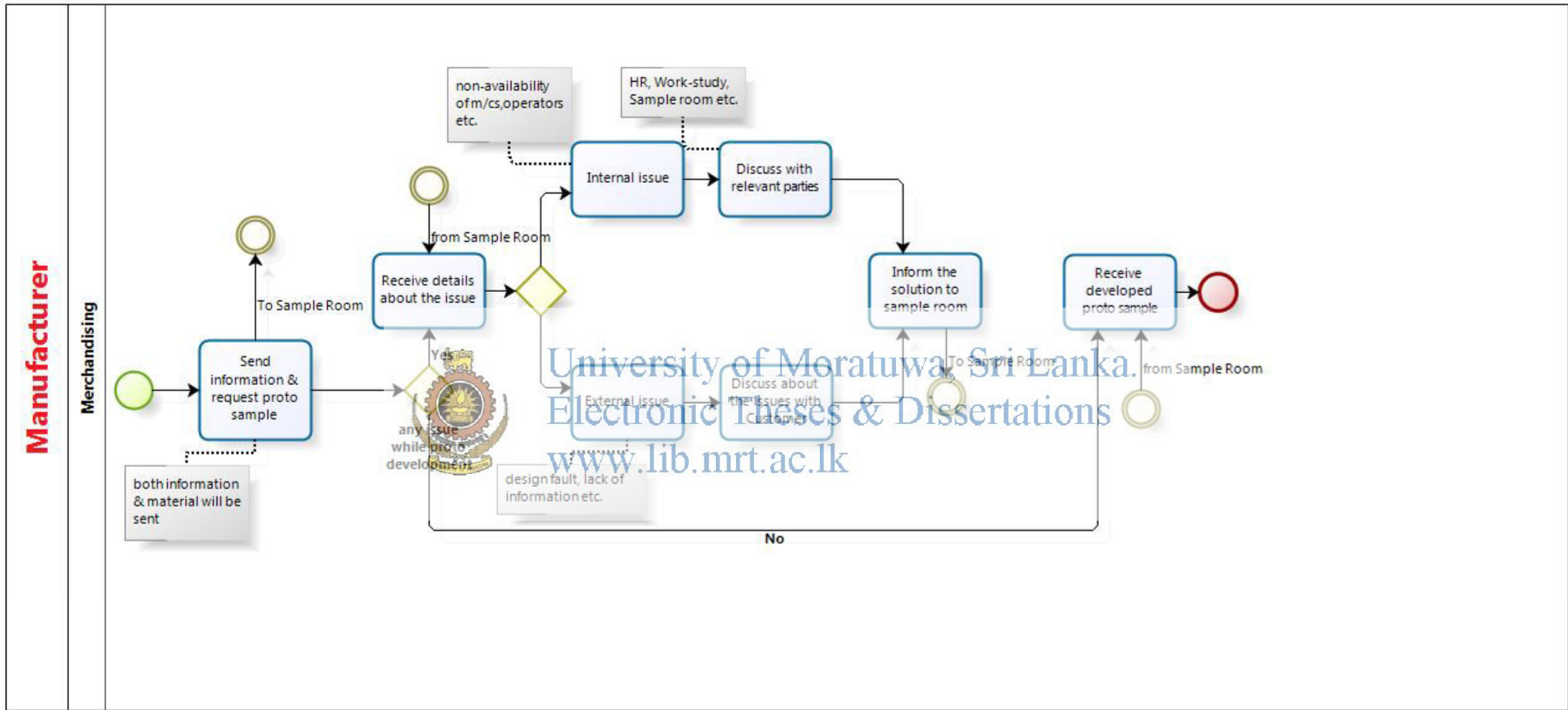

1: Workflow of the sub process is in Annex A1.3
2: Workflow of the sub process is in Annex A1.4
3: Workflow of the sub process is in Annex A1.2
4: Workflow of the sub process is in Annex A1.5
5: Workflow of the sub process is in Annex A1.6
6: Workflow of the sub process is in Annex A1.7

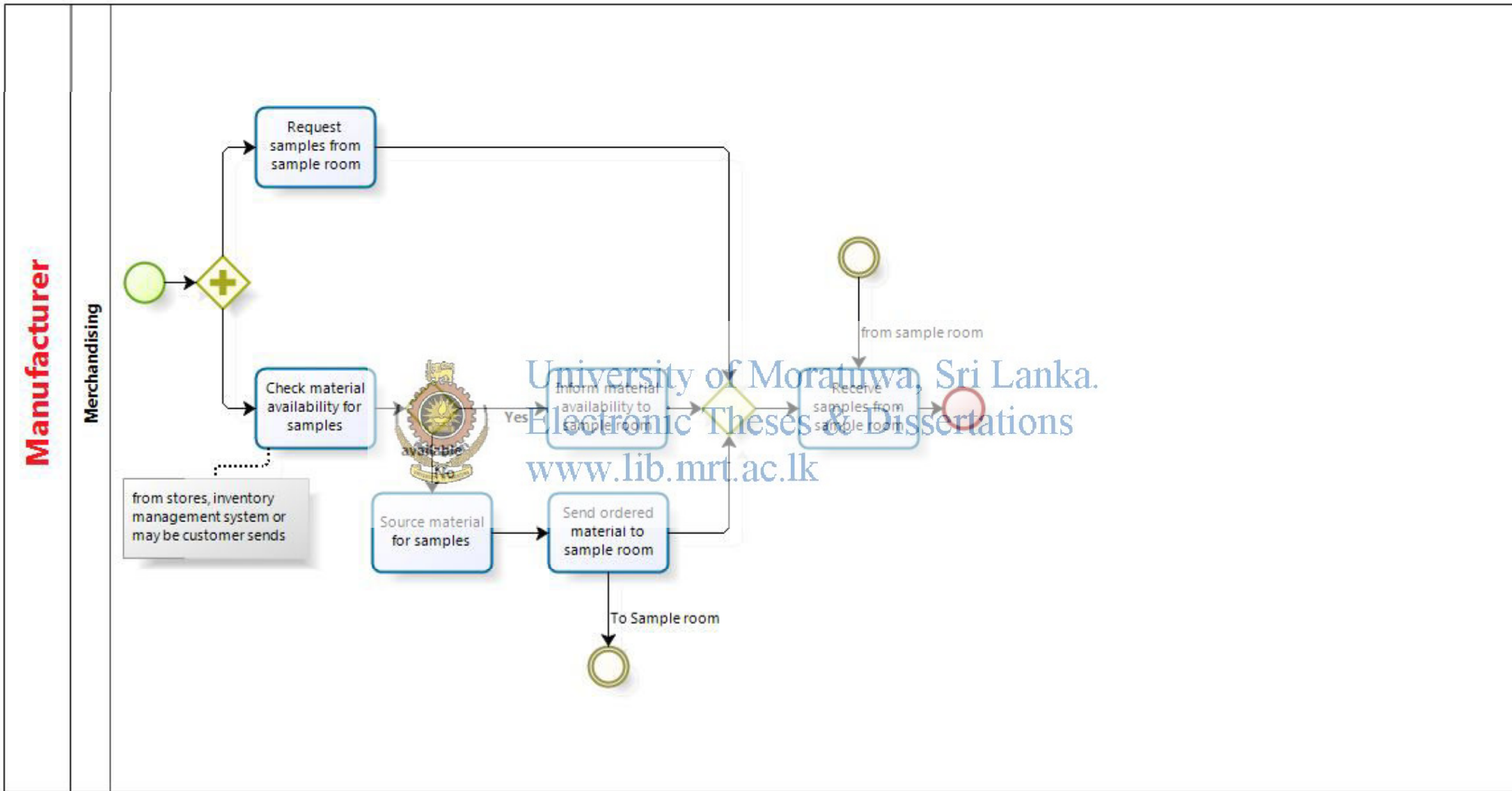**Annex A1.2 - Workflow of the activity *Check produce-ability and prepare costing* of the Merchandising Department**
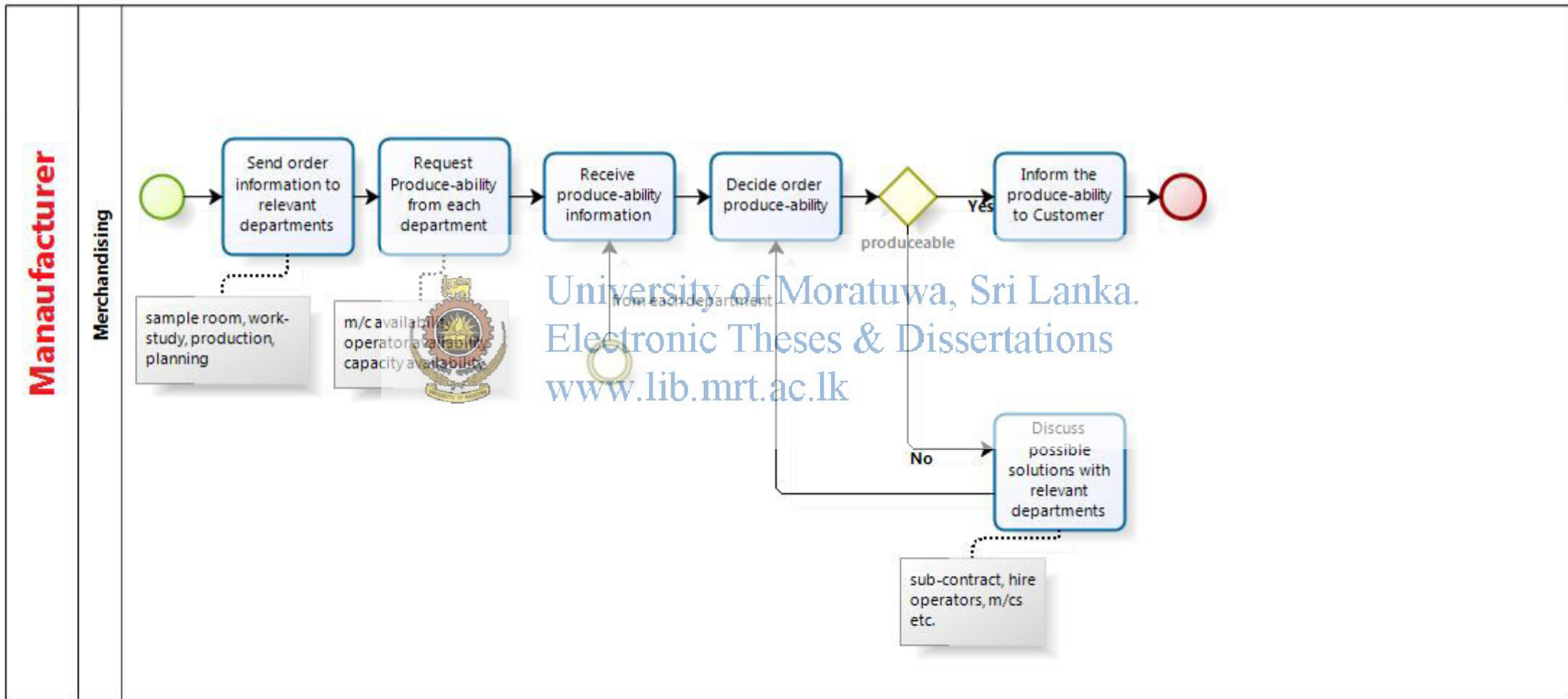
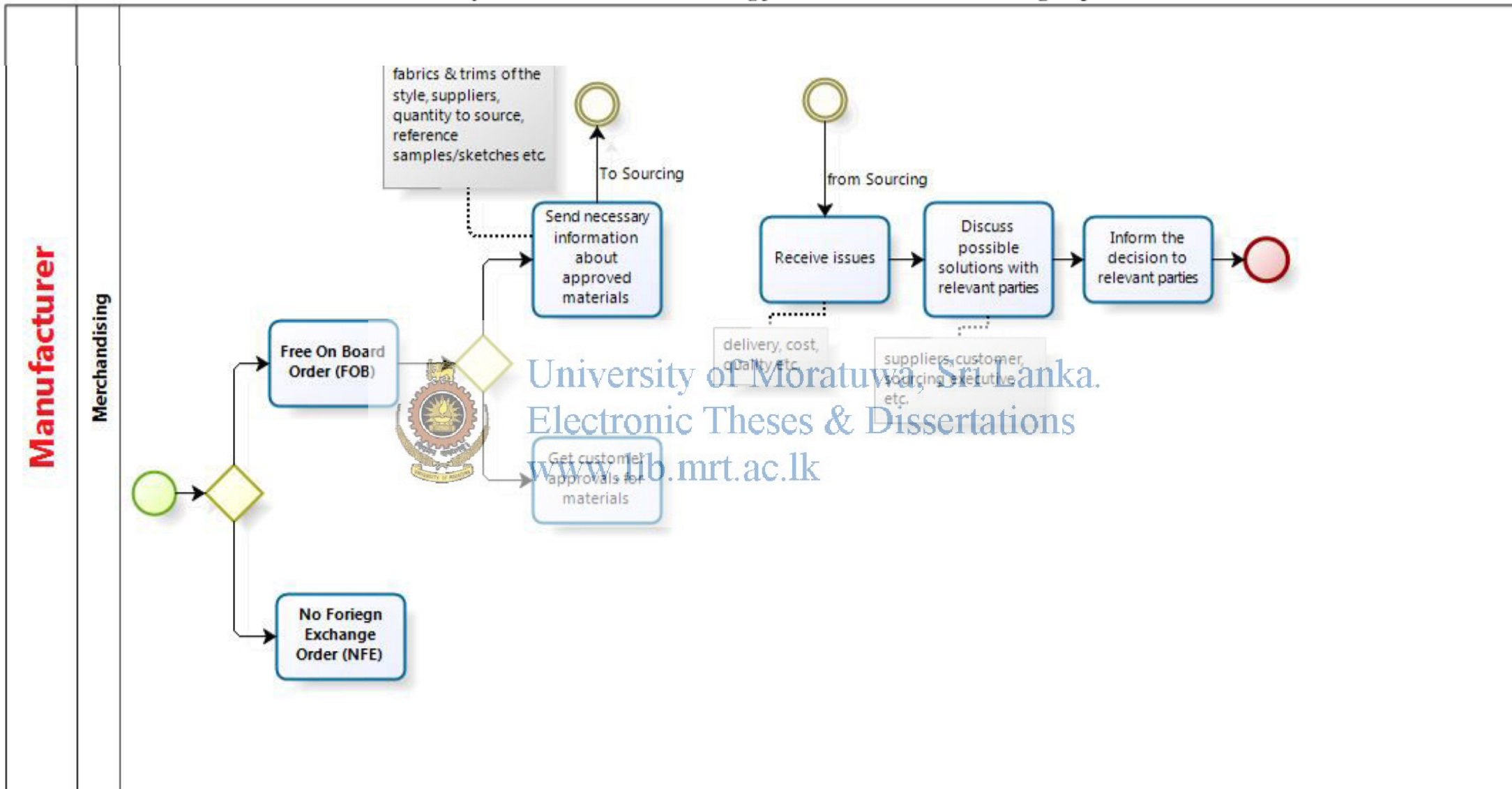**Annex A1.3 - Workflow of the activity *Coordinate proto sample developement* of the Merchandising Department**

Annex A1.4 - Workflow of the activity *Coordinate achieving customer standards* of the Merchandising Department
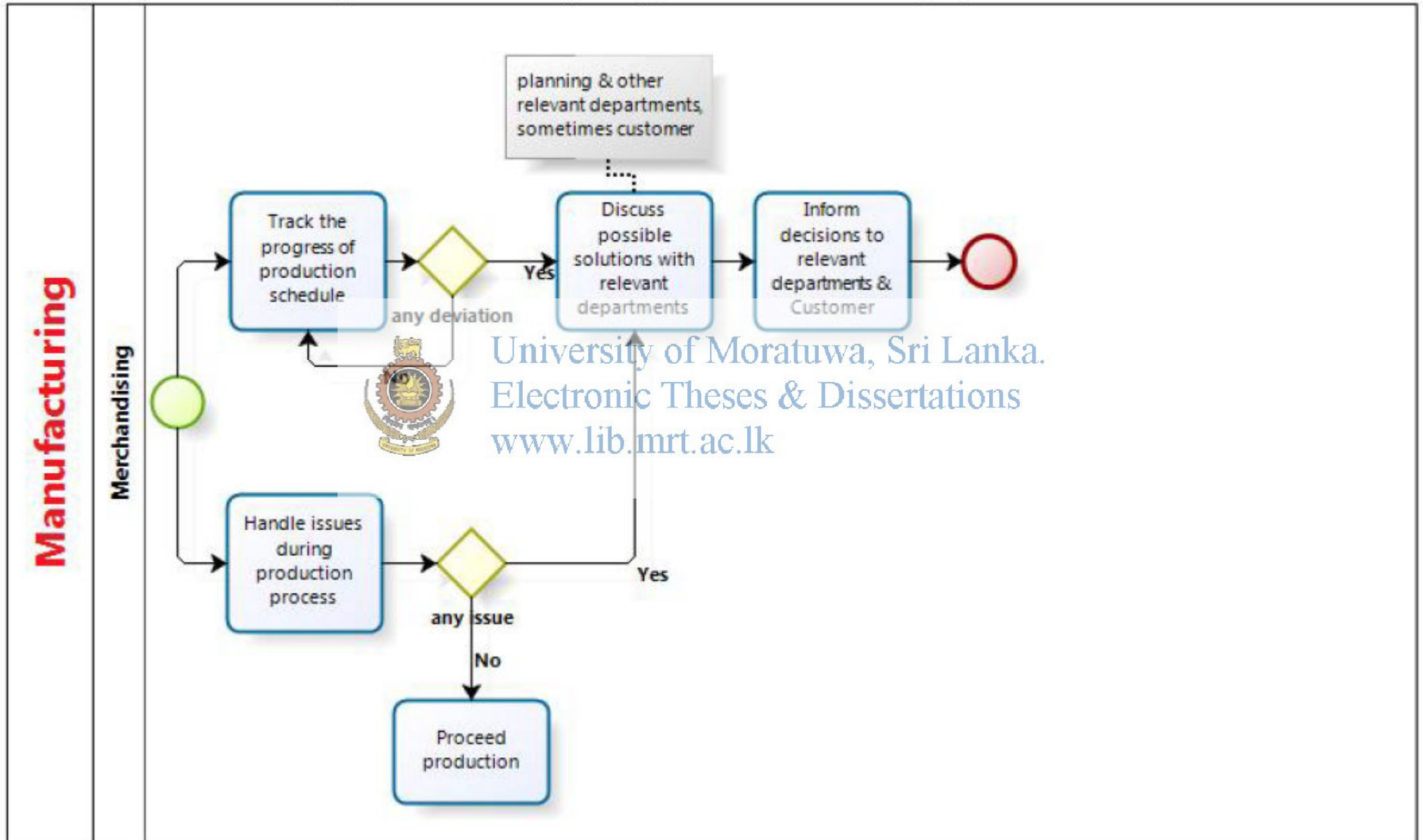
Manufacturer

Merchandising

Request samples from sample room

Check material availability for samples

from stores, inventory management system or may be customer sends

available

No

Yes

Inform material availability to sample room

Source material for samples

Send ordered material to sample room

To Sample room
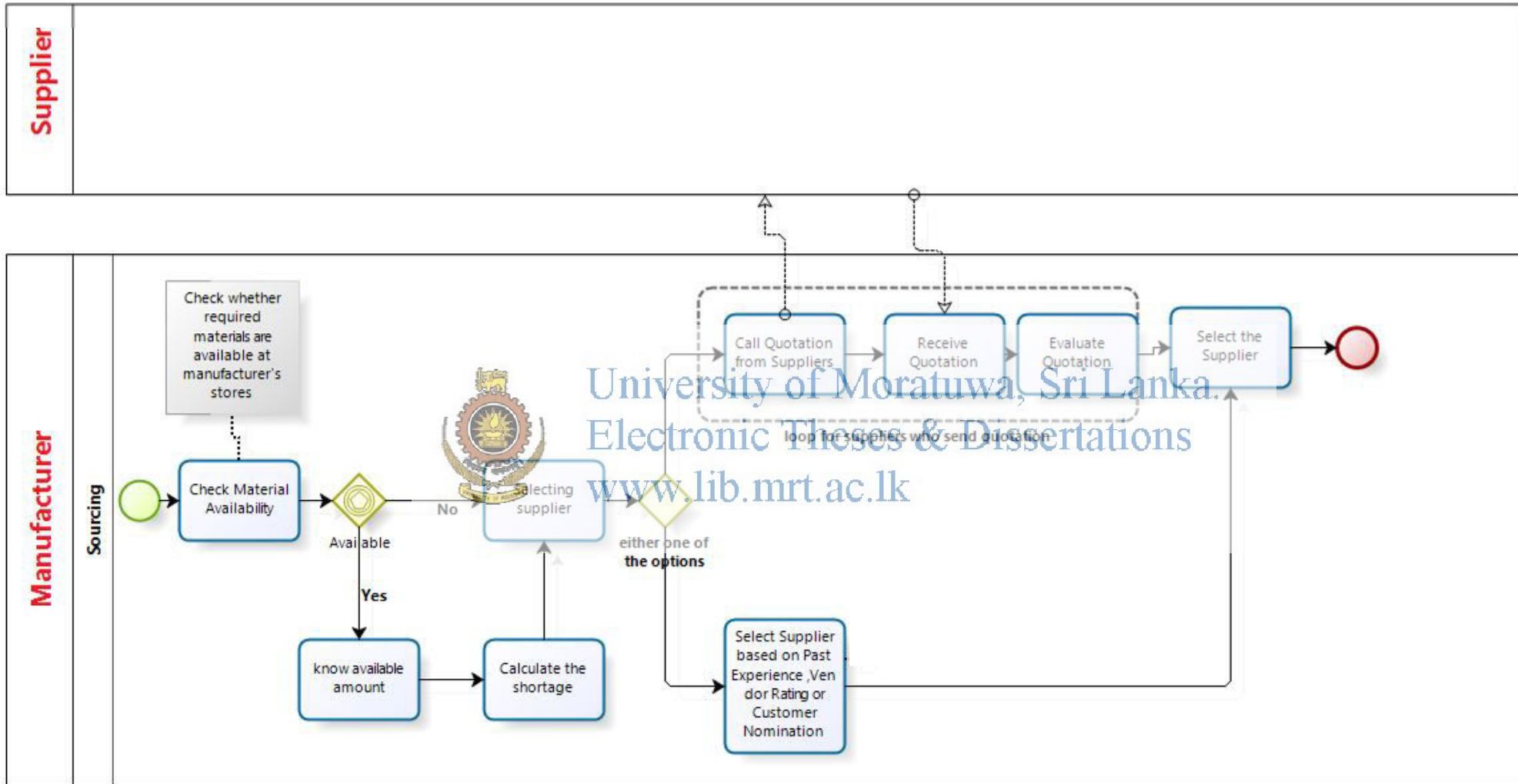
from sample room

Receive samples from sample room

Annex A1.6 - Workflow of the activity *Coordinate material sourcing for bulk* of the Merchandising Department

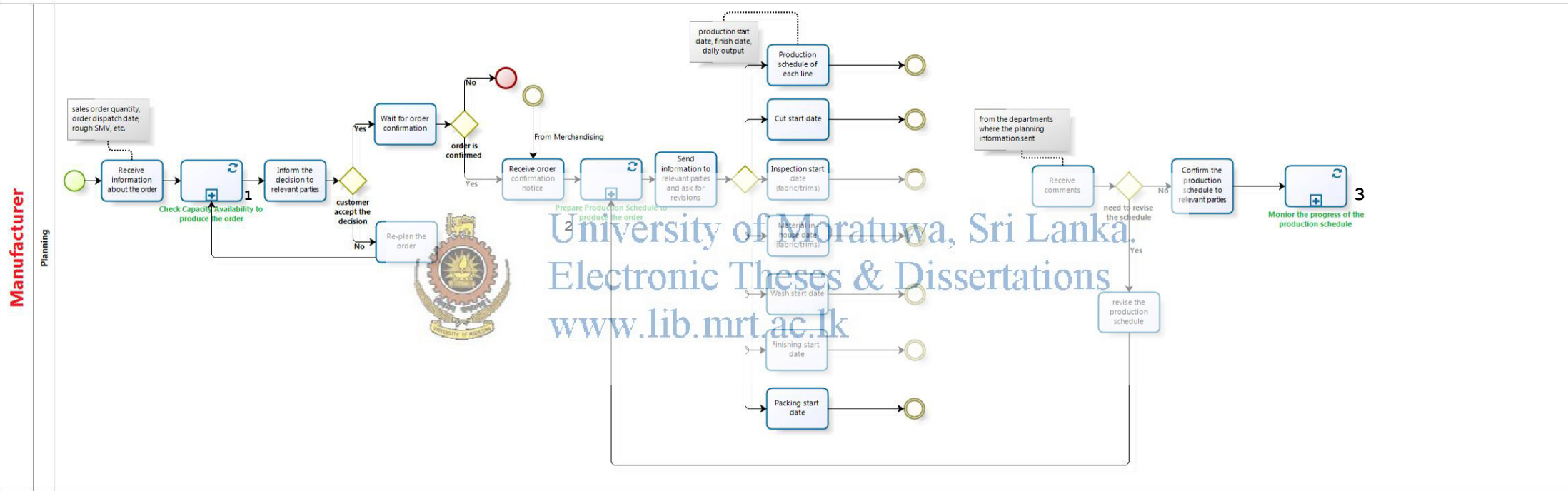**Annex A1.7 - Workflow of the activity *Coordinate entire manufacturing process* of the Merchandising Department**

Supplier

Manufacturer

Sourcing

including material in-house date, purchasing quantity, delivery location etc.

Receive Production Plan

from planning

Receive Bill of Material (BOM) and reference sample

from Merchandising

BOM contains details about the materials need to purchase for a particular order. Sample is for quality approving

receive information

Fabrics will be purchased by customer. Trims will be purchased either by customer or manufacturer

No Foriegn Exchange (NFE) Order

Fabric

customer will purchase instead of manufacturer, therfore process is terminated

Same as for fabric

Purchase by Customer

Trim

Either one of the options

Purchase by Manufacturer

Mainly 2 Order types; NFE and FOB .Whether the materials are purchase by manufacturer, depend on the type of order

Free On Board (FOB) Order

Both fabrics and trims will be purchased by manufacturer

Check Material Availability & Supplier Selection

for both fabrics and trims

Discuss necessary information with Supplier

Raise Purchase Order (PO)

Open Letter of Credit (LC)

Send PO to Supplier and Stores

to Stores

Receive PO Receipt Confirmation from Supplier

Invoice, Goods Receive Note (GRN)

Receive Material Delivery Information

shortages, wrong material etc

Any issue in the delivered material

No

Keep for future reference

Yes

Inform the issue

To Supplier   from supplier

Receive solution

Inform solution to Stores

to Stores

from Stores

Trim card, quality reports

Receive Quality Status of materials from Inspection

from Quality Inspection

Reference is sent by Merchandiser

Check Sample with Reference

Quality Acceptable

Yes

No

Approve the Material

Inform the Decision to Inspection

to Inspection

Send Documents to Finance, to Arrange Payment

Goods Receive Note (GRN), Invoice

to Finance

Raise PO for replacement

Request replacement with PO for Replacement

loop till materials get approved

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Annex A2.2 - Workflow of the activity *check material availability and supplier selection* of the Sourcing Department

Annex A3.1 - Functionality of the Planning Department
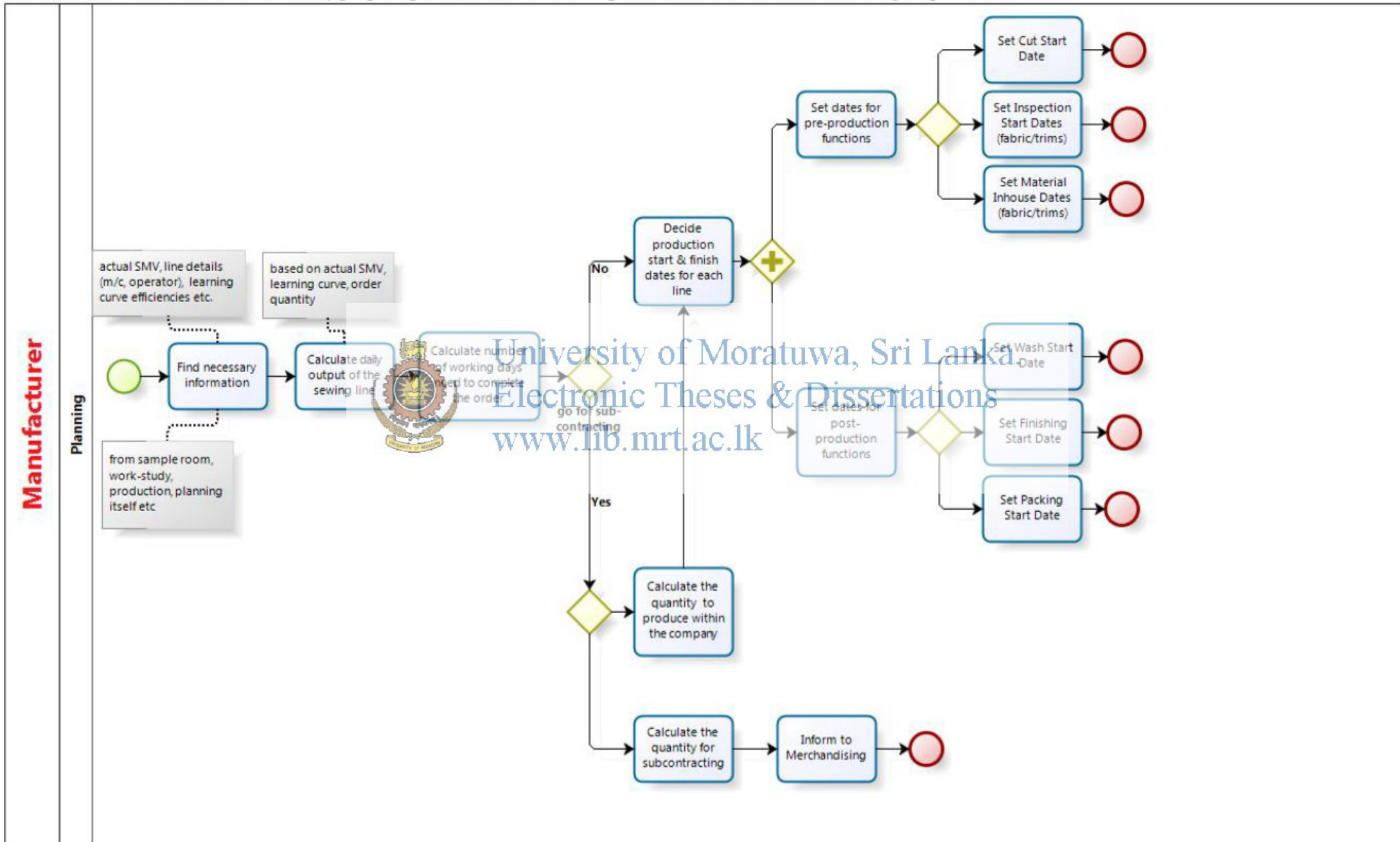

1: Workflow of the sub process is in Annex A3.2
2: Workflow of the sub process is in Annex A3.3
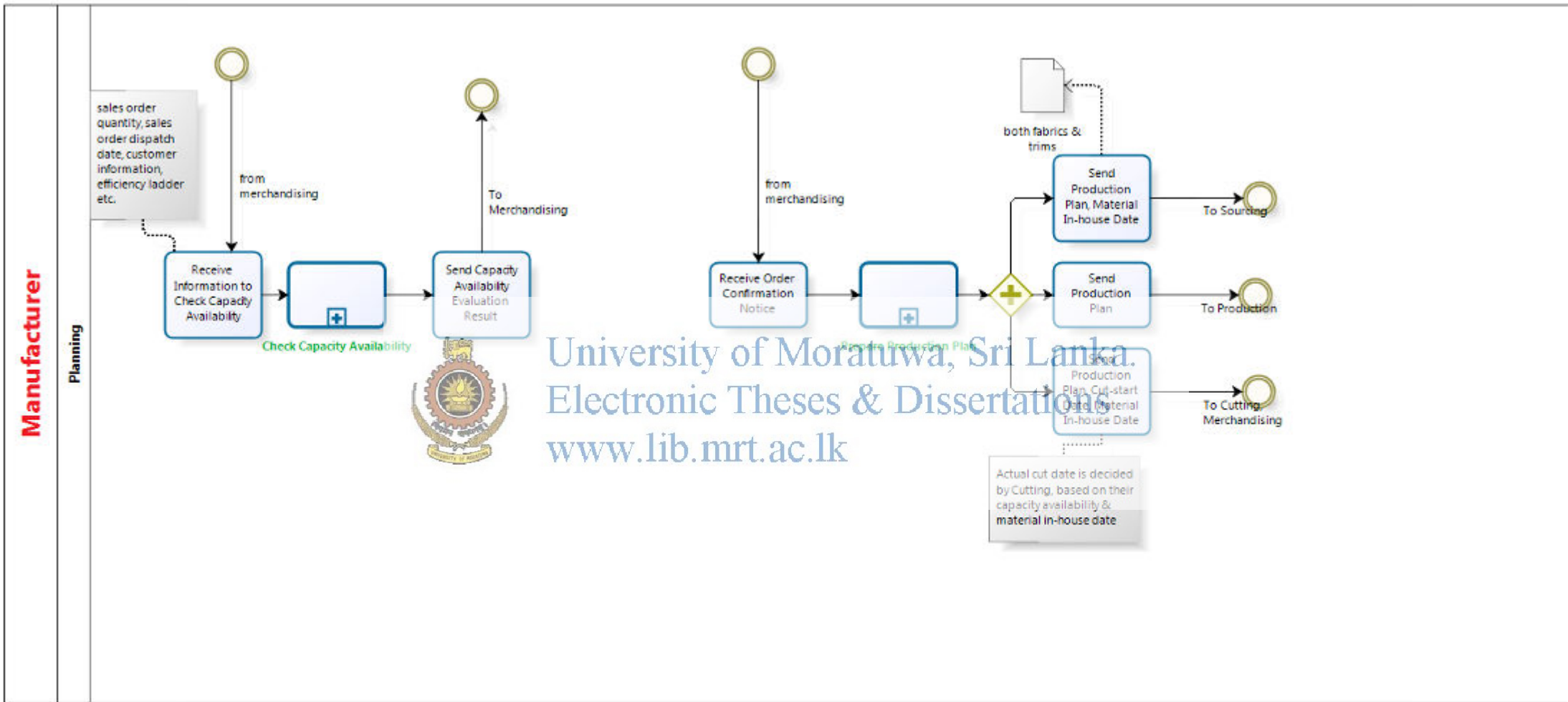3: Workflow of the sub process is in Annex A3.4

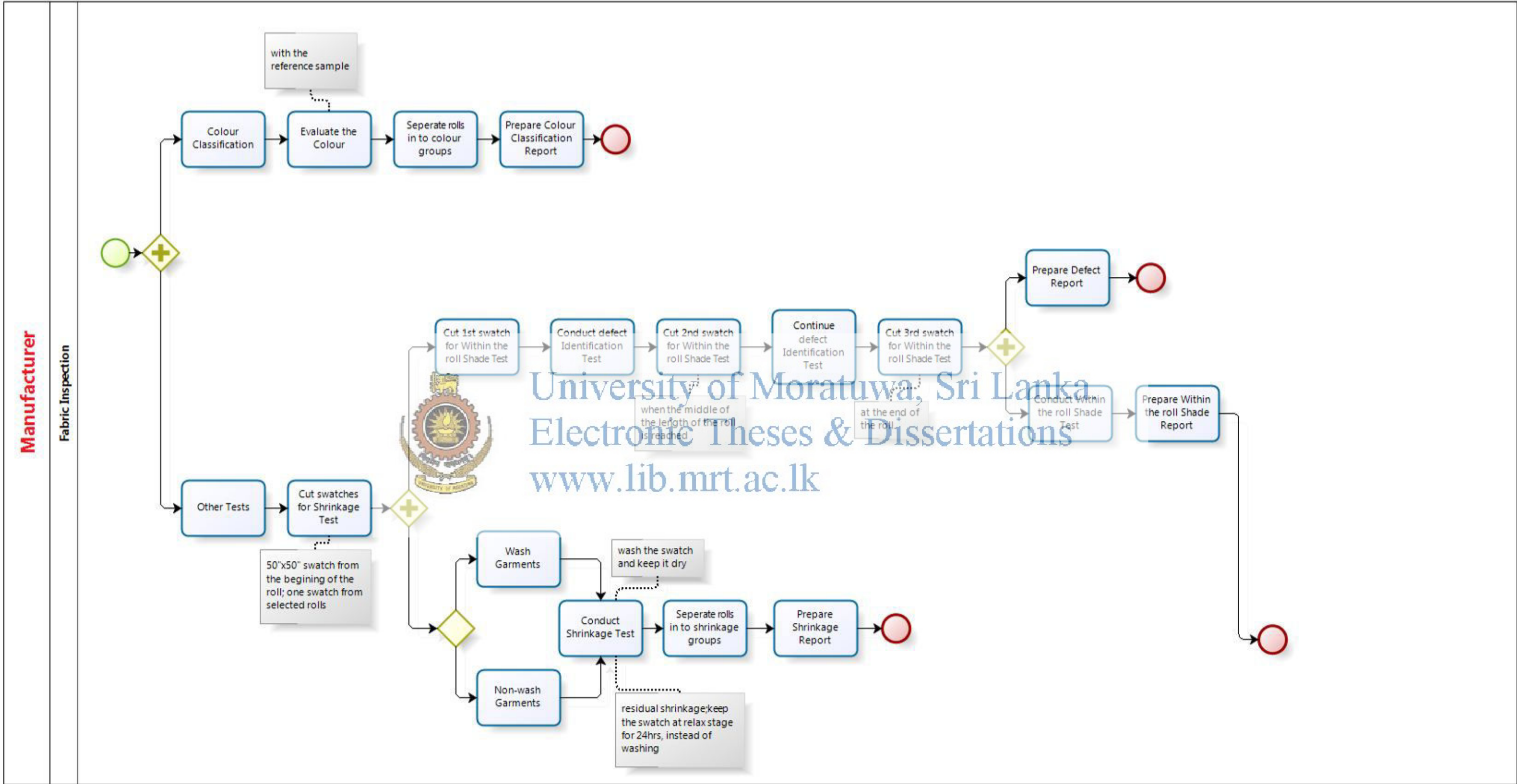**Annex A3.2 - Workflow of the activity *check capacity availability to produce the order* of the Planning Department**
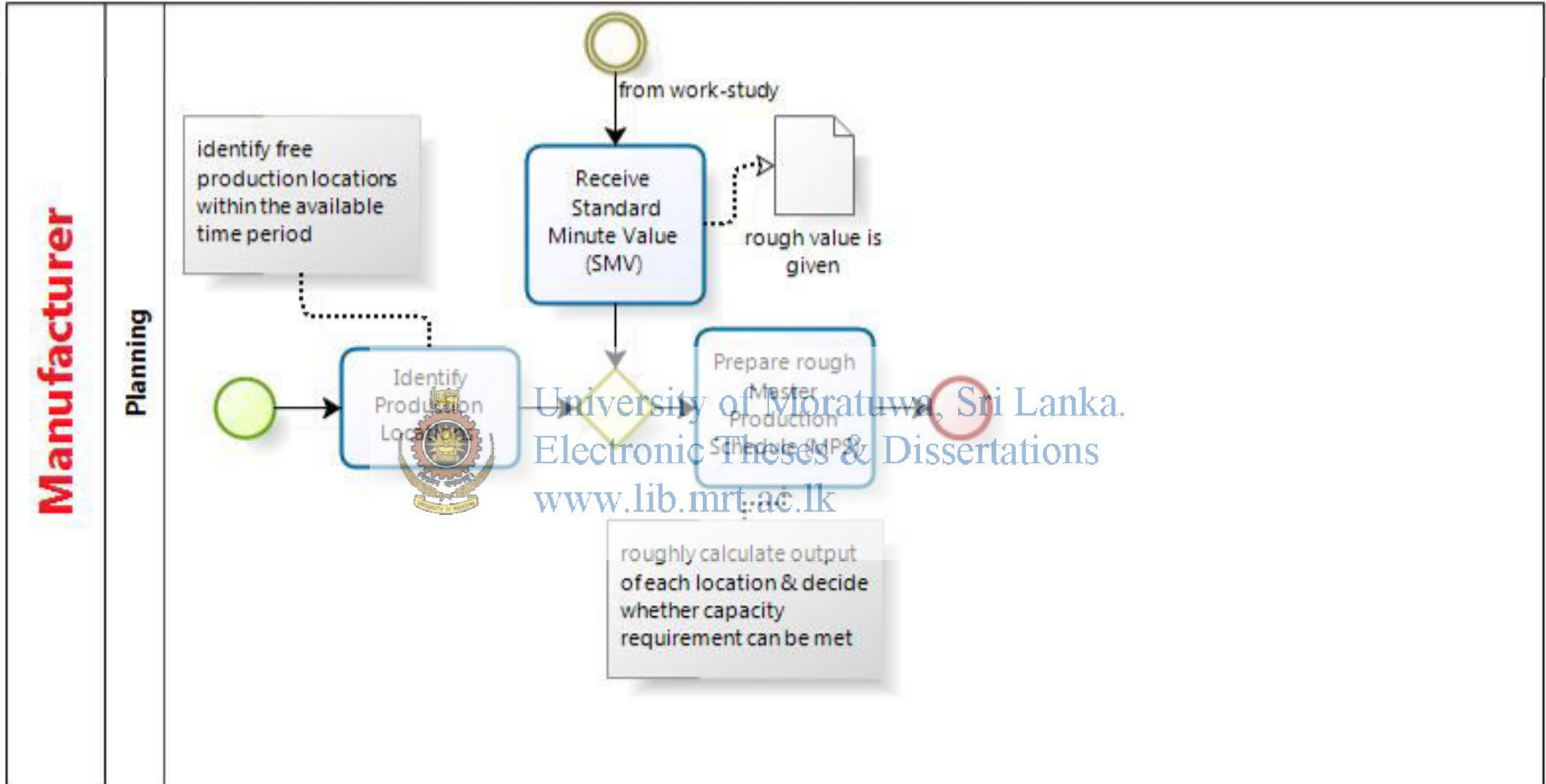
Annex A3.3 - Workflow of the activity *prepare prodcution schedule to produce the order* of the Planning Department

Annex A3.4 - Workflow of the activity *monitor the progress of the production schedule* of the Planning Department

Annex A4.1 - Functionality of the Sample Room
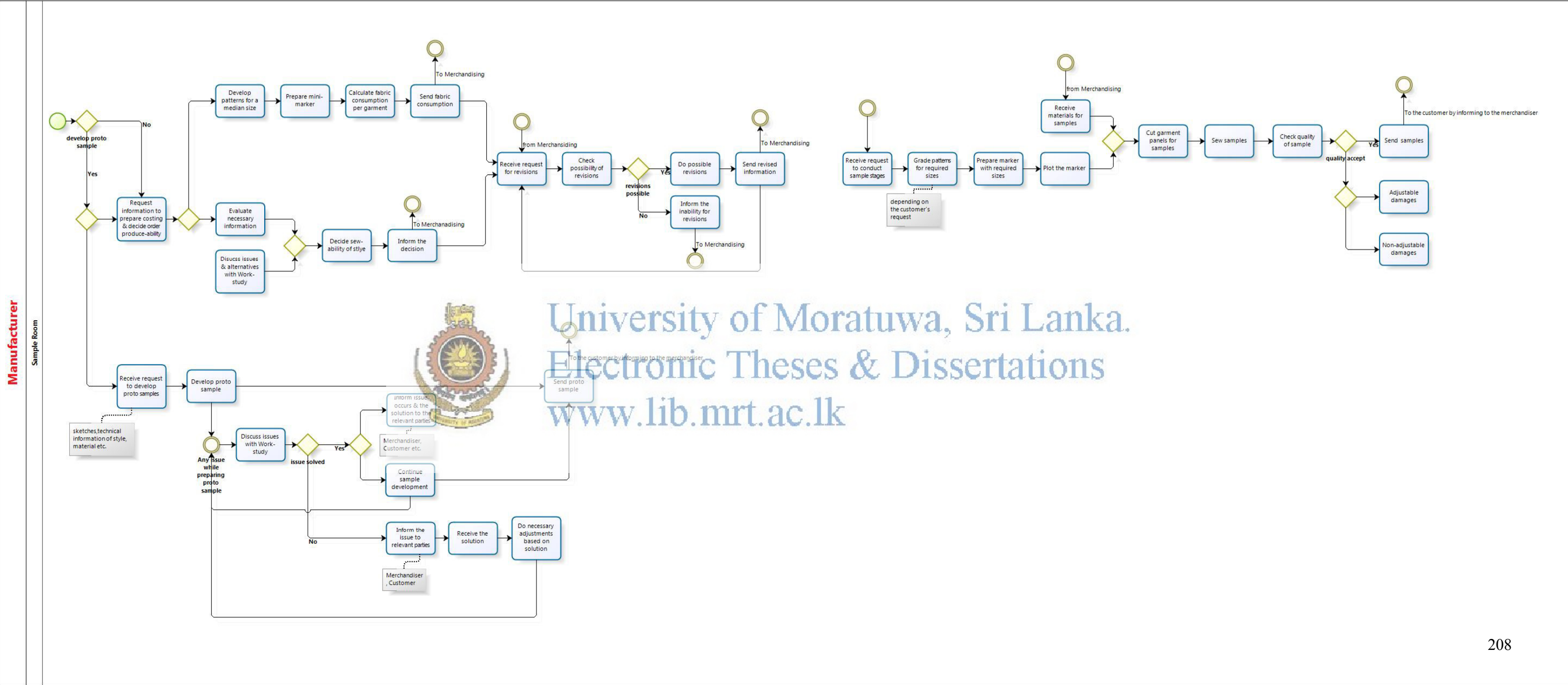
Annex A5.1 - Functionality of the Stores Department

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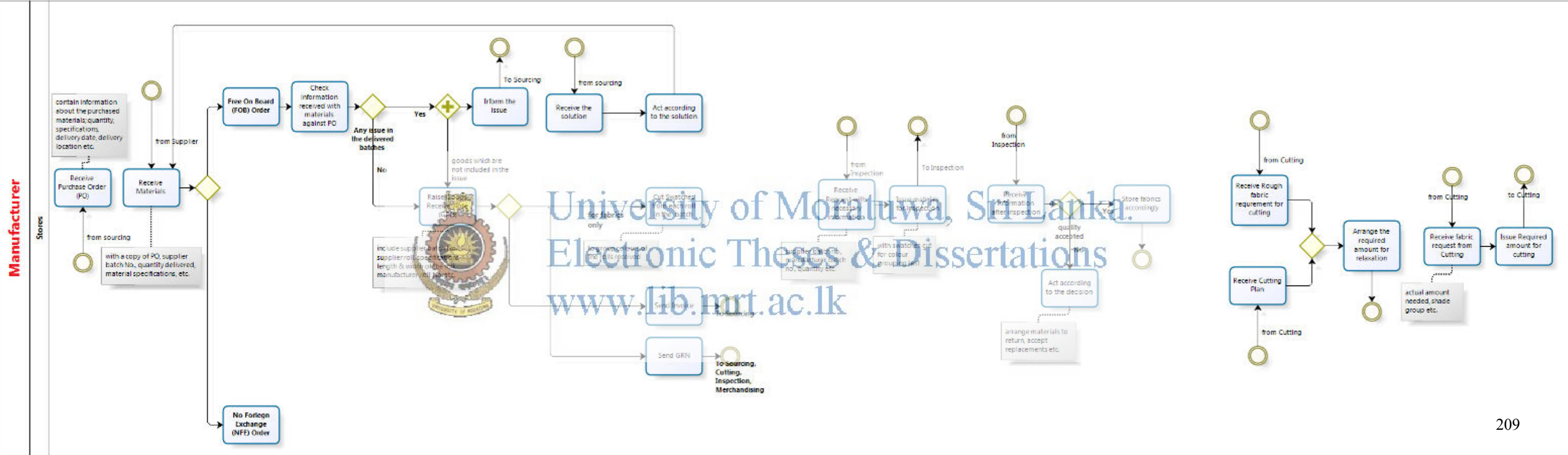
Annex A6.1 - Functionality of the Fabric Inspection Department
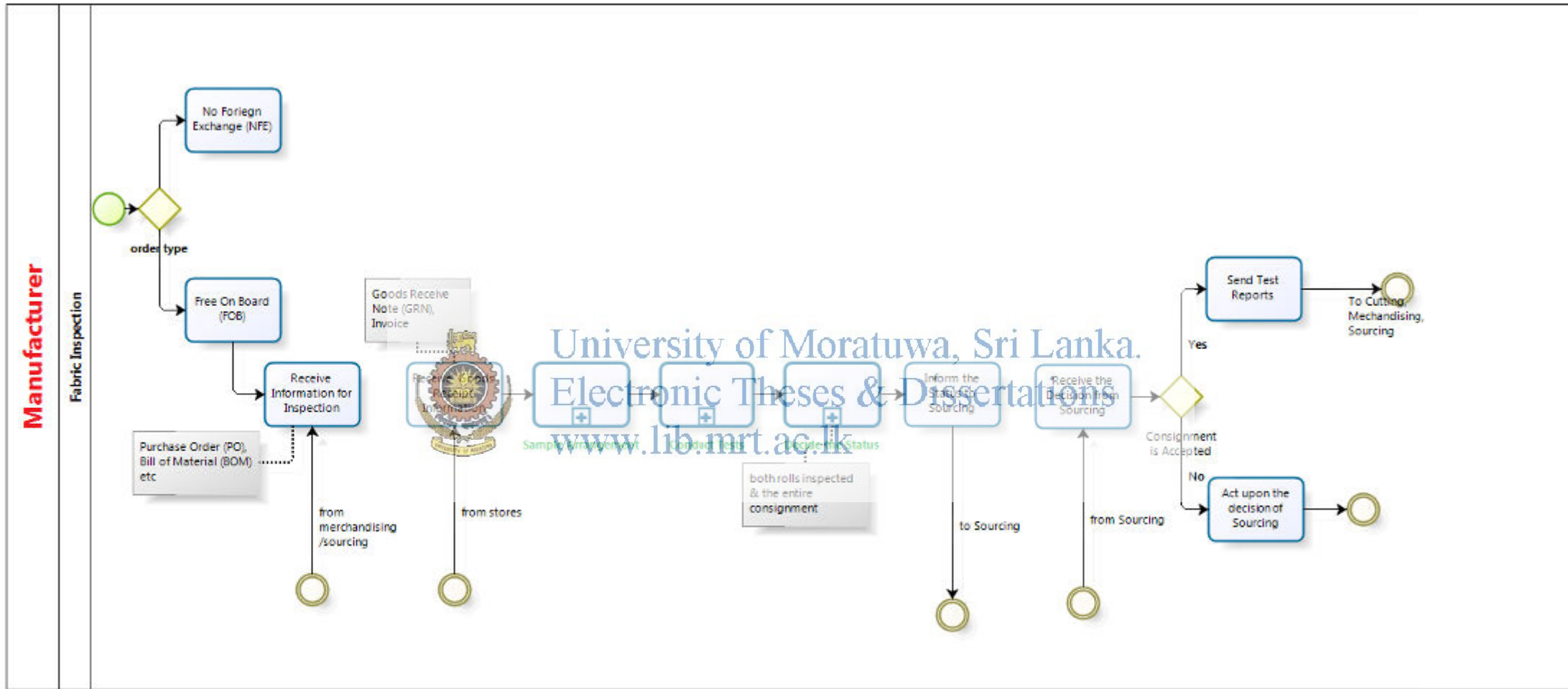
1: Workflow of the sub process is in Annex A6.2
2: Workflow of the sub process is in Annex A6.3
3: Workflow of the sub process is in Annex A6.4
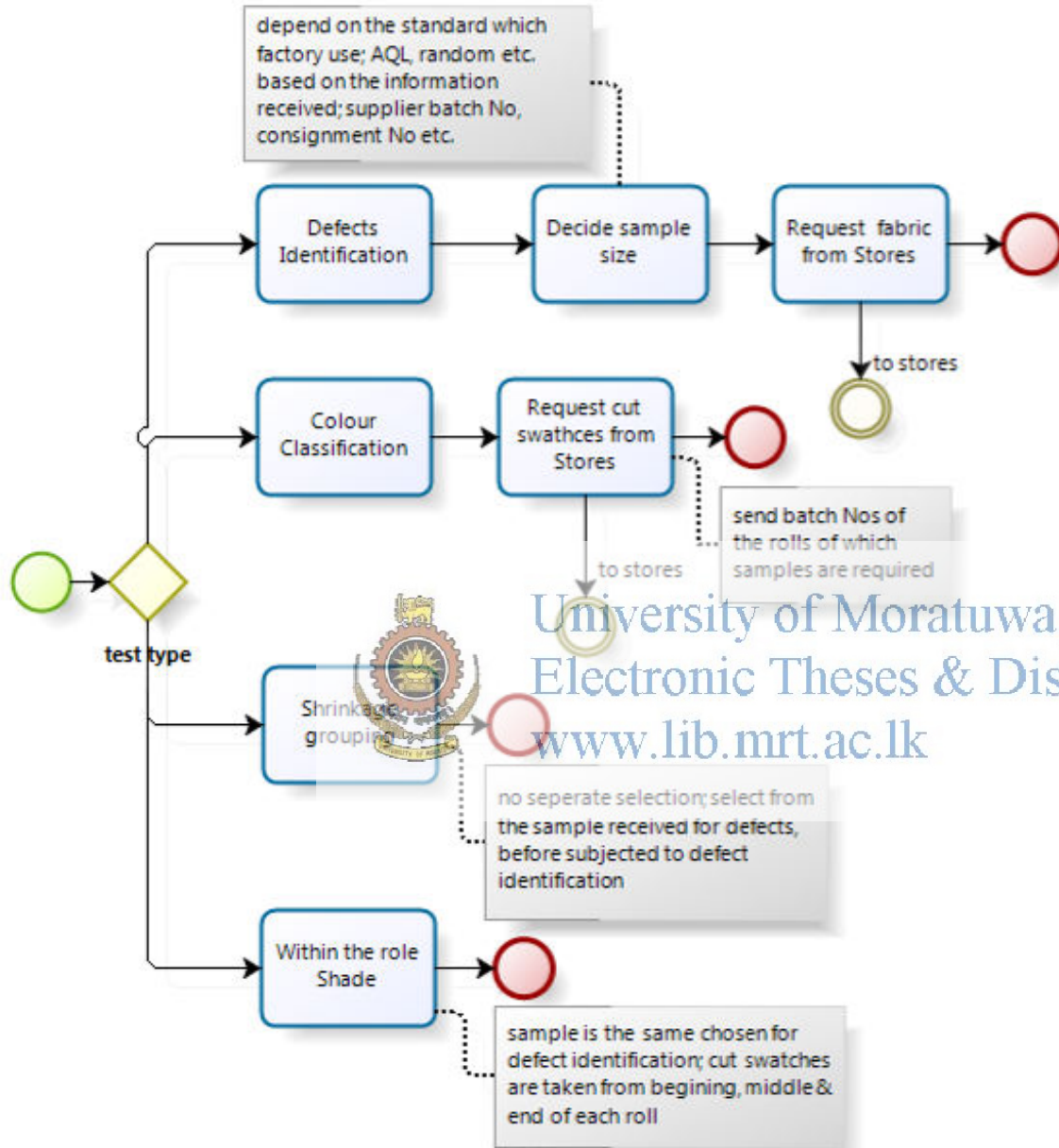
Annex A6.2 - Workflow of the activity *sample arrangement* of the Inspection Department

Annex A6.3 - Workflow of the activity *conduct tests* of the Fabric Inspection Department
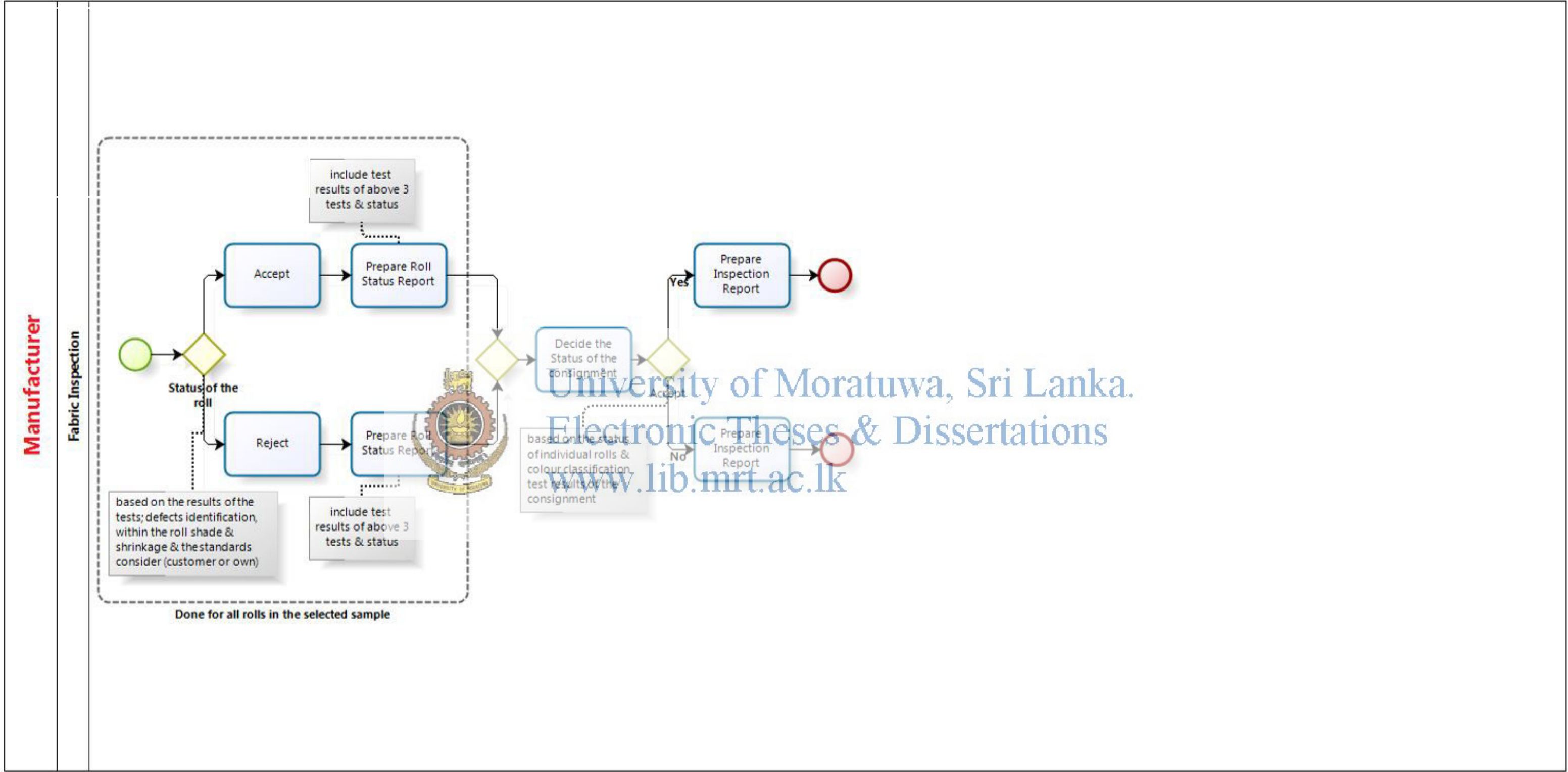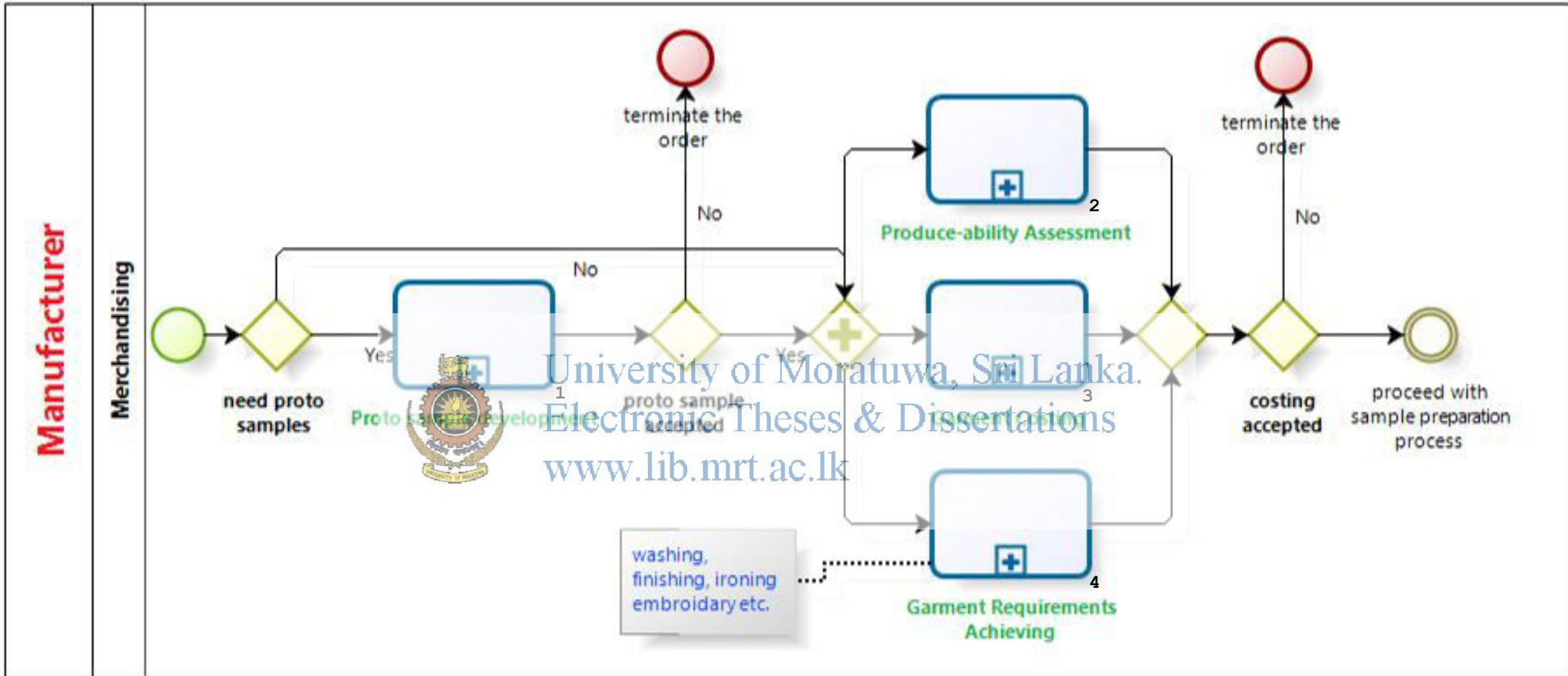
Annex A7.1 - Functionality of the Work-study Department
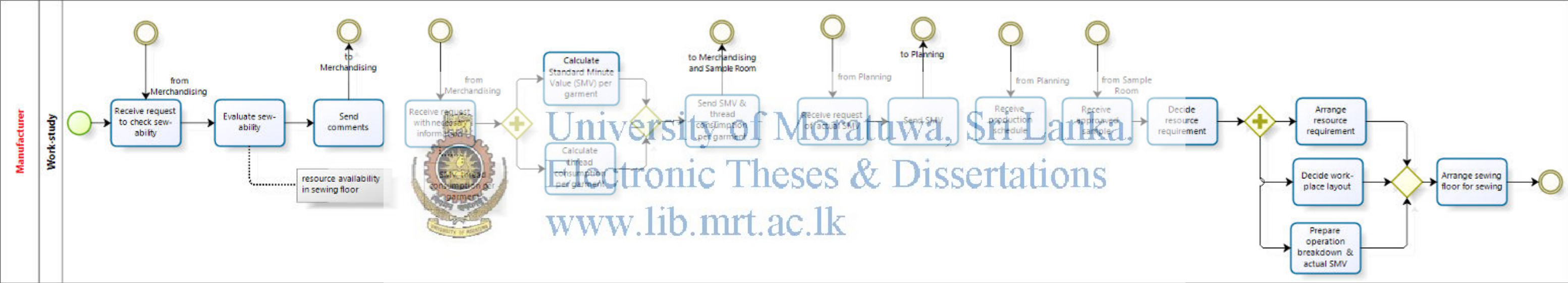
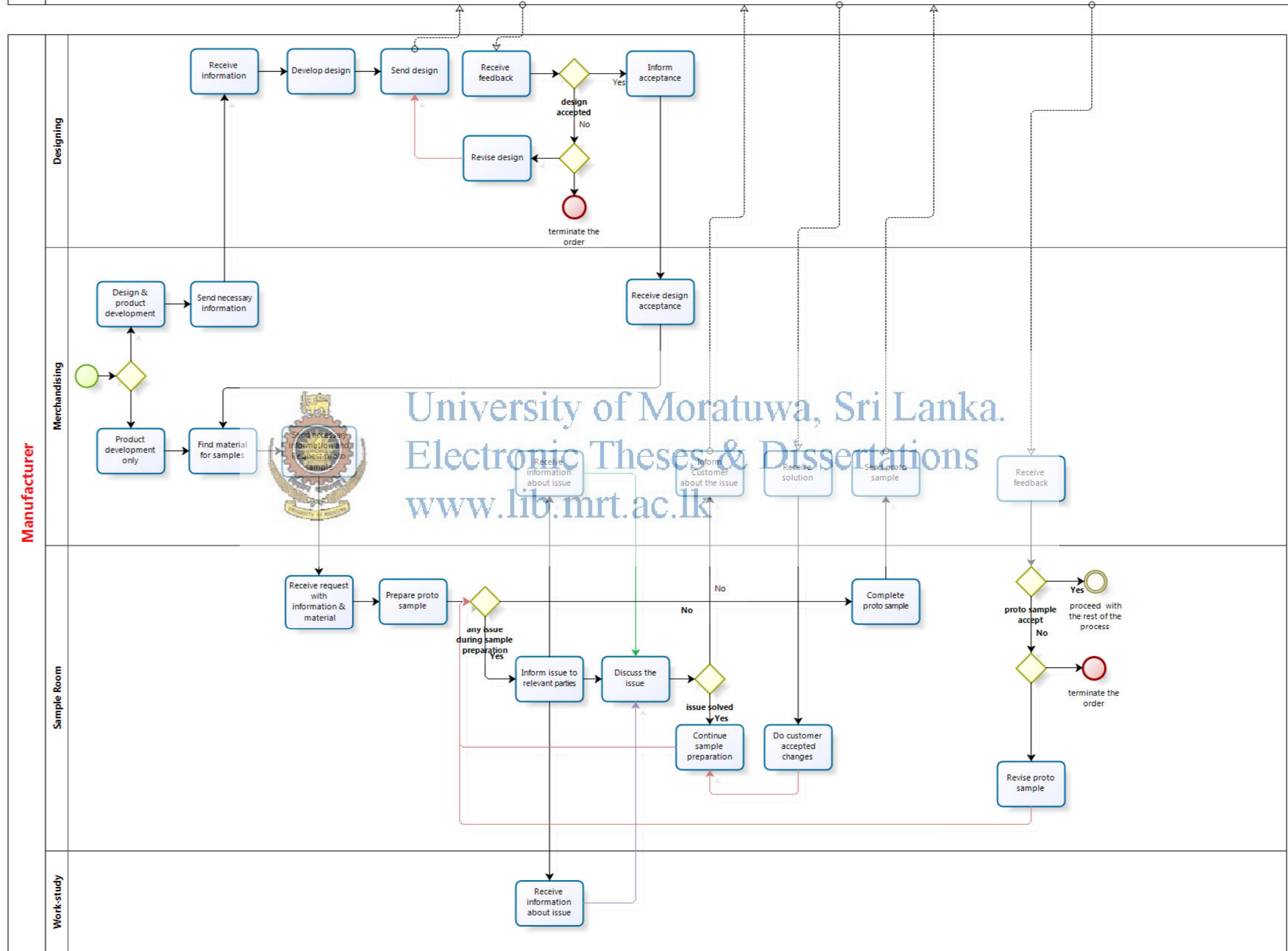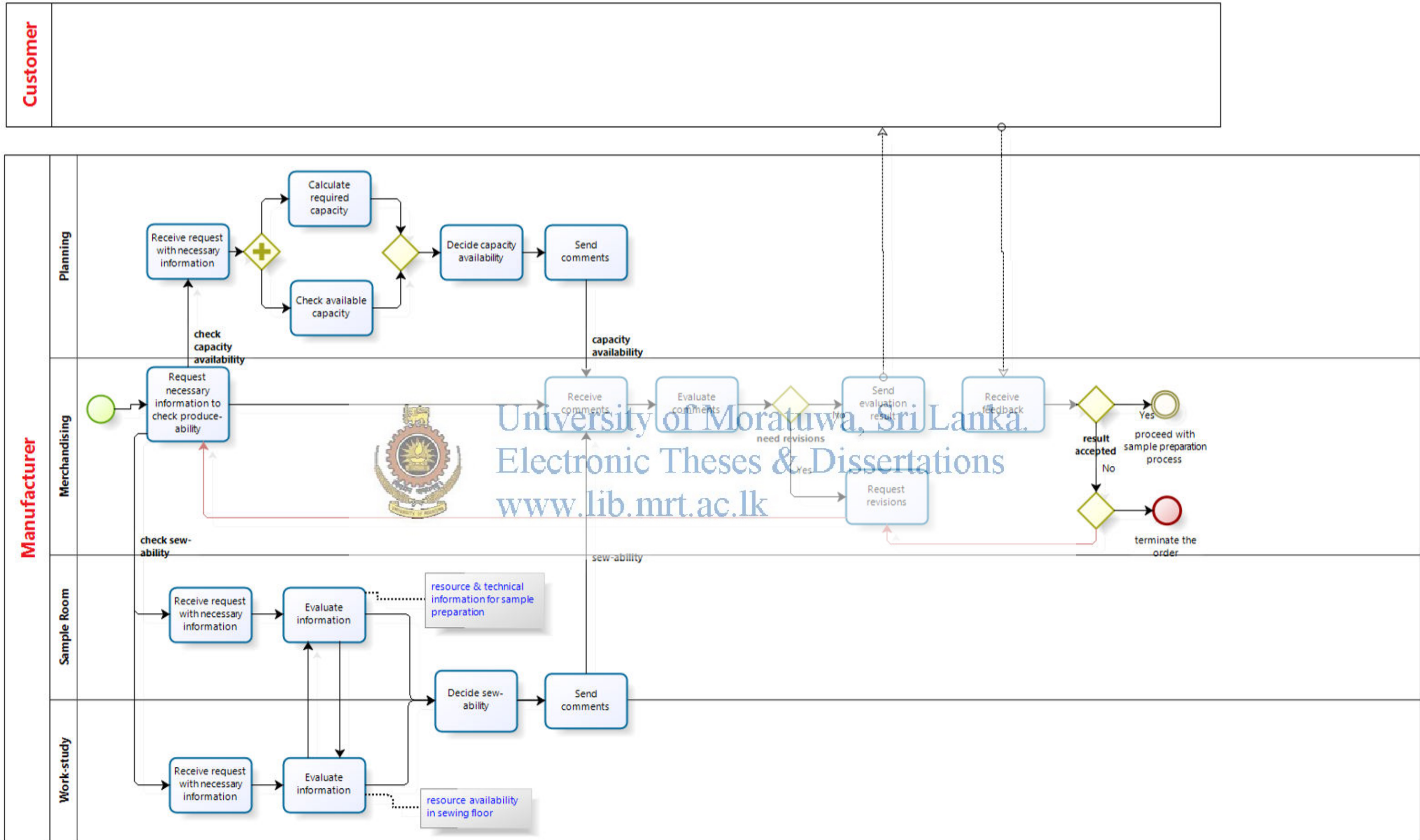**Annex A8.1 - Functionality of the Production Department**

Annex B1.1 - Workflow of the Order Placement sub-process

1: Workflow of the sub process is in Annex B1.2
2: Workflow of the sub process is in Annex B1.3
3: Workflow of the sub process is in Annex B1.4
4: Workflow of the sub process is in Annex B1.5

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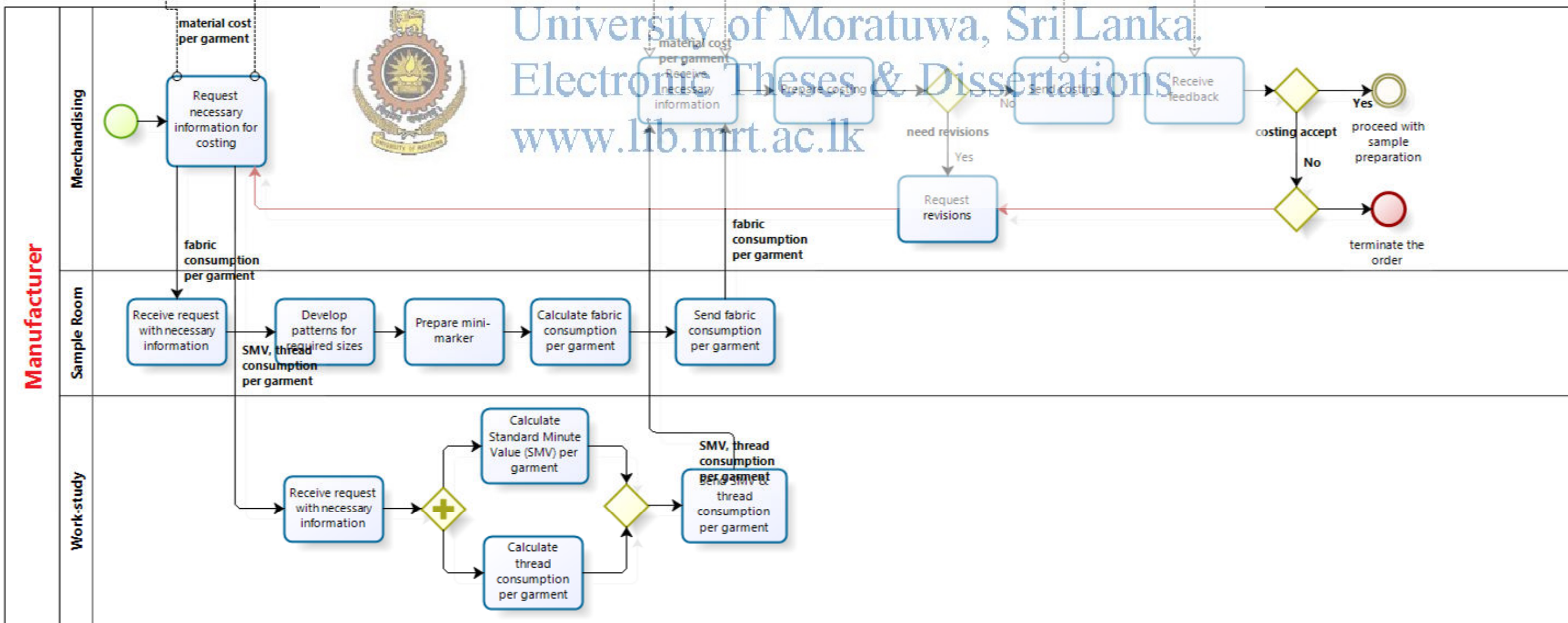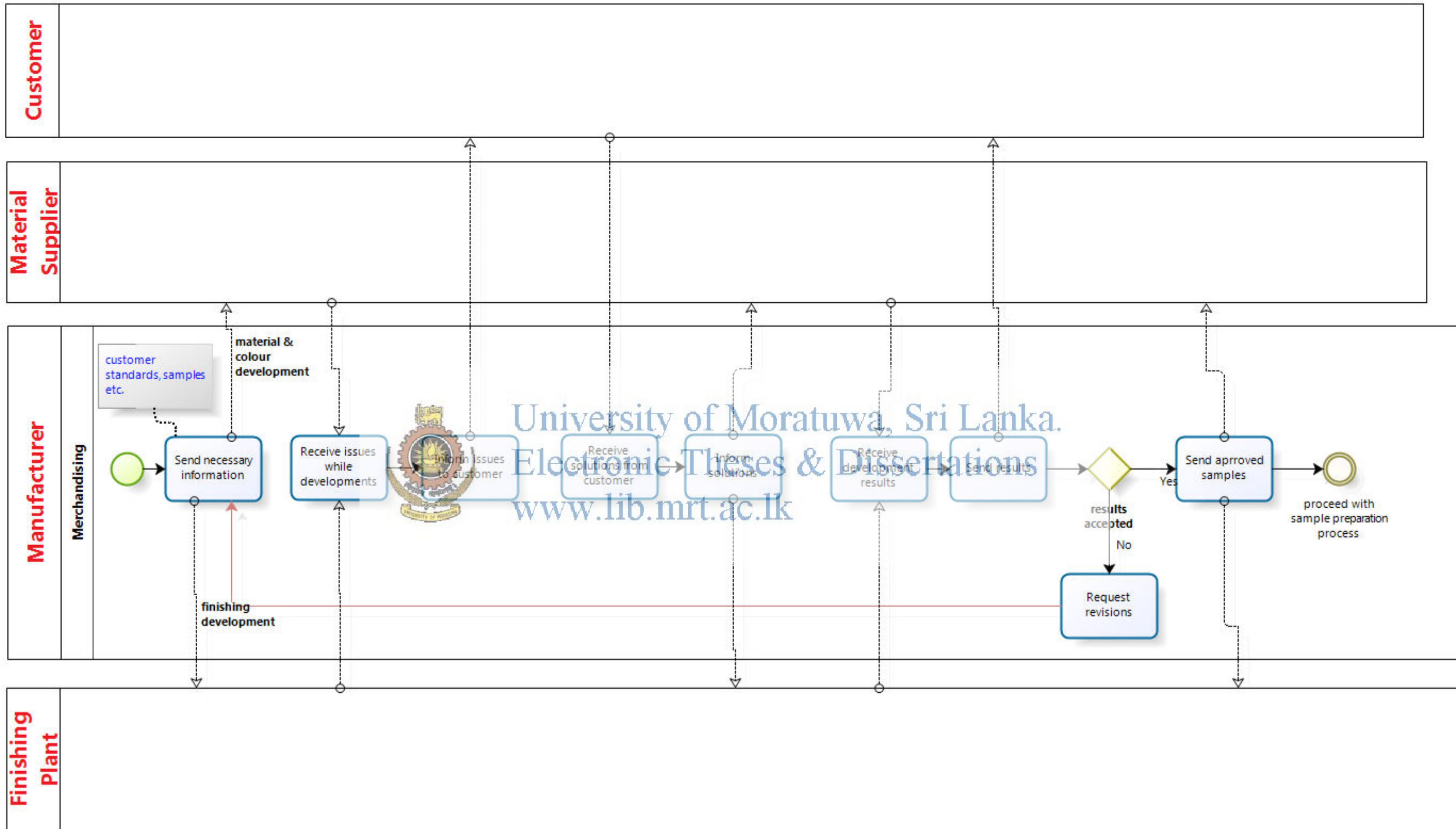**Annex B1.2 - Workflow of the activity *Proto sample developement* of the order Placement sub-process**

Customer

Manufacturer

Designing

Merchandising

Sample Room

Work-study

Receive information

Develop design

Send design

Receive feedback

design accepted

Yes

No

Inform acceptance

Revise design

terminate the order

Design & product development

Send necessary information

Receive design acceptance

Product development only

Find material for samples

Send necessary information and request proto sample

Receive information about issue

Inform Customer about the issue

Receive solution

Send proto sample

Receive feedback

Receive request with information & material

Prepare proto sample

any issue during sample preparation

Yes

No

No

Complete proto sample

proto sample accept

Yes

proceed with the rest of the process

No

terminate the order

Inform issue to relevant parties

Discuss the issue

issue solved

Yes

Continue sample preparation

Do customer accepted changes

Revise proto sample

Receive information about issue

Annex B1.4 - Workflow of the activity *Garment costing* of the Order Placement sub-process

Customer

Manufacturer

Merchandising

next sample stage

Send necessary information to develop samples

Check material availability for samples

materials available

No

Yes

Source material

Send material

Send samples

Receive feedback

samples accepted

Yes

No

all sample stages completed

Send approved sample

No

Inform necessary changes

order confirmed

inform the relevant parties

planning, production, purchasing etc.

terminate the order

Sample Room

Receive material for samples

Receive information

Grade patterns for required sizes from patterns prepared for costing

required sizes depend on customer

Prepare marker

Plot the marker

Cut panels

Sew samples

Check quality of the samples

sample quality accepted

Do necessary changes

Yes

Work-study

Receive approved sample

proceed with production process

Sewing

Receive approved sample

proceed with production process

Annex B3.1 - Workflow of Production Scheduling sub-process

Finishing Plant

Manufacturer

Planning
Send production schedule

Cutting
Receive production schedule
Receive information
Prepare cutting schedule
Prepare cut order plan
Send cut order plan
Receive patterns
Grade patters for required sizes
Prepare marker
Calculate marker efficiency
sufficient efficiency
No
Revise marker
Calculate fabric consumption
Plot the marker
Request required fabric quantity for cutting
Receive fabrics
Prepare fabric lay
Cut garment panels
Check cut panel quality
cut panel quality accept
No
repairable defects
Repair defects
non-repairable defects
Re-cut
Yes
Bundle the panels
one bundle consists panels from number of garments
Receive request
Issue cut bundles
conduct by quality assurance unit

Sample Room
Send patterns prepared for samples

Merchandising
Send necessary information
size to cut ratio, material specifications etc.
Send approved sample
Receive request with necessary information
Issue fabrics for cutting

Stores
Receive cut order plan
Prepare fabrics accorting to the cutting schedule

Material Inspection
Send fabric quality report
Receive request
Issue trims and accessories

Production
Receive production schedule
Receive approved sample
Decide resource requirement
Request cut bundles
Request trims & accessories
operator, machinery etc.
Receive trims and accessories
Sewing
Receive cut bundles
Check quality of partially sewn garment
intermediate quality checking
need repairs
Yes
Do necessary repairs
Continue sewing
No
Finish sewing
Check sewn garment quality
quality accepted
No
Yes
adjustable damage
Adjust damage
non-adjustable damage
Re-sew
Send for finishing
Receive finished garments
Check quality of finished garments
Quality accepted
No
Yes
Due to finishing
Send for corrections
Receive corrected garments
Due to sewing
proceed with order dispatching process
perform at several critical intermediate points by quality assurance unit
conduct by quality assurance unit

Work-study
Receive production schedule
Receive approved sample
Arrange resource requirement
Decide work-place layout
Prepare operation breakdown & actual SMV
Arrange sewing floor for sewing

Annex B6.1 - Workflow of Order Dispatch sub-process

QUESTIONNAIRE – **MERCHANDISING**

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks of Merchandising?

   (B) Check ability to produce the received order (sew-ability, capacity availability etc.) ☐

   (C) Prepare costing for the order ☐

   (D) Coordinate material development of the order ☐

   (D) Coordinate development of finishes (including washing) ☐

   (A, E) Coordinate sample preparation process ☐

   (G) Coordinate material sourcing for bulk ☐

   Coordinate execution of the entire manufacturing process ☐

   Other (describe) ☐

2. Rate the possibility of occurring each option given below, regarding the order type/s that your company receives

Option	Very low	Low	Average	High	Very high
Free On Board (FOB)	☐	☐	☐	☐	☐
No Foreign Exchange (NFE)	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐

3. Rate the possibility of occurring each option given below, regarding the customer request on design and proto samples at order placement

Option	Very low	Low	Average	High	Very high
(A) Customer asks to develop designs for a particular style	☐	☐	☐	☐	☐
(A) Customer sends the design & asks to develop proto sample	☐	☐	☐	☐	☐
(A) Customer doesn't ask to develop proto samples	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐

4. **(A, E)** How are you involved in providing materials for samples?

   Find required materials (at stores or by purchasing) & send to sample room ☐

   Do not involve in any way ☐

   Other (describe) ☐

5. **(A, E)** Does sample room inform you about the issues arise during sample preparation?

   Informs any type of issue ☐

   Informs critical issues only ☐

   Informs only when customer comment is needed ☐

   Never informs, they directly contact customer & solve it ☐

   Other (describe) ☐

6. **(B)** Select the appropriate cell/s which shows the correct **relationship between information need to check ability to produce the order** & the **department the information sends.**

Department \ Information	Sample Room	Work-study	Planning	Other (specify)		
Capacity availability	☐	☐	☐	☐	☐	☐
Sew-ability	☐	☐	☐	☐	☐	☐
Operator skill availability	☐	☐	☐	☐	☐	☐
Machine availability	☐	☐	☐	☐	☐	☐
Other (specify)						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐		☐

7. **(B, F)** In which way/s are you involved in sub-contracting process?

   Decide going for sub-contracting ☐

   Decide which part of the process to sub-contract (eg. Cutting, sewing etc.) ☐

   Prepare sub-contracting plan ☐

   Choose the sub-contractor ☐

   Coordinate entire sub-contracting process ☐

   Do not involve in any way ☐

   Other (describe) ☐

8. **(C)** Rate the possibility of occurring each option given below, regarding the type of costing that customers request

Option	Very low	Low	Average	High	Very high
CM (cost for cut & make only)	☐	☐	☐	☐	☐
CMT (total cost except cost for fabrics)	☐	☐	☐	☐	☐
FOB (total cost including cost for fabrics)	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐

9. **(C)** Select the appropriate cell/s which shows the correct **relationship between information need to prepare costing of the order** & the **department the information sends**

Department / Information	Merchandising it-self	Sample Room	Work-study	Finishing	Other (specify)	
Fabric consumption	☐	☐	☐	☐	☐	☐
Trim consumption	☐	☐	☐	☐	☐	☐
Thread consumption	☐	☐	☐	☐	☐	☐
Standard Minute Value (SMV)	☐	☐	☐	☐	☐	☐
Cost per Minute (CM)	☐	☐	☐	☐	☐	☐
Finishing cost - internal	☐	☐	☐	☐	☐	☐
Other (specify)						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

10. **(D)** How are you involved in developing materials & finishes required for a particular style?

Send relevant information to material supplier & finishing plant ☐

Involve in solving issues occur while developing materials & finishes ☐

Communicate supplier comments to customer ☐

Never involve in any way ☐

Other (describe) ☐

11. **(C, E)** When the customer confirms order?

At the half way of sample preparation process ☐

When all sample stages are completed ☐

When the costing is approved ☐

Other (describe) ☐

12. **(G)** Are you responsible for sourcing materials required for bulk order processing?

Yes, I do material sourcing for bulk ☐

No, but I coordinate the sourcing process (send information, track the progress etc.) ☐

No, but I involve when issues arise ☐

I do not involve in anyway ☐

Other (describe) ☐

13. **(G)** Rate the possibility of occurring each option given below, regarding selecting suppliers to purchase materials

	Very low	Low	Average	High	Very high
Customer nominates suppliers	☐	☐	☐	☐	☐
Merchandiser chooses suppliers	☐	☐	☐	☐	☐

Sourcing/purchasing executive chooses suppliers	☐	☐	☐	☐	☐

14. **(G)** Does Stores inform you about the issues occurring at the delivery of purchased materials?

    Yes, inform any type of issue   ☐

    No, only critical issues are informed   ☐

    Never informs   ☐

    Other (describe)   ☐

15. **(H)** What do you do if quality status of purchased materials is not up to the accepted level?

    Discuss possible solutions with relevant parties (supplier, inspection etc.) ☐

    Involve only if the issue is critical   ☐

    Communicate material inspection issues to supplier   ☐

    Never involves in any situation   ☐

    Other (describe)   ☐

16. **(K)** How are you involved in the finishing process (either cut panels or garments)?

    Involve in solving any type of issue arise within the process   ☐

    Involve in solving critical issues only   ☐

    Communicate comments between finishing department & customer   ☐

    Arrange payments for external finishing plants   ☐

    Never involves in any way   ☐

    Other (describe)   ☐

17. How are you involved in arranging payments to external finishing plants?

    Send necessary documents to finance, to arrange payments   ☐

    Coordinate payment process   ☐

    Do not involve in any way   ☐

    Other (describe)   ☐

18. What are the methods you use to track the progress of the production plan?

    Conduct meetings with all departments   ☐

    Ask each department to update a formatted document prepared by Merchandising   ☐

    Each department updates their progress to a common computerized system   ☐

    Each department updates their own format & sends it   ☐

    Never track the progress of the production plan   ☐

    Other (describe)   ☐

19. Do you normally update the customer about the progress of the production process of the order?

    Yes, I regularly inform the progress   ☐

    Not always, only when customer approval is needed   ☐

    Not always, only when need customer involvement   ☐

    Other (describe)   ☐

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20. Indicate the average time taken to complete each of the following tasks

	Less than one day	1 – 2 days	2 – 4 days	4 – 6 days	7 days or more
(C) To finalize costing after necessary information is received	☐	☐	☐	☐	☐
(B) To check ability to produce the order after necessary information is sent to relevant parties	☐	☐	☐	☐	☐

21. Indicate the number of revisions of each option given below, based on customer response

	Never revise	1 - 2 times	2 - 4 times	4 – 6 times	More than 6 times
(B) Produce-ability checking process	☐	☐	☐	☐	☐
(A, E) Sample preparation process (for one stage)	☐	☐	☐	☐	☐
(C) Garment costing process	☐	☐	☐	☐	☐
(D) Material development process	☐	☐	☐	☐	☐
(D) Garment finishes development process	☐	☐	☐	☐	☐

22. What are the key performance indicators (KPI) of Merchandising?

Delivery hit rate ☐

Air freight rate ☐

Order confirmation rate ☐

Other (describe) ☐

23. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐
(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the style	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production plan of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(L)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation. . 230

QUESTIONNAIRE – **MATERIAL SOURCING** (considered as a separate function from Merchandising)

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below. Mention whether you are responsible for fabric sourcing, trims sourcing or both.

1. What are the major tasks of Material Sourcing process?

    (G) Purchase materials for bulk order processing ☐

    (G) Handle issues occur in delivery of materials purchased ☐

    (H) Approve the quality of the purchased materials ☐

    On-time delivery of purchased materials to the production location ☐

    Other (describe) ☐

2. **(G)** Select the appropriate cell/s which shows the correct relationship between **information receive to purchase materials for bulk** & the **party it sends.**

Party / Information	Merchandising	Planning	Customer	Other (specify)		
Material specifications	☐	☐	☐	☐	☐	☐
Material consumption	☐	☐	☐	☐	☐	☐
Reference sample/ sketch	☐	☐	☐	☐	☐	☐
Supplier information	☐	☐	☐	☐	☐	☐
Production Plan	☐	☐	☐	☐	☐	☐
Other (specify)						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

3. **(G)** How do you check the availability of materials?

    Through Inventory Management System ☐

    Ask from stores ☐

    Refer past documents ☐

    Do not check the availability of materials ☐

    Other (describe) ☐

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4. **(G)** Rate the possibility of occurring each option given below, regarding selecting suppliers to purchase materials

	Very low	Low	Average	High	Very high
Customer nominates suppliers	☐	☐	☐	☐	☐
Merchandiser choose suppliers	☐	☐	☐	☐	☐
Sourcing executive choose suppliers	☐	☐	☐	☐	☐

5. **(G)** When do you ask Finance to approve the Purchase Order (PO) raised?

Every PO raised is sent to Finance to get the approval ☐

Every PO raised for foreign suppliers is sent to Finance to get the approval ☐

When the cost of PO exceeds the allowed cost limit for the material ☐

When a PO is raised for a new supplier ☐

Other (describe) ☐

6. **(G)** Select the appropriate cell/s which shows the correct **relationship between documents/information send & parties they are received.**

Party / Document	Material supplier	Stores	Inspection	Finance	Other (specify)		
Purchase Order (PO)	☐	☐	☐	☐	☐	☐	☐
Reference sample/ sketch	☐		☐		☐		☐
Invoice					☐		☐
Other (specify)							
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐

7. **(G)** How many times do you normally remind supplier the delivery information (delivery date, location etc.?

0 times	1 -2 times	2 – 4 times	4 – 6 times	More than 6 times
☐	☐	☐	☐	☐

8. **(G)** How do you know that the ordered materials are received?

Supplier informs the delivery ☐

Stores informs the receipt ☐

Contact supplier & get to know ☐

Contact stores & get to know ☐

Check from the Inventory Management System ☐

Other (describe) ☐

9. **(G)** How are you involved in solving issues occurred with delivered materials?

Involve to solve any type of issue occurs ☐

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Involve to solve critical issues only ☐

Discuss possible solutions with relevant parties (eg. Supplier) ☐

Work as the coordinator between stores & supplier ☐

Do not involve in any situation ☐

Other (describe) ☐

10. How are you involved in arranging payments to material suppliers?

Send necessary documents to finance, to arrange payments ☐

Coordinate payment process ☐

Do not involve in any way ☐

Other (describe) ☐

11. **(H)** When are you informed about the quality status of the purchased materials, by the inspection department?

Informs only when issues arise ☐

Informs only when need replacements ☐

Informs only when need to contact supplier ☐

Informs to get the approval to proceed with them ☐

Do not inform in any situation ☐

Other (describe) ☐

12. Indicate the average time taken for each of the following tasks

	Less than one day	1 - 2 days	2 – 4 days	4 – 6 days	7 days or more
To get approval from finance when the cost of requirement exceeds the allowed cost limit	☐	☐	☐	☐	☐
To select a supplier to purchase material (if you are responsible)	☐	☐	☐	☐	☐
To raise PO for a material after all information is received	☐	☐	☐	☐	☐
To handle issues arise at delivery	☐	☐	☐	☐	☐

13. What are the key performance indicators (KPI) of material sourcing?

Rate of receipt of correct materials, at the correct time, to the correct location ☐

Number of re-orderings per order, due to faults of sourcing department ☐

Rate of meeting delivery deadlines of purchased materials ☐

Other (describe) ☐

14. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐

(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the garment	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production schedule of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(M)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student)   *tolushayapa@gmail.com*

QUESTIONNAIRE – **SAMPLE ROOM**

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks of Sample Room?

    (B) Decide capability to sew the style (whether style can be sewn or not) ☐

    (C) Calculate fabric consumption for costing ☐

    (E) Conduct customer requested sample stages ☐

    Other (describe) ☐

2. **(B)** Do you normally discuss with Work-study, when checking the capability to sew the style?

    Yes, always discuss with work-study ☐

    Not always, only when a technical difficulty occurs ☐

    Not always, only to check availability of resources (machines, operators etc.) ☐

    Not always, only to check possible alternatives to sew the style ☐

    Never discuss with works-study ☐

    Other (describe) ☐

3. **(A, E)** Does Merchandiser provide materials for samples?

    Yes, Merchandiser provides them ☐

    No, we check stores & borrow, if available ☐

    No, we check stores & inform Merchandiser to purchase, if materials are not available ☐

    Other (describe) ☐

4. **(A, E)** Tick on the appropriate cell/s which shows the correct relationship between **major parties you inform or discuss issues occur while sample development & when they are informed or discuss**

Major party / When to inform	Merchandising	Work-study	Other (specify)		
Always, any type of issue	☐	☐	☐	☐	☐
Only when issue cannot be solved or no alternative found	☐	☐	☐	☐	☐
Only when a technical issue arise	☐	☐	☐	☐	☐
Only when need to get comments from customer	☐	☐	☐	☐	☐

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Other (describe)					
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

5. **(A, E)** Are you authorized to directly contact customer?

   Yes, I am authorized ☐

   Not always, but authorized to send samples & information to customer ☐

   Not always, Merchandiser works as the intermediary when issues occur ☐

   No, Merchandiser always works as the intermediary between me & customer ☐

   Other (describe) ☐

6. **(A,B,C,E)** Indicate the average number of revisions need to conduct for each of the below tasks, in order to be accepted by the customer

	Never revise	1 - 2 times	2 - 4 times	4 – 6 times	More than 6 times
To decide capability to sew the style	☐	☐	☐	☐	☐
To calculate fabric consumption	☐	☐	☐	☐	☐
To complete one sample stage	☐	☐	☐	☐	☐

7. Tick on the appropriate cell/s which shows correct relationship between the **outputs you generate** & the **parties they are sent**

Party / Information	Merchandising	Customer	Work-study	Cutting (Marker making)	Other (specify) production	
Prepared samples	☐	☐	☐	☐	☐	☐
Prepared patterns	☐	☐	☐	☐	☐	☐
Mini-marker	☐	☐	☐	☐	☐	☐
Fabric consumption	☐	☐	☐	☐	☐	☐
Sew-ability information	☐	☐	☐	☐	☐	☐
Other (specify)						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

8. What are the key performance indicators (KPI) of sample room functions?

   No. of revisions per sample stage ☐

   On-time delivery of samples to customer ☐

   Other (describe) ☐

9. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐
(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the garment	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production schedule of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(M)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student)   *tolushayapa@gmail.com*
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QUESTIONNAIRE – OPERATIONAL PLANNING

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks of Planning?

    (B) Check capacity availability to produce the order ☐

    (F) Prepare production schedule of the order (E.g. start & finish dates, daily quantity etc.) ☐

    Monitor the progress of the operational plan ☐

    Re-schedule the plan when actual execution deviates from the plan ☐

    Other (describe) ☐

2. **(B)** What are the decisions you take if available capacity is not sufficient to produce the order, when checking the capacity availability to produce the order?

    Re-check the capacity availability ☐

    Decide to go for sub-contracting ☐

    Inform the best possible date to complete the order ☐

    Discuss possible options with Merchandiser ☐

    Other (describe) ☐

3. **(B, F)** In which way/s are you involved in sub-contracting process?

    Decide going for sub-contracting ☐

    Decide which part of the process to sub-contract (eg. Cutting, sewing etc.) ☐

    Prepare sub-contracting plan ☐

    Choose the sub-contractor ☐

    Coordinate entire sub-contracting process ☐

    Do not involve in any way ☐

    Other (describe) ☐

4. **(F)** When do you prepare production schedule for a particular order?

    When the order is confirmed ☐

    At the same time while checking capacity availability to produce the order ☐

    Rough plan is prepared while checking capacity availability ☐

    Other (describe) ☐

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5. Tick on the appropriate cell/s which shows correct relationship between the **information need to prepare production schedule** & the **department the information sends**

Department / Information	Merchandising	Work-study	Other (specify)		
Order Quantity	☐	☐	☐	☐	☐
Order Dispatch Date	☐	☐	☐	☐	☐
Standard Minute Value (SMV)	☐	☐	☐	☐	☐
Learning Curve/ Efficiency Ladder	☐	☐	☐	☐	☐
Style Details (e.g. m/cs needed)	☐	☐	☐	☐	☐
Other (specify)					
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

6. **(F)** How do you allocate time for each function of the manufacturing process?

There is a fixed time allocated for each process for any type of order ☐

(e.g. 3 days for cutting, 2 days for fabric inspection etc.)

It depends on order details ☐

(e.g. quantity, delivery date etc.)

Other (describe) ☐

7. **(F)** Select the appropriate cell/s which shows the correct relationship between **information send by you &** the **departments it receive.**

Department / Information	Merchandising	Cutting	Material Inspection	Production	Other (specify) Stores	
Total production plan	☐	☐	☐	☐	☐	☐
Sewing-floor plan	☐	☐	☐	☐	☐	☐
Sub-contract plan	☐	☐	☐	☐	☐	☐
Cut start date	☐	☐	☐	☐	☐	☐
Material inspection plan	☐	☐	☐	☐	☐	☐
Other (specify)						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

8. What are the methods you use to track the progress of the plan?

Conduct meetings with departments ☐

Ask each department to update a formatted document prepared by planning ☐

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Each department updates their progress to a common computerized system ☐

Never track the progress of the production plan ☐

Other (describe) ☐

9. What are the decisions you take if any department fails to achieve the planned schedule?

Ask the responsible department to work overtime to achieve the schedule ☐

Ask next step of the process to work overtime to achieve the schedule ☐

(E.g. ask cutting to work overtime to achieve the delay at inspection)

Revise the schedule if deviation is due to an uncontrollable factor ☐

(E.g. supplier has sent materials on time, but delivery is late due to a problem

due to an external issue)

Other (describe) ☐

10. How many times do you normally revise operational plan for a particular order, due to the inability to achieve the plan by respective departments?

Never revise	1 – 2 times	2 – 4 times	4 – 6 times	More than 6 times
☐	☐	☐	☐	☐

11. Indicate the average time taken for each of the following tasks

	Less than one day	1 – 2 days	2 – 4 days	4 – 6 days	7 days or more
(B) To check capacity availability	☐	☐		☐	☐
(F) To finalize operational plan of an order	☐	☐	☐	☐	☐
Re-schedule plan due to issues at execution	☐	☐	☐	☐	☐
Receive comments from relevant departments	☐	☐	☐	☐	☐

12. What are the key performance indicators (KPI) of planning process?

(B) Average time taken to check capacity availability for an order ☐

(F) Average time taken to prepare operational plan for an order ☐

Average time taken to handle an issue occurs at execution of plan ☐

(F) Rate of being right first time in preparing the plan ☐

Number of re-schedules per order ☐

Level of technology usage in monitoring the progress of the plan ☐

Other (describe) ☐

13. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐
(B)	Check capability to produce the garment	☐	☐	☐	☐	☐

(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the garment	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production schedule of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(M)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student)   *tolushayapa@gmail.com*

QUESTIONNAIRE – **RAW MATERIAL STORES**

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks of Raw Material Stores?

    (G) Accept delivered materials after checking against the requirement ☐

    (H) Issue materials for inspection ☐

    (I) Issue fabrics for cutting ☐

    (J) Deliver trims & accessories to production location on-time ☐

    (L) Deliver finishing materials (eg. Packing) to finishing department on-time ☐

    Other (describe) ☐

2. **(G)** When do you inform Sourcing about delivered materials?

    When materials of a particular PO is received to stores ☐

    When issues occur in delivered materials ☐

    When need to contact supplier ☐

    When the delivered materials are accepted ☐

    Other (describe) ☐

3. What do you do if any issue occurs with the delivered materials?

    Inform supplier directly ☐

    Inform the issue to Sourcing executive ☐

    Hold entire batch without accepting (do not GRN goods received) ☐

    Accept the goods (raise GRN) which are not caused the issue ☐

    Other (describe) ☐

4. **(G)** What do you do just after the delivered materials are accepted?

    Raise Goods Receive Note (GRN) for accepted materials ☐

    Cut swatches from each fabric roll received, for colour classification test ☐

    Number each batch accepted by giving a manufacturer batch number ☐

    Other (describe) ☐

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5. **(G)** Tick on the appropriate cell/s which shows correct relationship between the **information/physical items you send after delivered materials are accepted** & the **department it receives**

Department Information	Sourcing	Inspection	Merchandising	Finance	Other (specify)	
Goods Receive Note (GRN)	☐	☐	☐	☐	☐	☐
Manufacturer batch numbers	☐	☐	☐	☐	☐	☐
Supplier invoice	☐	☐	☐	☐	☐	☐
Swatches cut for colour classification	☐	☐	☐	☐	☐	☐
Other (specify)						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

6. **(H)** How do you provide samples for inspection tests?

Inspection department requests samples by giving necessary information (eg. Quantity) ☐

Samples we prepare are sent before they are requested (eg. For colour classification) ☐

Inspection department itself comes & gets necessary samples ☐

Other (describe) ☐

7. **(H)** When are you informed about the quality of the delivered materials?

Informs either quality is accepted or rejected with the inspection report ☐

Informs to hold the batch if quality is not accepted ☐

Informs to proceed with the batch if quality is accepted ☐

Never informed ☐

Other (describe) ☐

8. **(H)** What do you do if quality of the materials is accepted by inspection department?

Store materials of the relevant batch based on shade groups ☐

Send trims & accessories to production plant ☐

Arrange fabrics according to the cut order plan ☐

Store materials of relevant batch without considering any particular factor ☐

Other (describe) ☐

9. **(I)** Do you receive the cut order plan prepared by the cutting department?

Yes ☐   No ☐

If your answer is 'No', please ignore Question No. 10

10. **(I)** Do you arrange fabric requirement for cutting (based on cut order plan), before it is requested?

Yes, always arrange in advance ☐

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	Not always, only when need to relax fabrics	☐
	Never	☐
	Other (describe) ☐	

11. Indicate the average time taken for each of the below tasks

	Less than one day	1 – 2 days	2 – 4 days	4 – 6 days	7 days or more
To GRN materials of a particular order, from the delivery date	☐	☐	☐	☐	☐
To issue materials to inspection from the request (if it is your responsible)	☐	☐	☐	☐	☐
To issue materials to cutting, from the request	☐	☐	☐	☐	☐

12. What are the key performance indicators (KPI) of Stores?

13. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐
(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the garment	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production schedule of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(L)	Packing	☐	☐	☐	☐	☐
(M)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student)   *tolushayapa@gmail.com*
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QUESTIONNAIRE – **MATERIAL QUALITY ASSURANCE**

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks of Material Inspection process?

    (H) Conduct inspection tests for purchased materials ☐

    (H) Decide the quality status of purchased materials ☐

    (H) Prepare material inspection reports ☐

    (H, I, J) Send inspection results to relevant parties ☐

    Other (describe) ☐

2. **(H)** Select the appropriate cell/s which shows the correct **relationship between information receive to inspect materials &** the **department it sends**.

Department / Information	Merchandising	Planning	Stores	Sourcing	Other (specify)	
Material specifications	☐	☐	☐	☐	☐	☐
Customer approved samples	☐	☐	☐	☐	☐	☐
Customer standards	☐	☐	☐	☐	☐	☐
Production plan	☐	☐	☐	☐	☐	☐
Goods Receive Note (GRN)	☐	☐	☐	☐	☐	☐
Manufacturer batch numbers	☐	☐	☐	☐	☐	☐
Supplier test reports	☐	☐	☐	☐	☐	☐
Other (specify)						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

3. **(H)** How do you get samples from materials delivered?

    Request samples from stores by giving necessary information (eg. Sample size) ☐

    Some samples are received from stores, in advance (eg. Colour classification test) ☐

    Go to stores & select samples from delivered materials ☐

    Other (describe) ☐

4. **(H)** What are the possible options regarding the status of a particular batch & a consignment?

Accept/Pass ☐

Reject/Fail ☐

Hold ☐

Other (describe) ☐

5. **(H)** What do you do if quality status of the batch or consignment is rejected or decided to kept hold?

Discuss possible solutions with supplier directly ☐

Inform the issue to supplier through Merchandiser ☐

Inform the issue to supplier through Sourcing executive ☐

Inform Stores to hold the batch without proceeding further ☐

Other (Describe) ☐

6. **(H)** What do you do if the quality status of the purchased materials is accepted?

Inform Stores to proceed with the accepted materials ☐

Send fabric quality report to Cutting ☐

Send fabric quality report to Marker making/CAD (if it is a separate unit of cutting) ☐

Send both fabric & trims quality reports for Production ☐

Send both fabric & trims quality reports for Stores ☐

Other (describe) ☐

7. **(F, H)** How do you decide the time duration to check the quality status of a particular batch?

Fixed time duration is allocated in the production plan ☐

Decide depending on the batch details (eg. Quantity) ☐

There is no such allocation of time ☐

Other (describe) ☐

8. **(H)** How long does it take to complete entire material quality assurance process?

	Less than one day	1 – 2 days	2 – 4 days	4 – 6 days	7 days or more
Fabrics	☐	☐	☐	☐	☐
Trims & accessories	☐	☐	☐	☐	☐

9. **(H)** Indicate the key performance indicators of fabric inspection process, in the space provided below

10. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐

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(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the garment	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production schedule of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(M)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student) *tolushayapa@gmail.com*

QUESTIONNAIRE – **CUTTING**

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks of Cutting process?

   (I) Prepare daily cutting schedule for a particular order ☐

   (I) Prepare markers ☐

   (I) Cut garment panels according to the marker ☐

   (I) Bundle cut panels ☐

   Other (describe) ☐

2. **(I)** Select the appropriate cell/s which shows the correct **relationship between information/documents receive for cutting** & the **department it sends.**

Department / Information	Inspection	Planning	Sample Room	Merchandising	Other (specify)	
Fabric quality report	☐	☐	☐	☐	☐	☐
Production plan	☐	☐	☐	☐	☐	☐
Garment patterns	☐	☐	☐	☐	☐	☐
Style information	☐	☐	☐	☐	☐	☐
Printed (plotted) marker	☐	☐	☐	☐	☐	☐
Other (specify)						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

3. Which of the following statements are true regarding the information you send to other departments?

   Daily cutting plan is prepared based on production plan ☐

   Daily cutting schedule is sent to Production ☐

   Daily cutting schedule is sent to Production Stores ☐

   Cut order plan is sent to Stores ☐

   Cut order plan is sent to Production ☐

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4. **(I)** Which of the following statements are true regarding marker making in your organization?

Marker making is a responsibility of cutting ☐

Marker making is a responsibility of sample room ☐

There is a separate marker making (CAD) unit ☐

If your answer is `Marker making is a responsibility of cutting' only, please answer Question No.5

5. **(I)** How do you find patterns for the marker?

Graded patterns are received from sample room ☐

Grade the patterns received from sample room, to the required sizes ☐

Develop patterns to one size & grade the rest of the requirement ☐

Other (describe) ☐

6. **(I)** Do you prepare a separate plan for fabric laying (lay planning)?

Yes, a separate plan is prepared for laying based on cut order plan ☐

Not always, only when a special laying requirement to be achieved ☐

A separate plan is not prepared for laying ☐

Other (describe) ☐

7. **(I)** How do you get fabrics for cutting?

Requests fabrics from Stores by providing necessary information ☐

Stores sends fabrics based on cut order plan, on-time ☐

Other (describe) ☐

8. **(I)** What do you do for the quality accepted cut panels?

Store bundled panels until production plant requests them ☐

Store bundled panels until they are sent for finishing (for pre-sewing finishing) ☐

Send them to the production plant just after bundling ☐

Other (describe) ☐

9. **(F, I)** How do you decide the time duration for the cutting process?

Fixed time duration is allocated in the production plan ☐

Depend on the quantity to be cut ☐

Depend on cutting complexity (eg. Matching) of the style ☐

There is no such allocation of time ☐

Other (describe) ☐

10. Indicate the number of occurrences per cut, of each task given below

Task	0 times	1 – 2 times	2 – 4 times	4 – 6 times	More than 6 times
Average no. of re-cuts per lot (quantity cut once)	☐	☐	☐	☐	☐

Average no. of marker revisions per cut (answer if it is your are responsible)	☐	☐	☐	☐	☐

11. What are the key performance indicators (KPI) of cutting process?

Number of re-cuts per order   ☐

Cut panels quality acceptance rate   ☐

Marker efficiency achievement rate   ☐

Other (describe)   ☐

12. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐
(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the garment	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production schedule of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(M)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student)   *tolushayapa@gmail.com*   .

QUESTIONNAIRE – **PRODUCTION**

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks of Production process?

   (B) Decide capability to produce the order ☐

   (J) Decide resources (operator, m/c etc.) need to sew the style ☐

   (J) Decide work-place layout to sew the style ☐

   (J) Sew garments while meeting customer expected quality level ☐

   Other (describe) ☐

2. **(B)** How are you involved in checking the capability to produce the order?

   I am fully responsible in checking resource availability to produce the order ☐

   Help sample room to decide the ability to sew the style ☐

   Send information to planning, to decide capacity availability to produce the order ☐

   I am not involved in any way ☐

   Other (describe) ☐

3. **(C)** Do you provide any information to prepare costing? If your answer is 'Yes', explain what information you provide, in the space provided

   Yes ☐   No ☐

4. **(J)** When do you check the resource requirement to produce the order?

   When the customer approved sample is received ☐

   When the production plan is received ☐

   At the same time while checking the resource availability to produce the order ☐

   I am not involved in checking resource requirement to produce the order ☐

   Other (describe) ☐

   If your answer is 'I am not involved in checking resource requirement to produce the order', please ignore Question No.5

5. **(J)** How are you involved in deciding the resource requirement to produce the order?

   Sew one garment as per the customer approved sample & decide required resources ☐

   Prepare operation breakdown & decide the resource requirement ☐

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Discuss with work-study about the required resources to produce the order ☐

Discuss with human resource division about the human resource availability ☐

Discuss with maintenance division about the machine availability ☐

Other (describe) ☐

6. **(J)** What do you do if available resources are not sufficient for a particular order?

For human resource, inform the shortage for human resource division ☐

For human resource, inform the shortage for operator training division ☐

For machinery, inform the shortage to maintenance division ☐

Other (describe) ☐

7. **(J)** How do you decide the work-place layout of the sewing line to sew the style?

Decide based on the garment sewn as per the customer approved sample ☐

Decide based on capabilities of available resources & operation breakdown ☐

Discuss with work-study & decide the work-place layout ☐

I am not involved in deciding the work-place layout ☐

Other (describe) ☐

8. **(I, J)** Do you normally request cut panels of a particular order from cutting department?

Yes, always request the requirement based on production plan ☐

No, cutting department sends them after bundling ☐

Other (describe) ☐

9. **(G, J)** Do you normally request trims & accessories of a particular order from stores?

Yes, always request the requirement based on production plan ☐

No, stores send them if quality is accepted ☐

Other (describe) ☐

10. Which of the following statements are true, regarding arranging the work-place layout of the sewing line

Work-place layout is arranged while the line is feeding ☐

Line feeding is done after work-place layout is arranged ☐

Production is responsible in arranging work-place layout ☐

Work-study is responsible in arranging work-place layout ☐

11. **(J)** What do you do for the garments which are sewn in customer accepted quality level?

Store until they are sent for finishing ☐

Send to finishing plant just after quality checking ☐

Other (describe) ☐

12. What are the key performance indicators (KPI) of production?

13. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐
(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the style	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production plan of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(L)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student)   *tolushayapa@gmail.com*

QUESTIONNAIRE – **WORK-STUDY**

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks of Work-study?

   (A, E) Handle issues occur during sample development ☐

   (B) Decide capability to produce the order ☐

   (C) Calculate Standard Minute Value (SMV) for costing ☐

   (C) Calculate threads consumption for costing ☐

   (J) Decide resources (operator, m/c etc.) need to sew the style ☐

   (J) Decide work-place layout to sew the style ☐

   Other (describe) ☐

2. **(B)** How are you involved in checking the capability to produce the order?

   I am fully responsible in checking resource availability (operator, m/c) to produce the order ☐

   Help sample room to decide the sew-ability of the style ☐

   Send information to planning, to decide capacity availability to produce the order ☐

   I am not involved in any way ☐

   Other (describe) ☐

3. **(B)** Does Sample room discuss with you, when checking the sew-ability of the style?

   Yes, always discuss with sample room ☐

   Not always, only when a technical difficulty occurs ☐

   Not always, only to check availability of resources (machines, operators etc.) ☐

   Not always, only to check possible alternatives ☐

   Never discuss with sample room ☐

   Other (describe) ☐

4. **(A, E)** In which way/s are you involved in sample development process?

   Involves in handling any type of issue ☐

   Involves in handling technical issues only ☐

   Not involve in any way ☐

   Other (describe) ☐

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5. **(C)** How many times do you normally revise information calculated for costing, per order?

Never revise	1 – 2 times	2 – 4 times	4 – 6 times	More than 6 times
☐	☐	☐	☐	☐

6. **(J)** When do you check the resource requirement to sew the style?

    When the customer approved sample is received   ☐

    When the production plan is received   ☐

    At the same time while checking the resource availability to produce the order   ☐

    I am not involved in checking resource requirement to produce the order   ☐

    Other (describe)   ☐

    If your answer is `I am not involved in checking resource requirement to produce the order', please ignore Question No. 7

7. **(J)** How are you involved in deciding the resource requirement to produce the order?

    Sew one garment as per the customer approved sample & decide required resources   ☐

    Prepare operation breakdown & decide the resource requirement   ☐

    Discuss with production about the required resources to produce the order   ☐

    Discuss with human resource division about the human resource availability   ☐

    Discuss with maintenance division about the machine availability   ☐

    Other (describe)   ☐

8. **(J)** What do you do if available resources are not sufficient for a particular order?

    For human resource, inform the shortage for human resource division   ☐

    For human resource, inform the shortage for operator training division   ☐

    For machinery, inform the shortage to maintenance division   ☐

    Other (describe)   ☐

9. **(J)** How do you decide the work-place layout of the sewing line to sew the style?

    Decide based on the garment sewn as per the customer approved sample   ☐

    Decide based on required resources & operation breakdown   ☐

    Decide based on operation breakdown & actual SMV of the garment   ☐

    Discuss with production and decide the work-place layout   ☐

    I am not involved in deciding the work-place layout   ☐

    Other (describe)   ☐

10. **(J)** How are you involved in sewing?

    To arrange work-place layout of the sewing line   ☐

    To guide operators in sewing first few garments   ☐

    To calculate performance of operators in sewing line   ☐

To handle issues occur during production ☐

Do not involve in any way ☐

Other (describe) ☐

11. Which of the following statements are true, regarding arranging the work-place layout of the sewing line

Work-place layout is arranged while the line is feeding ☐

Line feeding is done after work-place layout is arranged ☐

Production is responsible in arranging work-place layout ☐

Work-study is responsible in arranging work-place layout ☐

12. Indicate the average time taken for each of the below tasks

	Less than one day	1 - 2 days	2 – 4 days	4 – 6 days	7 days or more
To check resource availability to sew the style	☐	☐	☐	☐	☐
To decide resource requirement to sew the style	☐	☐	☐	☐	☐
To decide work-place layout of the sewing line, to sew the style	☐	☐	☐	☐	☐

13. What are the key performance indicators (KPI) of work-study?

14. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐
(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the garment	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐
(F)	Prepare production schedule of the order	☐	☐	☐	☐	☐
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(M)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student)   *tolushayapa@gmail.com*   . 256

QUESTIONNAIRE – PRODUCTION QUALITY ASSURANCE

INSTRUCTIONS

- **Please tick the relevant check box provided in front of the option/s you choose.**

- **You may have more than one answer. If so please tick them all.**

- **If your answer belongs to the option "Other", describe/specify it on the space provided in front of the option.**

- **Please take few seconds to understand the question & answers, then select your choice/es.**

Please write your company name & your designation on the space provided below.

1. What are the major tasks in Production Quality Assurance process?

    (I) Check quality of cut panels ☐

    (J) Check garment quality while sewing (intermediate points) ☐

    (J) Check garment quality at the end of sewing ☐

    (K) Check garment quality after finishing ☐

    (L) Check quality of packing ☐

    Other (describe) ☐

2. **(I)** What is the sample size for cut panel inspection?

    Conduct 100% inspection for any garment type ☐

    Conduct 100% inspection for complex situations ☐

    Conduct random inspection for any garment type ☐

    It depends on the cut panel quantity ☐

    It depends on the garment quantity of the cut ☐

    Other (describe) ☐

3. **(I)** What do you do to the cut panels with defects?

    Repairable defects are repaired at the point of inspection ☐

    Non-repairable defects are informed to re-cut ☐

    Other (describe) ☐

4. **(J)** How do you set the intermediate quality check points for a particular garment?

    There is a pre-defined set of intermediate points for any garment type ☐

    Depends on the complexity of sewing operations ☐

    Other (describe) ☐

5. **(J)** What is the sample size for intermediate quality checking?

    Conduct 100% inspection for any garment type ☐

    Conduct 100% inspection for complex operations ☐

    Conduct random inspection for any garment type ☐

It depends on the garment quantity to sew per delivery ☐

Other (describe) ☐

6. **(I)** Rate the possibility of occurring each of the below options per lot (quantity inspected once), for quality checking while sewing & after sewing

		Very low	Low	Average	High	Very high
While sewing	Repairable defects	☐	☐	☐	☐	☐
	Non- repairable defects	☐	☐	☐	☐	☐
After sewing	Repairable defects	☐	☐	☐	☐	☐
	Non- repairable defects	☐	☐	☐	☐	☐

7. **(J)** What do you do to the garments with damages?

Repairable damages are given to the responsible operator to repair ☐

Non-repairable damages are informed to re-sew ☐

Other (describe) ☐

8. **(K)** How are you involved in checking the quality of garments after finishing?

If finishing is done internally (within the company), both quality of finishing & quality of the } ☐
garment after finishing is checked

If finishing is done externally (by an external plant) only quality of garments after finishing } ☐
Is checked

Other (describe) ☐

9. **(K)** In internal finishing, what do you do for the damages after finishing?

Repairable damages are sent for repairs ☐

Non- repairable damages are informed to Merchandising ☐

Other (describe) ☐

10. What are the key performance indicators (KPI) of quality assurance?

11. Rate the key operational processes given below, according to your feeling about their level of performance within your organization

	Process	Very low	Low	Average	High	Very high
(A)	Design & proto sample development at the beginning of a particular order	☐	☐	☐	☐	☐
(B)	Check capability to produce the garment	☐	☐	☐	☐	☐
(C)	Calculate garment costing	☐	☐	☐	☐	☐
(D)	Develop materials & finishes for the style	☐	☐	☐	☐	☐
(E)	Prepare samples (product development)	☐	☐	☐	☐	☐

(F)	Prepare production plan of the order	☐	☐	☐	☐	☒
(G)	Purchase materials for bulk	☐	☐	☐	☐	☐
(H)	Check quality of purchased raw materials	☐	☐	☐	☐	☐
(I)	Cutting	☐	☐	☐	☐	☐
(J)	Sewing	☐	☐	☐	☐	☐
(K)	Finishing – within the company	☐	☐	☐	☐	☐
	Finishing – by external party	☐	☐	☐	☐	☐
(L)	Monitoring & controlling entire manufacturing process	☐	☐	☐	☐	☐

Thank you for your corporation.

For clarifications please contact Tolusha Yapa (research student)   **tolushayapa@gmail.com**
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Annex D1.1 – Analyzing and Generalizing sub-process validation data

Analyzing Dichotomous Data

Dichotomous type data has only two possibilities, *Yes* or *No* (Bryman and Bell, 2007). Questions with dichotomous data in the questionnaire contain more than one option. If Question 01 of the merchandising questionnaire is considered (refer Annex C1), 7 options were given where the respondent only selects the options suitable to him. The selected options were considered as 'Yes' while others were considered as 'No'.

E.g. Question 01 in the 'Merchandising' questionnaire (Annex C1)

1. What are the major tasks you perform during merchandising process?

    Develop proto samples for the designs available in the order ⊠
    Check produce-ability of the order before order is confirmed ⊠
    Prepare costing for the order ⊠
    Coordinate development of materials ⊠
    Coordinate development of finishing (including washing) process ⊠
    Coordinate sample preparation process ⊠
    Coordinate material sourcing for bulk ☐
    Coordinate execution of the entire manufacturing process & handle issues ☐
    Other (describe) ☐

Data analysis technique adopted for dichotomous data was Frequency Tables (Bryman and Bell, 2007). For each option, 'Yes rate' and 'No rate' were calculated based on the number of valid responses received.

$$Yes\ rate = \frac{'Yes'\ count\ of\ the\ option}{Total\ count\ of\ valid\ responses\ of\ the\ option}$$

$$No\ rate = \frac{'No'\ count\ of\ the\ option}{Total\ count\ of\ valid\ responses\ of\ the\ option}$$

If *Yes rate* $\geq$ *No rate*, then the option was selected. Otherwise it was rejected.

Option	1	2	3	4	5	6	7	8	9
Sample size	30	30	30	30	30	30	30	30	30
Responses	19	19	19	19	19	19	19	19	19
Yes count	18	19	19	18	19	18	17	0	0
Yes rate/sample	0.95	1	1	0.95	1	0.95	0.89	0	0
No count	1	0	0	1	0	1	2	19	19
No rate/sample	0.05	0	0	0.05	0	0.05	0.11	1	1
Selection	S	S	S	S	S	S	S	NS	NS

Analyzing Ordinal Data

Questions with ordinal type data was presented in the questionnaire with a five point scale which was prepared in the order of increment of the usage of the options given in the question (Bryman and Bell, 2007).

E.g. Question 03 in the 'Merchandising' questionnaire (Annex C1)

Option	Very low	Low	Average	High	Very high
Customer asks to develop designs for a particular style	☒	☐	☐	☐	☐
Customer sends the design & asks to develop proto sample	☐	☐	☐	☐	☒
Customer doesn't ask to develop proto samples	☒	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐

Respondents were asked to rate each option based on the given scale where

Very Low   1   Low   2   Average   3   High   4   Very High   5

For each option, total 'Yes count' of each point of the scale was multiplied by the corresponding value of the point. Then the total Yes counts of all the points of a particular option were summed up and the average rating of the entire option was calculated. If the average rating of the option is equal or greater than the average value of the points (3), then the option was selected as an activity happens within the core operational process of the Sri Lankan apparel manufacturing business, at present.

Option			1					3		
Sample size	30	30	30	30	30	30	30	30	30	30
Responses	19	19	19	19	19	19	19	19	19	19
Response rate	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Yes count	4	2	4	6	3	13	4	2	0	0
Total count	4	4	12	24	15	13	8	6	0	0
					59					27
Average					3.11					1.42
			SELECT(3.11 ≥ 3)							

Generalizing the survey results

Each option of each question in the corresponding questionnaire was hypothetically evaluated by defining suitable hypotheses.

E.g. 1st option of the Question 01 in the 'Merchandising' questionnaire, *Develop proto samples for the designs available in the order* (Annex C1)

H_0: *Develop proto samples for the designs available in the order* is not an activity of the Order Placement sub-process

H_1: *Develop proto samples for the designs available in the order* is an activity of the Order Placement sub-process

- *t*-distribution is used in generalizing the sample results for the entire Sri Lankan Apparel Industry

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} \tag{1}$$

Where $\bar{x}$ – mean of the sample

μ - mean of the population

s – standard deviation of the sample $s = \sqrt{\frac{\sum (xi - \bar{x})^2}{n-1}}$

n – number of valid responses received

1. Ordinal type data

- Each option of the question is subjected to generalization
  - ✓ Find the sample mean $\bar{x}$ from the data collected from the survey
  - ✓ Calculate the corresponding *t* value (t_{actual}), using eq. (1)

✓ Find the critical t value ($t_{critical}$) corresponding to the degree of freedom (n-1) and confidence interval of 95%

✓ If $t_{critical} < t_{actual}$ then the corresponding option is Accepted. If not it is rejected.

2. <u>Dichotomous type data</u>

- Each option of the question is subjected to generalization

- Find the sample mean $\bar{x}$ from the data collected from the survey

- Since the data is binomial, then

  $\bar{x}$ – success rate of the option / Yes rate of the option = p

  $q = p-1$ $\qquad$ $s = \sqrt{pq}$

  Then $t = \dfrac{\bar{x} - p}{\sqrt{\dfrac{pq}{n}}}$ $\hspace{4cm}$ (2)

- Calculate the corresponding t value (t_{actual}), using eq. (2)

- Find the critical t value ($t_{critical}$) corresponding to the degree of freedom (n-1) and confidence interval of 95%

- If $t_{critical} < t_{actual}$ then the option is Accepted. If not option is rejected.

Annex D1.2 – Sub-process verification results

Sub-process – Order Placement annexed in B1.1

Activity	Merchandising		Sample Room		Planning		Stores		Cutting		Work-study		Sewing		Production Quality		Material Supplier		Finishing	
	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q
Coordinate both designs and proto samples development	√	√																		
Find materials for proto samples	√	√																		
Develop proto samples			√																	
Inform proto sample development issues			√	√																
Parties informed about proto sample development issues			√	√									√	√						
Inform proto sample development issues to customer	√	√																		
Inform solutions to the issues	√	√																		
Parties who are informed about the solutions			√	√																
Send proto samples to customer																				
Receive customer feedback about proto samples	√	√																		
Inform customer feedback	√	√																		
Receive customer feedback			√	√																
Do corrections requested by the customer			√	√																
Check feasibility to produce the order																				
Request information to check produce-ability of the order	√	√																		
Send capacity availability to check produce-ability					√	√														
Send sew-ability to check produce-ability			√	√									√	√						
Resource availability													√	√						

P – Checking criterion of whether the activity is included in the Order Placement sub-process under the corresponding department
Q –Checking criterion of whether the activity is verified by the industry as it happens under the same department

Task	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
Inform produce-ability to customer	√	√															
Receive feedback about produce-ability from customer	√	√															
Calculate costing of the order	√	√															
Request information for costing	√	√															
Send fabric consumption for costing			√	√													
Send trim consumption for costing	√	√															
Send thread consumption for costing											√	√					
Send Standard Minute Value for costing											√	√					
Send material cost per garment for costing																√	√
Send finishing cost per garment for costing																	
Send costing to customer	√	√															
Receive feedback from the customer	√	√															
Request revisions from relevant parties																	
Send information to develop materials and finishes	√																
Receive information to develop materials and finishes																√	√
Inform development issues to customer	√	√															
Receive solutions from the customer	√	√															
Inform solutions to relevant parties	√	√															
Parties receive solutions																√	√
Send development results to customer	√	√															

Activity	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19
Send material information; specifications, quantity etc.	√	√																	
Receive material information					√	√	√	√											
Send production schedule			√	√															
Receive production schedule					√	√	√	√											
Request checking availability of required materials					√	√													
Check availability of required materials								√	√										
Inform availability of materials								√	√										
Parties inform about availability of required materials					√	√													
Calculate the shortage of required materials					√	√													
Select suppliers if customer has not recommended					√	√													
Raise Purchase Order (PO)					√	√													
Send PO for approval if it exceeds the credit limit					√	√													
Approve the PO with exceeded credit limits																		√	√
Send PO																			
Parties receive PO								√	√						√	√	√	√		
Receive materials with documents from suppliers								√	√										
Check received materials against PO								√	√										
Inform issues about purchased materials								√	√										
Parties informed about issues in purchased materials					√	√													
Inform issues to the material supplier					√	√													
Discuss solutions with material supplier					√	√													
Inform solution to internal departments					√	√													
Parties informed about the solutions								√	√										
Raise Goods Receive Note (GRN)								√	√										
Send GRN to internal departments								√	√										
Parties receive the GRN	√	√			√	√	√	√										√	√
Receive samples for tests							√	√											
Conduct inspection tests for purchased materials							√	√											
Prepare quality reports for purchased materials							√	√											

Send quality reports						√	√										
Parties receive the quality reports of purchased materials				√	√			√	√	√	√	√	√	√	√		
Discuss solutions with the supplier about quality rejected purchased materials				√	√	√	√										
Inform solutions				√	√												
Receive solutions about the quality rejected materials								√	√								
Act according to the solution for the quality rejected materials								√	√								
In-house the quality accepted materials								√	√								
Inform about payments				√	√												
Arrange payments to the material supplier																√	√

Annex E1.1 – Performance Improvement Best Practices identified through literature

Performance Improvement Best Practice		Source of literature
GT - GROUP TECHNOLOGY		
GT_01	Form small work teams and train them towards a common focus	Shah and Ward (2007); Zhang and Cao (2002); Motwani et al. (2004); Thamizhmanii and Hasan (2010); Poppendieck (2002)
GT_02	Arrange work stations in the sequence of which the product is made	Liker (2005)
GT_03	Train workers to perform more than one operation	Shah and Ward (2007); Poppendieck (2002); Liker and Lamb (2000); Mansar and Reijers (2005)
GT_04	Use machine layouts which facilitate minimum movement of man and material	Harrington (2005); Mansar and Reijers (2005)
GT_05	Reward teams with good performance	Raisinghani (2005); Motwani et al. (2004)
STD - STANDARDIZATION		
STD_01	Document a step by step detailed work procedure for each operation	Jesus et al. (2009); Harrington (2005)
STD_02	Let work teams to develop their own standardized way of doing their work	Kim and Ramkaran (2004); Mansar and Reijers (2005)
STD_03	Audit the standardized procedures in regular basis	Harrington (2005)
STD_04	Upgrade the standardized work procedures in regular basis	Harrington (2005); Jesus et al. (2009)
BIQ - BUILD IN QUALITY		
BIQ_01	Train work teams to check the availability of all necessary resources, before the work starts	Liker (2005)

BIQ_02	When a problem occurs at a workstation, fix it before moving it to the next workstation	Kim and Ramkaran (2004); Poppendieck (2002); Raisinghani (2005)
BIQ_03	Conduct inline quality checks at pre-defined places within the work cell	Thamizhmanii and Hasan (2010); Hull (2010)
BIQ_04	Conduct a detailed quality check on every output of the work cell	Liker (2005)
BIQ_05	Use signaling system to indicate that the workstation is stopped due to a quality issue	Liker (2005)
BIQ_06	Communicate the new problems among the team members immediately to avoid re-occurrence	Liker (2005)
BW - BALANCING THE WORKLOAD		
BW_01	Maintain a balanced workload on all workstations based on different product types and their quantities	Harrington (2005); Shah and Ward (2007)
BW_02	Maintain a small inventory of inputs of the daily production, closer to the workstation	Poppendieck (2002); Holweg (2007); Liker and Lamb (2000); Shah and Ward (2003)
MP - MISTAKE PROOFING		
MP_01	Use a mechanism to make sure that all the operations are done	Harrington (2005); Liker (2005)
MP_02	Use a mechanism to alert workers when an error is happened	Poppendieck (2002)
MP_03	Modify machines to detect errors where it happens	Raisinghani (2005)
MP_04	Shutdown the work cell when an error occurs	Liker (2005)
VC - VISUAL CONTROLS		
VC_01	Use charts and graphs to visualize the information about the work and update them regularly	Liker (2005)

VC_02	Present information which are interrelated, in one sheet of paper	Liker (2005)
SUR - SETUP REDUCTION		
SUR_01	Perform setup activities while the work is progressing at the workstation (external setup)	Liker (2005)
SUR_02	Perform setup activities while the work is stopped at the workstation (internal setup)	Liker (2005)
SUR_03	Increase the amount of external setup activities as much as possible	Shah and Ward (2007)
SUR_04	Store equipment need to setup machines, closer to the workstation	Liker (2005)
SUR_05	Train workers on the setup process before it is performing, to minimize the setup time	Liker (2005)
TPM - TOTAL PRODUCTIVE MAINTENANCE		
TPM_01	Train workers to do minor maintenance tasks	Sashkin and Kiser (1993); Wireman (2004)
TPM_02	Give worker the responsibility of maintenance work which he/she performs	Sashkin and Kiser (1993); Mansar and Reijers (2005)
TPM_03	Conduct maintenance activities on a regular basis, in a planned way	Shah and Ward (2007); Shah and Ward (2003); Liker (2005); Wireman (2004)
TPM_04	Develop a mechanism to repair and maintain machines when man and machines are idling	Liker (2005)
KB - KANBAN		
KB_01	Use a signaling system to control the inventory within a workstation (production kanban)	Liker (2005)

KB_02	Use a signaling system to control the inventory between workstations (withdrawal kanban)	Liker (2005)

CF - CONTINUOUS FLOW

CF_01	Use small inventory buffers where continuous flow is not possible	Liker and Lamb (2000)

JIT - JUST IN TIME

JIT_01	Plan the work in backward direction (from demand to supply)	Liker and Lamb (2000)
JIT_02	Perform work of a workstation based on the demand of the next workstation	Poppendieck (2002); Liker and Lamb (2000)

5S

5S_01	Keep resources necessary to perform the work and dispose unnecessary	Liker (2005)
5S_02	Create permanent locations for resources based on easy access and frequency of use	Liker (2005)
5S_03	Clean the workplace daily within a fixed time duration	Liker (2005)

EE - EMPLOYEE EMPOWERMENT

EE_01	Let workers to take major decisions about their work	Kim and Ramkaran (2004); Government of South Australia (2001); Mansar and Reijers (2005)
EE_02	Train workers to discuss with others before taking important decisions	Thamizhmanii and Hasan (2010)
EE_03	Give responsibility to workers to check the input they receive	Liker (2005); Mansar and Reijers (2005)
EE_04	Give responsibility to workers to check their output before passing to the next worker	Kim and Ramkaran (2004); Mansar and Reijers (2005)

EE_05	Give responsibility to workers to take necessary actions when a defect is found	Kim and Ramkaran (2004); Shah and Ward (2007); Thamizhmanii and Hasan (2010)
CI - CONTINUOUS IMPROVEMENT		
CI_01	Create team of workers to find solutions to the problems of a workstation	Raisinghani (2005); Kristensen et al. (1995); Shah and Ward (2003)
CI_02	Take ideas of both workers of the workstation (insiders) and workers outside the workstation (outsiders)	Kristensen et al. (1995); Government of South Australia (2001)
CI_03	Conduct meetings among team members on a regular basis	Raisinghani (2005)
CI_04	Reward teams with good ideas	Government of South Australia (2001); Thamizhmanii and Hasan (2010)
PFD - PROCESS FLOW DESIGN		
PFD_01	Avoid repeating the same activity at the different places of the workflow	Harrington (2005); Mansar and Reijers (2005)
PFD_02	Perform parallel work wherever possible to reduce the total lead time	Harrington (2005); Kim and Ramkaran (2004); Zhang and Cao (2002); Mansar and Reijers (2005)
OTH - OTHER		
OTH_01	Reduce number of indirect people involve in the work	Poppendieck (2002); Mansar and Reijers (2005)

Survey to identify the Process Improvement Status of Sri Lankan Apparel Manufacturing Industry

This survey is a part of the postgraduate research progressing at present, at the University of Moratuwa.

The research is to develop a framework to implement Business Process Management (BPM) principles to the Sri Lankan Apparel Industry.

The **major aims of this survey** are

* To identify the level of understanding about the concept 'process' among the Sri Lankan apparel manufacturing organizations

* To identify the most popular process improvement best practices among the industry

Your honest and dedicated participation to the survey by filling the following questionnaire is highly appreciated. It will definitely help to increase the success of the survey and the accuracy level of the information revealed by the survey. **All the information you provide will be treated in the strictest confidence**. Only the aggregated results will be published and used in future work.

This questionnaire would take maximum 20 minutes to complete. Take time to read and understand the question and the given answers.

Thank you for participating and spending your time in the survey.

Tolusha Yapa

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Company you are currently working

Working experience in Process Improvement	Less than 1 year	1 – 3 years	3 – 6 years	6 – 9 years	9 years or more
	☐	☐	☐	☐	☐

QUESTIONNAIRE

1. Select the most suitable option of each of the five categories, which best describes your company. Please select **only one answer from each category**.

   Definition: Process is a set of activities that goes across the departments. E.g. sample development process
   Department is a section that helps to execute processes. E.g. Merchandising, sample room

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1.1 Process design and documentation

Do not have a good understanding about the processes within the company or outside the company (customers, suppliers etc.)	☐
Have identified processes within the company but not well defined and structured	☐
Have identified, well defined and structured the processes within the company	☐
Have identified processes within the company and outside the company, but outside processes are not well defined and structured	☐
Have identified, well defined and structured processes both within the company and outside the company	☐

1.2 Organizational structure

Fully designed based on major departments of the company	☐
Mainly designed based on departments but processes within the company are also considered to some extent	☐
Fully designed based on processes within the company	☐
Majorly designed based on processes within the company but processes outside the company are also considered to some extent	☐
Designed based on processes both within the company and outside the company	☐

1.3 Performance improvement focus

Improvement efforts are focused on individual departments of the company	☐
Improvement efforts are focused on individual processes within the company	☐
Improvement efforts are focused on combined processes (several processes integrated) within the company	☐
Improvement efforts are focused on entire business process within the company	☐
Improvement efforts are focused on entire business process, including processes outside the company	☐

1.4 Performance measurement

No performance measurement system is used within the company	☐
Performance measures are set for departments of the company, based on department's individual goals	☐
Performance measures are set for processes within the company, based on process's individual goals	☐
Performance measures are set for departments of the company, based on the company's corporate goals	☐
Performance measures are set for processes within the company, based on the company's corporate goals	☐

1.5 Ownership

Department leader is responsible for the performance of the department	☐
Representatives from each department of a process is responsible for their part of the process	☐
One person is assigned to each process to take the responsibility of the performance of the process	☐
One person or a group of people of the company is responsible for the entire business process within the company	☐
Group of people from company and outside the company is responsible for the entire business process, including processes outside the company	☐

2. Select the best practices that your company has used to improve the performance of the business process. Rate the level of use (column 2) and the level of success achieved (column 3) of each selected practice. Indicate your personal feeling about the usefulness of all the best practices (column 4).

0 – Do not use / No success	1 –Very low	2 – Low	3 – Moderate	4 – High	5 – Very High

Best practices	Level of Use						Level of Success						Usefulness	
	0	1	2	3	4	5	0	1	2	3	4	5	Yes	No
GROUP TECHNOLOGY/CELLULAR MANUFACTURING														
Form small work teams and train them towards a common focus	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Arrange work cells in the sequence of which the product is made	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Train workers to perform more than one operation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use machine layouts which facilitate minimum movement of man and material	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Reward teams with good performance	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
STANDARDIZATION														
Document a step by step detailed work procedure for each operation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Let work teams to develop their own standardized way of doing their work	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Audit the standardized procedures in regular basis	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Upgrade the standardized work procedures in regular basis	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
BUILD IN QUALITY														
Train work teams to check the availability of all necessary resources, before the work starts	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
When a problem occurs at a workstation, fix it before moving it to the next workstation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Conduct inline quality checks at pre-defined places within the work cell	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Conduct a detailed quality check on every output of the work cell	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use signaling system to indicate that the workstation is stopped due to a quality issue	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Communicate the new problems among the team members immediately to avoid re-occurrence	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
BALANCING THE WORKLOAD														
Maintain a balanced workload on all workstations based on different product types and their quantities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Maintain a small inventory of inputs of the daily production, closer to the workstation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Best practices	Level of Use						Level of Success						Usefulness	
	0	1	2	3	4	5	0	1	2	3	4	5	Yes	No
MISTAKE PROOFING														
Use a mechanism to make sure that all the operations are done	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use a mechanism to alert workers when an error is happened	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Modify machines to detect errors where it happens	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Shutdown the work cell when an error occurs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
VISUAL CONTROLS														
Use charts and graphs to visualize the information about the work and update them regularly	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Present information which are interrelated, in one sheet of paper	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
SETUP REDUCTION														
Perform setup activities while the work is progressing at the workstation (external setup)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Perform setup activities while the work is stopped at the workstation (internal setup)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Increase the amount of external setup activities as much as possible	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Store equipments need to setup machines, closer to the workstation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Train workers on the setup process before it is performing, to minimize the setup time	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
TOTAL PRODUCTIVE MAINTENANCE (TPM)														
Train workers to do minor maintenance tasks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Giver worker the responsibility of maintenance work which he/she performs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Conduct maintenance activities on a regular basis, in a planned way	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Develop a mechanism to repair and maintain machines when man and machines are idling	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
KANBAN														
Use a signaling system to control the inventory within a workstation (production kanban)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use a signaling system to control the inventory between workstations (withdrawal kanban)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
CONTINUOUS FLOW														
Use small inventory buffers where continuous flow is not possible	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
JUST IN TIME (JIT)														
Plan the work in backward direction (from demand to supply)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Perform work of a workstation based on the demand of the next workstation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Best practice	Level of Use						Level of Success						Usefulness	
	0	1	2	3	4	5	0	1	2	3	4	5	Yes	No
5S														
Keep resources necessary to perform the work and dispose unnecessary	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Create permanent locations for resources based on easy access and frequency of use	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Clean the workplace daily within a fixed time duration	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EMPLOYEE EMPOWERMENT														
Let workers to take major decisions about their work	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Train workers to discuss with others before taking important decisions	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Give responsibility to workers to check the input they receive	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Give responsibility to workers to check their output before passing to the next worker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Give responsibility to workers to take necessary actions when a defect is found	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
CONTINUOUS IMPROVEMENT														
Create team of workers to find solutions to the problems of a workstation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Take ideas of both workers of the workstation (insiders) and workers outside the workstation (outsiders)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Conduct meetings among team members on a regular basis	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Reward teams with good ideas	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PROCESS FLOW DESIGN														
Avoid repeating the same activity at the different places of the workflow	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Perform parallel work wherever possible to reduce the total lead time	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
OTHER														
Reduce number of indirect people involve in the work	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Annex E1.3 – Performance Improvement Best Practices suitable for the Sri Lankan Apparel Industry

Code	Performance Improvement Best Practice
BP_01	Form small work teams and train them towards a common focus
BP_02	Arrange work stations in the sequence of which the product is made
BP_03	Train workers to perform more than one operation
BP_04	Use machine layouts which facilitate minimum movement of man and material
BP_05	Reward teams with good performance
BP_06	Document a step by step detailed work procedure for each operation
BP_07	Audit the standardized procedures in regular basis
BP_08	Upgrade the standardized work procedures in regular basis
BP_09	Train work teams to check the availability of all necessary resources, before the work starts
BP_10	When a problem occurs at a workstation, fix it before moving it to the next workstation
BP_11	Conduct inline quality checks at pre-defined places within the work cell
BP_12	Conduct a detailed quality check on every output of the work cell
BP_13	Use signaling system to indicate that the workstation is stopped due to a quality issue
BP_14	Communicate the new problems among the team members immediately to avoid re-occurrence
BP_15	Maintain a balanced workload on all workstations based on different product types and their quantities
BP_16	Maintain a small inventory of inputs of the daily production, closer to the workstation
BP_17	Use a mechanism to make sure that all the operations are done
BP_18	Use a mechanism to alert workers when an error is happened
BP_19	Modify machines to detect errors where it happens
BP_20	Shutdown the work cell when an error occurs
BP_21	Use charts and graphs to visualize the information about the work and update them regularly
BP_22	Present information which are interrelated, in one sheet of paper
BP_23	Perform setup activities while the work is progressing at the workstation
BP_24	Increase the amount of external setup activities as much as possible
BP_25	Store equipment need to setup machines, closer to the workstation

BP_26	Train workers on the setup process before it is performing, to minimize the setup time
BP_27	Train workers to do minor maintenance tasks
BP_28	Give worker the responsibility of maintenance work which he/she performs
BP_29	Conduct maintenance activities on a regular basis, in a planned way
BP_30	Develop a mechanism to repair and maintain machines when man and machines are idling
BP_31	Use a signaling system to control the inventory within a workstation
BP_32	Use a signaling system to control the inventory between workstations
BP_33	Use small inventory buffers where continuous flow is not possible
BP_34	Plan the work in backward direction
BP_35	Perform work of a workstation based on the demand of the next workstation
BP_36	Keep resources necessary to perform the work and dispose unnecessary
BP_37	Create permanent locations for resources based on easy access and frequency of use
BP_38	Clean the workplace daily within a fixed time duration
BP_39	Train workers to discuss with others before taking important decisions
BP_40	Give responsibility to workers to check the input they receive
BP_41	Give responsibility to workers to check their output before passing to the next worker
BP_42	Give responsibility to workers to take necessary actions when a defect is found
BP_43	Create team of workers to find solutions to the problems of a workstation
BP_44	Take ideas of both workers of the workstation (internal) and workers outside the workstation (external)
BP_45	Conduct meetings among team members on a regular basis
BP_46	Reward teams with good ideas
BP_47	Avoid repeating the same activity at the different places of the workflow
BP_48	Perform parallel work wherever possible to reduce the total lead time
BP_49	Reduce number of indirect people involve in the work

Annex E1.4 – Kolmogorov Smirnov Test and Spearman's rho

Explaining the theory of the Kolmogorov-Smirnov Test using an example

- Steps of calculation

Steps are depicted for the Question 1 of the Executive Questionnaire (Annex F1.1).

Variable – *Identify the improvement opportunities of the existing system*

Aim – To check whether the Sri Lankan apparel manufacturing organizations put a significant effort on *Identifying the improvement opportunities of the existing system* when implementing a process improvement project or not.

Step 1: decide the null and alternative hypotheses of the variable

H$_0$: Organizations put a significant effort on identifying the improvement opportunities of the existing system

H$_1$: Organizations do not put a significant effort on identifying the improvement opportunities of the existing system

Step 2: calculate the frequency of each measurement of the scale for the variable (Table 1; column 2)

Step 3: calculate the frequency proportion of each variable (Table 1; column 3)
E.g. for measurement '3', proportion is $3/38 = 0.0789$

Step 4: calculate the cumulative proportion of the observed frequencies (Table 1; column 4)

Step 5: decide the expected proportion of each measurement. In this case the scale is used in the order of increasing the degree of effort put on the variable, so expected proportion should also be decided based on it. Since the total of the expected proportion should be equal to '1' and with the assumption that the effort put is gradually increasing, a triangle of an area of '1' is divided in to 6 sections (x-axis is divided in to 6 equal lengths and parallel line to y-axis were drawn until they meet the diagonal of the triangle). Areas of 6 divisions are taken as the expected proportion of each scale in the ascending order (Table 1; column 5)
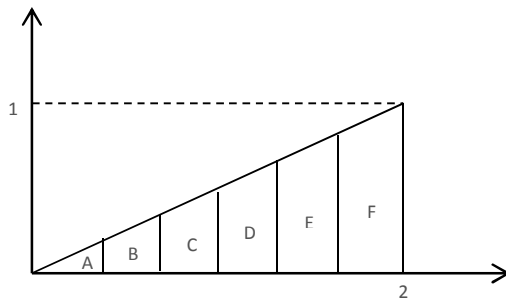
Division	Area	Scale point
A	1/2*2/6*1/6 = 0.0278	0
B	(1/6+2/6)/2*2/6 = 0.0833	1
C	0.1389	2
D	0.1944	3
E	0.25	4
F	0.3056	5

Step 6: calculate the expected cumulative proportion (Table 1; column 6)

Step 7: calculate the absolute difference of the Observed Cumulative Proportion (O) and the Expected Cumulative Proportion E (Table 1; column 7)

D value = Abs (Observed cumulative proportion - Expected Cumulative proportion)

Scale	Observed frequency	Observed proportion	Observed cumulative proportion (O)	Expected proportion	Expected Cumulative proportion (E)	Abs (O – E)
0	0	0.0000	0.0000	0.0278	0.0278	0.0278
1	0	0.0000	0.0000	0.0833	0.1111	0.1111
2	3	0.0789	0.0789	0.1389	0.2500	0.1711
3	8	0.2105	0.2895	0.1944	0.4444	0.1549
4	19	0.5000	0.7895	0.2500	0.6944	0.0951
5	8	0.2105	1.0000	0.3056	1.0000	0.0000

Table E1.4.1: Basic calculations of Kolmogorov-Smirnov Test

Step 8: decide the Maximum of abs (O-E). This is called as 'D_{max}. In this case the D_{max} is 0.1711.

Step 9: decide the critical D value for the selected level of significance (α) and the sample size (n). In this case α = 0.05 and n = 38. Critical D value of the selected α is decided using D value tables. For the samples more than 35, critical D value is calculated as below.

$$Critical\ D_{0.05} = 1.36/\sqrt{n}$$

So the Critical $D_{0.05}$ for the example is $1.36/\sqrt{38} = 0.2206$.

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Step 10: decide the acceptance or rejection of the null hypothesis. This is decided based on whether D_{max} exceeds the critical D value or not.

If D_{max} > Critical D, then **REJECT** the null hypothesis

For this example

$$D_{max} \quad < \quad \text{Critical } D_{0.05}$$
$$0.1711 \qquad\qquad 0.2206$$

Therefore the null hypothesis cannot be rejected. The conclusion is that Sri Lankan apparel manufacturing organizations put a significant effort on identifying improvement opportunities of the system.

Explaining the theory of the Spearman's rho (spearman's rank correlation coefficient), using an example

- Steps of calculation

Steps are depicted for the Question 2 of the Manager Questionnaire (Annex E1.2).

Variable 1 – Level of use of the best practice 'Form small work teams and train them towards a common focus'

Variable 2 – Level of success of the best practice 'Form small work teams and train them towards a common focus'

Aim – To check whether there exists a relationship between level of use and the level of success of the best practice *Form small work teams and train them towards a common focus*

Step 1: decide the null and alternative hypotheses of the variable

H_0: There is no relationship between the level of use and the level of success of the best practice *Form small work teams and train them towards a common focus*

H_1: There is no relationship between the level of use and the level of success of the best practice *Form small work teams and train them towards a common focus*

Step 2: calculate the Spearman's rho value
SPSS can be used to calculate the Spearman's rho value easily. Thus the calculated Spearman's rho value for the relationship is + 0.513.

Step 3: decide the critical value

The critical rho value for the chosen significance level (0.01) and for the sample size (35) can be determined by referring a critical rho value table given in statistics. For this example, the critical rho value is 0.433 (Zar, 1972).

Step 4: decide the acceptance or rejection of the null hypothesis. The decision is taken by comparing the calculated rho value with the critical rho value.

If calculated rho > critical rho, then **REJECT** the null hypothesis

For this example,

calculated rho > critical rho

0.513   0.0.433

Therefore the null hypothesis is rejected. That means there is a relationship between the level of use and level of success of the best practice *Form small work teams and train them towards a common focus.* The positive direction (+) indicates that increase in the level of use effects on increasing the level of success of the best practice *Form small work teams and train them towards a common focus.*

Annex E1.5 - Relatioinship status between the best practices

	BP_01	BP_02	BP_03	BP_04	BP_05	BP_06	BP_07	BP_08	BP_09	BP_10	BP_11	BP_12	BP_13	BP_14	BP_15	BP_16	BP_17	BP_18	BP_19	BP_20	BP_21	BP_22	BP_23	BP_24	BP_25	BP_26	BP_27	BP_28	BP_29	BP_30	BP_31	BP_32	BP_33	BP_34	BP_35	BP_36	BP_37	BP_38	BP_39	BP_40	BP_41	BP_42	BP_43	BP_44	BP_45	BP_46	BP_47	BP_48	BP_49
BP_01	-	0	+	++	0	+	+	+	+	+	+	0	0	0	0	+	0	0	+	0	+	0	0	0	0	+	0	0	0	0	0	0	0	0	0	+	0	+	+	0	0	+	0	0	0	0	0	0	+
BP_02		-	+	0	0	+	0	0	0	+	0	0	0	0	0	0	+	0	+	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0
BP_03			-	++	0	+	+	+	+	+	0	0	0	0	0	+	0	+	0	+	0	+	0	0	0	0	+	0	0	0	0	0	0	0	0	+	++	++	+	0	0	0	0	0	0	0	0	0	+
BP_04				-	0	++	0	+	0	0	0	+	0	0	0	0	0	0	0	+	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	+	0	0	0	0	0	0	0	0	0	0	++
BP_05					-	+	+	+	+	+	+	0	0	+	0	+	0	+	+	++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	+	0	0	0	0	0	0	0	0	0	0	+
BP_06						-	++	+	++	0	+	++	0	0	+	++	0	0	0	+	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	++
BP_07							-	+++	++	+	++	0	+	0	++	0	0	0	0	0	0	0	0	+	0	0	0	0	+	0	+	+	+	0	0	0	+	0	0	0	0	0	0	0	0	+	0	0	+
BP_08								-	+	+	+	0	0	++	0	0	+	0	0	++	++	0	0	0	0	+	0	0	0	0	++	+	+	+	++	0	+	++	0	+	0	++	0	0	+	0	0	0	+
BP_09									-	++	++	++	+	0	++	+++	0	0	0	0	+	0	+	0	+	0	++	0	0	0	0	0	0	+	0	+	+	+	0	0	0	+	-	+	+	0	0	+	++
BP_10										-	++	0	0	++	0	+	++	0	++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	++	0	0	+	0	0	0	0	0	0	++
BP_11											-	+	0	++	0	0	++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	+	+	0	0	0	0	0	0	0	0	0	0	0	++
BP_12												-	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	0	0	+	+
BP_13													-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	+	0	0	0	0	0
BP_14														-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	+	0	0	0	0	+	0	0	0	0	++
BP_15															-	++	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+
BP_16																-	+	+	0	0	++	0	0	0	0	+	+	0	+	0	+	0	+	0	+	0	0	0	0	0	+	+	++	+	0	+	+	++	+	++
BP_17																	-	++	++	+	++	+	0	0	0	0	0	0	0	0	0	0	0	0	+	++	+	+	++	0	+	+	0	0	0	0	0	0	+
BP_18																		-	++	+++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	+	+	0	0	0	0	0	0	0	0	0	0
BP_19																			-	+	+	0	0	0	0	0	0	0	+	0	0	+	++	++	+	++	0	+	0	0	0	0	0	0	0	0	0	0	+
BP_20																				-	+	0	0	0	+	0	0	0	+	0	0	0	++	+	+	+	0	0	++	0	0	++	0	0	0	+	0	0	+
BP_21																					-	++	0	0	0	+	0	0	++	0	+	0	+	0	+	++	++	+	++	0	+	0	0	0	0	+	0	0	+
BP_22																						-	0	0	0	+	+	+	+	0	+	+	+	+	+	0	0	++	0	0	+	0	0	0	+	+	+	+	++
BP_23																							-	+	0	+	+	+	0	++	0	++	0	0	0	0	0	0	0	0	0	+	+	0	++	++	0	0	0
BP_24																								-	+	++	0	0	++	0	0	0	0	+	+	0	+	0	0	+	0	0	++	+	+	0	0	0	0
BP_25																									-	+	0	0	+	0	0	0	0	0	0	0	0	0	0	0	++	+	+	0	+	0	0	+	0
BP_26																										-	++	++	+	0	++	0	++	+	0	++	+	++	+	0	0	+	++	++	++	++	++	++	+
BP_27																											-	+++	+	0	++	+	+++	++	0	0	+	0	0	++	++	++	+	+++	++	++	++	+++	0
BP_28																												-	+	0	+++	+	+++	+	0	0	+	0	0	+	++	+	+	++	++	++	++	++	0

Representation of relationship strength:- 0 :no relationship,   + :weak positive relationship,   ++ :moderate positive relationship,   +++ :strong positive relationship

BP_XX are included in Annex 1.3

	BP_01	BP_02	BP_03	BP_04	BP_05	BP_06	BP_07	BP_08	BP_09	BP_10	BP_11	BP_12	BP_13	BP_14	BP_15	BP_16	BP_17	BP_18	BP_19	BP_20	BP_21	BP_22	BP_23	BP_24	BP_25	BP_26	BP_27	BP_28	BP_29	BP_30	BP_31	BP_32	BP_33	BP_34	BP_35	BP_36	BP_37	BP_38	BP_39	BP_40	BP_41	BP_42	BP_43	BP_44	BP_45	BP_46	BP_47	BP_48	BP_49
BP_29																													-	0	+	0	+	+	++	+	0	+	+	0	+	0	0	+	+	+	+	+	0
BP_30																														-	0	+	0	0	0	0	0	0	0	0	0	+	+	0	0	0	0	0	0	0
BP_31																															-	++	+++	++	+	+	0	0	+	+	++	++	0	++	++	++	++	++	0
BP_32																																-	++	++	+	+	0	0	+	0	+	++	0	0	0	++	0	0	0
BP_33																																	-	++	+	+	0	0	+	+	++	++	0	++	++	++	++	++	0
BP_34																																		-	+	+	0	+	+	+	+	+	+	++	++	+++	++	++	0
BP_35																																			-	++	+	+	++	0	+	0	0	0	+	++	0	0	+
BP_36																																				-	+++	+++	+++	0	+	+	0	0	+	++	0	0	++
BP_37																																					-	++	++	0	+	0	0	0	+	++	0	0	+
BP_38																																						-	++	0	0	+	0	0	+	++	0	0	+
BP_39																																							-	0	+	+	0	0	+	++	0	0	++
BP_40																																								-	+++	++	0	++	+	+	+	+	0
BP_41																																									-	++	0	++	++	++	++	++	0
BP_42																																										-	0	+	+	+	0	+	0
BP_43																																											-	+	++	+	+	+	0
BP_44																																												-	+++	++	++	+++	0
BP_45																																													-	+++	++	+++	0
BP_46																																														-	++	++	+
BP_47																																															-	+++	0
BP_48																																																-	0
BP_49																																																	-

Representation of relationship strength:- 0 :no relationship,   + :weak positive relationship,   ++ :moderate positive relationship,   +++ :strong positive relationship
BP XX are included in Annex 1.3

Survey to identify the Process Improvement Status of Sri Lankan Apparel Manufacturing Industry

This survey is a part of the postgraduate research progressing at present, at the University of Moratuwa.

The research is to develop a framework to implement Business Process Management (BPM) principles to the Sri Lankan Apparel Industry.

The **major aims of this survey** are

- To identify the level of consideration about a methodical approach to implement process improvement projects among Sri Lankan apparel manufacturers and

- To identify the most common techniques they are applying in executing the steps of a process improvement project

Your honest and dedicated participation to the survey by filling the following questionnaire is highly appreciated. It will definitely help to increase the success of the survey and the accuracy level of the information revealed by the survey. **All the information you provide will be treated in the strictest confidence**. Only the aggregated results will be published and used in future work.

This questionnaire would take maximum 15 minutes to complete. Take time to read and understand the question and the given answers. Please rate the answers you select based on the scale given or write you answer on the space provided.

Thank you for participating and spending your time in the survey.

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Company you are currently working

Working experience in Process Improvement	Less than 1 year	1 – 3 years	3 – 6 years	6 – 9 years	9 years or more
	☐	☐	☐	☐	☐

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QUESTIONNAIRE

Please use the following scale to answer all the questions. Click (×) the relevant checkbox

0– Do not follow No Success	1 – Very Low	2 – Low	3 – Moderate	4 – High	5 – Very High

1. Rate the steps you follow in implementing a process improvement project based on the effort you put.

	Steps of the Process Improvement Project	Rating 0 1 2 3 4 5
1	Identify the improvement opportunities of the existing system	☐ ☐ ☐ ☐ ☐ ☐
2	Select improvement techniques to the available opportunities	☐ ☐ ☐ ☐ ☐ ☐
3	Design the new system with suitable improvements	☐ ☐ ☐ ☐ ☐ ☐
4	Set performance measures to appropriate operations of the new system	☐ ☐ ☐ ☐ ☐ ☐
5	Train workers to work in the new system	☐ ☐ ☐ ☐ ☐ ☐
6	Implement the new system	☐ ☐ ☐ ☐ ☐ ☐
7	Evaluate the performance of the new system	☐ ☐ ☐ ☐ ☐ ☐
8	Check whether the improvement targets are achieved	☐ ☐ ☐ ☐ ☐ ☐
9	Perform process improvement steps continually until the targets are achieved	☐ ☐ ☐ ☐ ☐ ☐

2. Select and rate the techniques you use to apply each step mentioned above, based on the success achieved.

Techniques applied in each step	Success achieved 0 1 2 3 4 5
1. Identify the improvement opportunities of the existing system	
Observe the existing system and record necessary information in real time	☐ ☐ ☐ ☐ ☐ ☐
Understand the situation by doing it at real time	☐ ☐ ☐ ☐ ☐ ☐
Discuss with the parties involved in the existing system	☐ ☐ ☐ ☐ ☐ ☐
Map the system with necessary information	☐ ☐ ☐ ☐ ☐ ☐
Compare the existing system with what needs to be achieved	☐ ☐ ☐ ☐ ☐ ☐
Study the strengths and weaknesses of the system	☐ ☐ ☐ ☐ ☐ ☐
Evaluate the value addition level of each activity to output of the system	☐ ☐ ☐ ☐ ☐ ☐
Compare with well performing similar areas within the company or outside	☐ ☐ ☐ ☐ ☐ ☐
Other (describe)	☐ ☐ ☐ ☐ ☐ ☐
2. Select improvement techniques to the available opportunities	
Find the root causes of the available improvement opportunities	☐ ☐ ☐ ☐ ☐ ☐
Rank the opportunities according to the impact to the performance	☐ ☐ ☐ ☐ ☐ ☐
Use the experts' knowledge	☐ ☐ ☐ ☐ ☐ ☐
Study the best practices used and succeeded in similar areas	☐ ☐ ☐ ☐ ☐ ☐
Get improvement ideas from parties involved in new system	☐ ☐ ☐ ☐ ☐ ☐
Use world-class well known best practice models	☐ ☐ ☐ ☐ ☐ ☐
Other (describe)	☐ ☐ ☐ ☐ ☐ ☐

	0	1	2	3	4	5
3. Design the new system with **suitable improvements**						
Design several alternative models for the improvement	☐	☐	☐	☐	☐	☐
Get ideas about alternative models from relevant parties	☐	☐	☐	☐	☐	☐
Simulate the selected, suitable models	☐	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐	☐
4. Set performance measures to appropriate operations of the new system						
Evaluate the importance of each operation to the value of the output	☐	☐	☐	☐	☐	☐
Discuss with the involved parties	☐	☐	☐	☐	☐	☐
Refer past information	☐	☐	☐	☐	☐	☐
Establish measures to team performance	☐	☐	☐	☐	☐	☐
Evaluate whether selected measures are aligned with improvement objectives	☐	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐	☐
5. Train workers to work in the new system						
Conduct training sessions about new changes	☐	☐	☐	☐	☐	☐
Educate involved parties about the new system	☐	☐	☐	☐	☐	☐
Communicate and share information systematically	☐	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐	☐
6. Implement the new system						
Test several randomly selected sections to validate the new system	☐	☐	☐	☐	☐	☐
Conduct a pilot run	☐	☐	☐	☐	☐	☐
Implement the new system parallel to old, for some period	☐	☐	☐	☐	☐	☐
Discuss with involved parties about the system	☐	☐	☐	☐	☐	☐
Display details about the system where anybody can easily see	☐	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐	☐
7. Evaluate the performance of the new system						
Use visual controls and audio signals	☐	☐	☐	☐	☐	☐
Measure performance on regular basis	☐	☐	☐	☐	☐	☐
Use intermediate and end inspection points	☐	☐	☐	☐	☐	☐
Use statistical techniques to analyze measured data	☐	☐	☐	☐	☐	☐
Display updated performance results where relevant parties can easily see	☐	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐	☐
8. Check whether the improvement targets are achieved						
Compare actual results with the expected results	☐	☐	☐	☐	☐	☐
Provide feedback to the involved parties about their performance	☐	☐	☐	☐	☐	☐
Present results to the relevant parties	☐	☐	☐	☐	☐	☐
Other (describe)	☐	☐	☐	☐	☐	☐

Annex G1.1 – BPM lifecycle techniques identified through literature

Lifecycle Execution Techniques		Source of Literature
Identify the improvement opportunities of the existing process (ID)		
ID_1	Observe the existing system and record necessary information	Colan (2006); Lee and Chuah (2001); Harrington (2005); Pearman (1999b)
ID_2	Understand the situation by doing it under actual working conditions	Harrington (2005); Motwani et al. (2004)
ID_3	Discuss with the parties involved in the existing system	van der Aalst et al (2003); Lee and Chuah (2001); Framinan and Parra (2004); Harrington (2005)
ID_4	Map the system with necessary information	van der Aalst et al (2003); Miers (2006); Colan (2006); Cousins and Stewart (2002); Harrington (2005); ; Pritchard and Armistead (1999); Carpinetti et al. (2003); Raisinghani (2005)
ID_5	Compare the existing system with what needs to be achieved	Lee and Chuah (2001); Cousins and Stewart (2002); Harrington (2005); Thamizhmanii and Hasan (2010)
ID_6	Study the strengths and weaknesses of the system	Colan (2006); Jeston and Nelis (2006a)
ID_7	Evaluate the value addition level of each activity to output of the system	Lee and Chuah (2001); Harrington (2005); Raisinghani (2005); Thamizhmaniiand Hasan (2010)
ID_8	Compare with well performing similar areas within the company or outside	Miers (2006); Lee and Chuah (2001); Carpinetti et al. (2003); Pearman (1999b)

Select appropriate improvements to the available opportunities (SEL)		
SEL_1	Find the root causes of the available improvement opportunities	Miers (2006); Carpinetti et al. (2003); Thamizhmanii and Hasan (2010)
SEL_2	Rank the opportunities according to the impact to the performance	Cousins and Stewart (2002); Jesus et al. (2009); Harrington (2005); Raisinghani (2005)
SEL_3	Use the experts' knowledge	Miers (2006); Cousins and Stewart (2002)
SEL_4	Study the best practices used and succeeded in similar areas	Jesus et al. (2009)
SEL_5	Get improvement ideas from parties involved in new system	Harrington (2005); Motwani et al. (2004)
SEL_6	Use world-class well known best practice models	Jeston and Nelis (2006a)
Design the new process with suitable improvements (DES)		
DES_1	Design several alternative models for the improvement	Netjes et al (2006); Miers (2006); Krebs, 2009
DES_2	Get ideas about alternative models from relevant parties	Jeston and Nelis (2006a)
DES_3	Simulate the selected, suitable models	Miers (2006); Colan, 2006; Krebs, 2009; Framinan and Parra (2004); Raisinghani (2005)
Set performance measures to appropriate operations of the new process (MEAS)		
MEAS_1	Evaluate the importance of each operation to the value of the output	Lee and Chuah (2001); Harrington (2005)

MEAS_2	Discuss with the involved parties	Miers (2006); Harrington (2005)
MEAS_3	Refer past information	Harrington (2005)
MEAS_4	Establish measures to team performance	Jeston and Nelis (2006a)
MEAS_5	Evaluate whether selected measures are aligned with improvement objectives	Miers (2006)
Train performers to work in the new process (TRAIN)		
TRAIN_1	Conduct training sessions about new changes	Miers (2006); zur Muehlen (2005)
TRAIN_2	Educate involved parties about the new system	Miers (2006); Vos et al., (2009); Raisinghani (2005)
TRAIN_3	Communicate and share information systematically	Miers (2006); Lee and Chuah (2001); Framinan and Parra (2004)
Implement the new process (IMPLE)		
IMPLE_1	Test several randomly selected sections to validate the new system	Wetzstein et al (2007); Krebs (2009)
IMPLE_2	Conduct a pilot run	Wetzstein et al (2007); zur Muehlen (2005)
IMPLE_3	Implement the new system parallel to old, for some time period	Jeston and Nelis (2006a)
IMPLE_4	Discuss with involved parties about the system	Miers (2006); Framinan and Parra (2004)

IMPLE_5	Display details about the system where anybody can easily see	Jeston and Nelis (2006a)
Monitor and control the performance of the new process (EVAL)		
EVAL_1	Use visual controls and audio signals	Wetzstein et al (2007); Miers (2006); zur Muehlen (2005)
EVAL_2	Measure performance on regular basis	Wetzstein et al (2007); Colan (2006); Government of South Australia (2001); zur Muehlen (2005)
EVAL_3	Use intermediate and end inspection points	Jeston and Nelis (2006a)
EVAL_4	Use statistical techniques to analyze measured data	Raisinghani (2005)
EVAL_5	Display updated performance results where relevant parties can easily see	Wetzstein et al (2007); Colan (2006); Raisinghani (2005)
Check whether the improvement targets are achieved (CHECK)		
CHECK_1	Compare actual results with the expected results	Raisinghani (2005); Government of South Australia (2001)
CHECK_2	Provide feedback to the involved parties about their performance	Government of South Australia (2001)
CHECK_3	Present results to the relevant parties	Jesus et al. (2009)

Annex H1.1: The proposed BPM maturity measuring framework

Domain	Category	Variable	Rating						
			0	1	2	3	4	5	6
OS	Organization of the structure	Organizational structure of the company is illustrated as a collection of cross-functional teams (OS-1)							
		All the activities of the company are operated as cross-functional teams (OS-2)							
	Roles and responsibilities	Job roles are designed based on cross-functional teams (OS-3)							
		Jobs are multi-dimensional instead of one simple task (OS-4)							
		Job roles are clearly defined and documented (OS-5)							
		Employees are well trained to perform in cross-functional teams (OS-6)							
PDD	Process focus	Employees use process terms such as process, process owners in their daily work; communicating, documenting etc. (PDD-1)							
		Employees of all levels share a common understanding about process terms (PDD-2)							
		Employees have a clear understanding about their work, how it affects other processes and the entire organization (PDD-3)							
		Employees view a process as a collection of cross-functional teams and the business as a collection of processes (PDD-4)							
		Corporate goals of the organization are considered in deciding process goals (PDD-5)							
		Resources are allocated based on the process design (PDD-6)							
	Process definition	Process is defined and documented with all necessary details; tasks, workflow, resources etc. (PDD-7)							
		Process documentation is periodically reviewed and updated (PDD-8)							
		Process documentation is used when performing the tasks of the process (PDD-9)							
		Process documentation is used when training and educating process performers (PDD-10)							

OS: Organizational Structure, PDD: Process Design and Documentation, PO: Process Ownership, PMM: Process Measurement and Management
PI: Performance Improvement

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PO	Assignment	Owner is assigned for the entire process, not for the functional units of the process (PO-1)								
		Process owner is selected without being biased to any functional unit of the process (PO-2)								
	Responsibility and authority	Process owner has a good understanding and knowledge about every aspect of his process as well as other processes (PO-3)								
		Process owner is responsible for all aspects of his process (PO-4)								
		Process owner has full controlling power over his process (PO-5)								
		Process owners responsibilities and authorities are well defined and documented (PO-6)								
		Process performers are clearly communicated about process owner's responsibilities and authorities (PO-7)								
PMM	Focus	Performance measures are set for the entire process, not the functional units (PMM-1)								
		Performance measures are set to measure the outcome of the process, not tasks or employees (PMM-2)								
		Measurement results are used to monitor and optimize the process performance (PMM-3)								
		Process performers are rewarded based on process performance results (PMM-4)								
	Definition	Performance measures are set based on company's corporate goals (PMM-5)								
		Performance measures and target values are clearly defined and documented (PMM-6)								
		Performance measures and target values are periodically reviewed and updated (PMM-7)								
		Process performance is measured in regular basis (PMM-8)								
PI	Focus	Improvement efforts are focused to optimize both process and company performance (PI-1)								
		Improvement efforts are focused on the process not on its functional units (PI-2)								
	Employee involvement	Process performers are trained on process improvement techniques (PI-3)								
		Process performers are encouraged to propose improvement ideas (PI-4)								

OS: Organizational Structure, PDD: Process Design and Documentation, PO: Process Ownership, PMM: Process Measurement and Management
PI: Performance Improvement

Annex H1.2: The proposed BPM maturity measuring mechanism

Category	Variable Code	Variable Weight	Response Rating	Response Score		Response Score(min)		Response Score(max)		Category Score(20)	Maturity Level
OS	OS-1	1		0		0		6			
	OS-2	1		0		0		6			
	OS-3	2		0		0		12			
	OS-4	2		0		0		12			
	OS-5	2		0		0		12			
	OS-6	2		0	0	0	0	12	60	0.00	
PDD	PDD-1	1		0		0		6			
	PDD-2	2		0		0		12			
	PDD-3	1		0		0		6			
	PDD-4	1		0		0		6			
	PDD-5	2		0		0		12			
	PDD-6	2		0		0		12			
	PDD-7	1		0		0		6			
	PDD-8	1		0		0		6			
	PDD-9	2		0		0		12			
	PDD-10	2		0	0	0	0	12	90	0.00	
PO	PO-1	2		0		0		12			
	PO-2	2		0		0		12			
	PO-3	2		0		0		12			
	PO-4	2		0		0		12			
	PO-5	2		0		0		12			
	PO-6	2		0		0		12			
	PO-7	2		0	0	0	0	12	84	0.00	
PMM	PMM-1	2		0		0		12			
	PMM-2	2		0		0		12			
	PMM-3	2		0		0		12			
	PMM-4	2		0		0		12			
	PMM-5	2		0		0		12			
	PMM-6	2		0		0		12			
	PMM-7	2		0		0		12			
	PMM-8	2		0	0	0	0	12	96	0.00	
PI	PI-1	2		0		0		12			
	PI-2	2		0		0		12			
	PI-3	2		0		0		12			
	PI-4	2		0	0	0	0	12	48	0.00	

OS: Organizational Structure, PDD: Process Design and Documentation, PO: Process Ownership, PMM: Process Measurement and Management
PI: Performance Improvement
Variable codes are explained in Annex H1.1

Annex J1.1 – Explaining the proposed BPM implementation framework through a hypothetical case

Nature of the proposed framework

- Objective of the framework – To offer a step-by-step guideline to direct any Sri Lankan apparel manufacturing organization towards a systematic approach to improve and manage their business process

- Focus of the framework – The 'core operational process' of the Sri Lankan apparel manufacturing business process

- Type of the framework –Descriptive; guiding on *what* needs to be done in order to manage the operational process

- Phases of the framework

Table J1.1.1: Key phases and their steps of the proposed BPM implementation framework

Phase 1	Process Orientation	• Design end-to-end business process with sub-processes • Determine the critical sub-processes for BPM application
Phase 2	Process Management	• Determine performance improvement best practices • Apply BPM execution lifecycle with techniques
Phase 3	Maturity Assessment	• Evaluate the maturity level of BPM initiatives

Phase I – Process Orientation

Step 1: Identify the end-to-end business process with sub-processes

The main aim of this step is to transform the business as a set of processes, instead of current behaviour of set of departments.

Step 1.1: Determine sub-processes of the operational process

- The structure proposed to be used in designing the sub-processes is the *Hybrid Structure*

- Features of the hybrid structure are,
  - ✓ Process consists of activities from different departments
  - ✓ Workers from different departments work as a team to achieve goals of the process they are involved with, rather than their departmental goals
  - ✓ Process goals are set based on the outcome of the process, not based on the outcomes of the departments
  - ✓ Worker performance indicators are set and measured based on the overall team performance, not the department-specific performance
  - ✓ Process owner is assigned from the management staff of the organization
  - ✓ Team reports to the process owner, but the department heads are also informed about worker performance through process owner

- Maximum number of sub-processes that the operational process can be represented, is 10
  - ✓ The example present here is for six sub-processes.. They are,
  1. Order placement   2. Sample preparation   3.   Production scheduling
  4. Raw material purchasing and quality assurance
  5. Production   6. Order dispatching

The example sub-process which is used to explain the rest of the proposed framework is *Raw Material Purchasing and Quality Assurance Process*

Step 1.2: Define the sub-processes of the operational process
- Define sub-process goals
  - ✓ Match them with the corporate business goals

     Corporate goal: To become a dynamic provider of customer needs with constant focus on quality, flexibility and on-time delivery of the goods produce

     Process goal   : To in-house the required quantity of trims in the required quality, within four days from the order confirmation

     Sub-goals   : To send the Purchase Order (PO) to supplier within one day from order confirmation

> To in-house the required quality in required quantity to the stores, within three days of PO sending
>
> To arrange payments to supplier within one day from receipt of goods in desired quality and quantity

- Determine sub-process elements; inputs, suppliers, outputs, customers, departments

Input	– raw material specifications and supplier information
Supplier	– customer
Output	– quality accepted, in-housed raw materials
Customer	– cutting executive of the production process
Departments	– merchandising, purchasing, stores, planning, finance, quality, cutting, sewing

- Determine the boundaries of the sub-processes
  - ✓ Beginning and end boundaries; determined by the initial inputs and the ultimate outputs of the sub-process

Beginning boundary	– send raw material specifications and supplier information from merchandising executive to purchasing executive
End boundary	– in-house the quality accepted raw materials

  - ✓ Upper and lower boundaries; determined by the intermediary inputs and outputs receive at the mid-way of the sub-process

Upper boundary	– receive raw materials from supplier
	receive solutions for delivery issues from supplier
	receive solutions for quality issues from supplier
Lower boundary	– send purchase order to supplier
	inform delivery issues to supplier
	inform quality issues to supplier

- Determine activities within the boundaries of sub-process and their flow of work
  - ✓ Purchasing the raw materials that need to produce the order
  - ✓ Checking the accuracy of delivered materials from supplier, against the requirement
  - ✓ Checking the quality of purchased materials

Step 1.3: Determine the resources required to perform the sub-processes

- Assign a leader or a group of leaders to the sub-process who
  - ✓ Has a good understanding and knowledge about the sub-process
  - ✓ Takes the responsibility in every aspect of the sub-process
  - ✓ Guides process performers, take decisions, measure and monitor process performance

- Decide the job roles involved in the sub-process

Merchandising executive	• Send raw material specifications and supplier information to purchasing executive • Send raw material specifications to quality executive
Purchasing executive	• Check availability of required materials and calculate shortages • Select supplier, raise Purchase Order (PO) and send PO to supplier • Coordinate purchasing process • Inform and discuss solutions to the delivery and quality issues of the purchased raw materials • Inform finance executive for payments
Stores executive	• Assist purchasing executive to calculate shortages of raw materials • Check the purchased raw materials against the PO and inform problems to purchasing executive • Raise Goods Receive Note (GRN) and send to relevant parties • Send raw materials for quality checking • In-house quality accepted raw materials • Act as informed, for the quality rejected raw materials
Quality executive	• Decide tests need to be done for the purchased raw materials • Check quality of the purchased raw materials • Inform the quality status to relevant parties

- Communicate common understanding among involved parties about the sub-process; inputs, outputs, workflow etc.

Step 2: Determine critical sub-processes to apply BPM

Step 2.1: Select sub-processes to apply Business Process Management

- Weighted Selection Approach is suggested in selecting critical sub-processes to apply BPM
  - ✓ Four factors used in assessing the criticality of the sub-processes

Importance	level of impact created by the sub-process on the output of the entire process
Strategic alignment	degree of alignment of sub-process goals with strategic business goals
Severity	degree of cruciality and the frequency of occurrence of the problems associated with the process
Feasibility	level of possibility of process to be improved

  - ✓ Rating scale used in assessing the sub-processes using abovementioned factors

5 – Very High   **4** – High   **3** – Moderate   **2** – Low   **1** – Very Low

Table J1.1.2: Factors considered in determining the critical sub-processes to apply BPM and the way they are measured

Sub-process	Factors																				Total Points
	Importance					Strategic Alignment					Severity					Feasibility					
Order placement	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Sample preparation	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Production scheduling	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Raw material purchasing & quality assurance	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Production	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Order dispatching	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	

- ✓ Total points of a sub-process is the sum of the ratings of 4 factors
- ✓ Critical sub-process to apply BPM – sub-processes with the highest total points
- ✓ Select one sub-process at a time

Sub-process with highest marks is assumed as 'raw material purchasing and quality assurance process' to explain the rest of the steps of the proposed BPM implementation framework.

- Flow chart the sub-processes selected to apply BPM
  - ✓ A graphical representation of the flow of work of the selected sub-process, with necessary information (Annex B1.4)

Phase II – Process Management

Step 3: Apply BPM to the selected sub-processes

Step 3.1: Performance improvement best practices

- Forty-nine performance improvement best practices are recommended as suitable for the Sri Lankan Apparel Industry (Annex G1.11.3)
  - ✓ Can select one or more best practices based on organization-specific capabilities and constraints such as strategic direction, resource availability, demand for the best practice

    Selection criterion for the **example sub-process** – strategic direction of the business (Jeston and Nelis, 2006a), which is to reduce lead time of the manufacturing process

    Selected best practices to be applied within the example sub-process, based on the strategic direction of the business (hypothetical)

    BP_06   Document a step by step detailed work procedure for each operation

    BP_09   Train work teams to check the availability of all necessary resources, before the work starts

    BP_36   Keep resources necessary to perform the work and dispose unnecessary

    BP_37   Create permanent locations for resources based on easy access and frequency of use

BP_48   Perform parallel work wherever possible to reduce the total lead time

Step 3.2: BPM execution lifecycle with techniques

- The proposed lifecycle contains nine steps, which are executed in an iterative manner
    - ✓ Lifecycle is executed for the best practices selected to be applied within the targeted sub-process
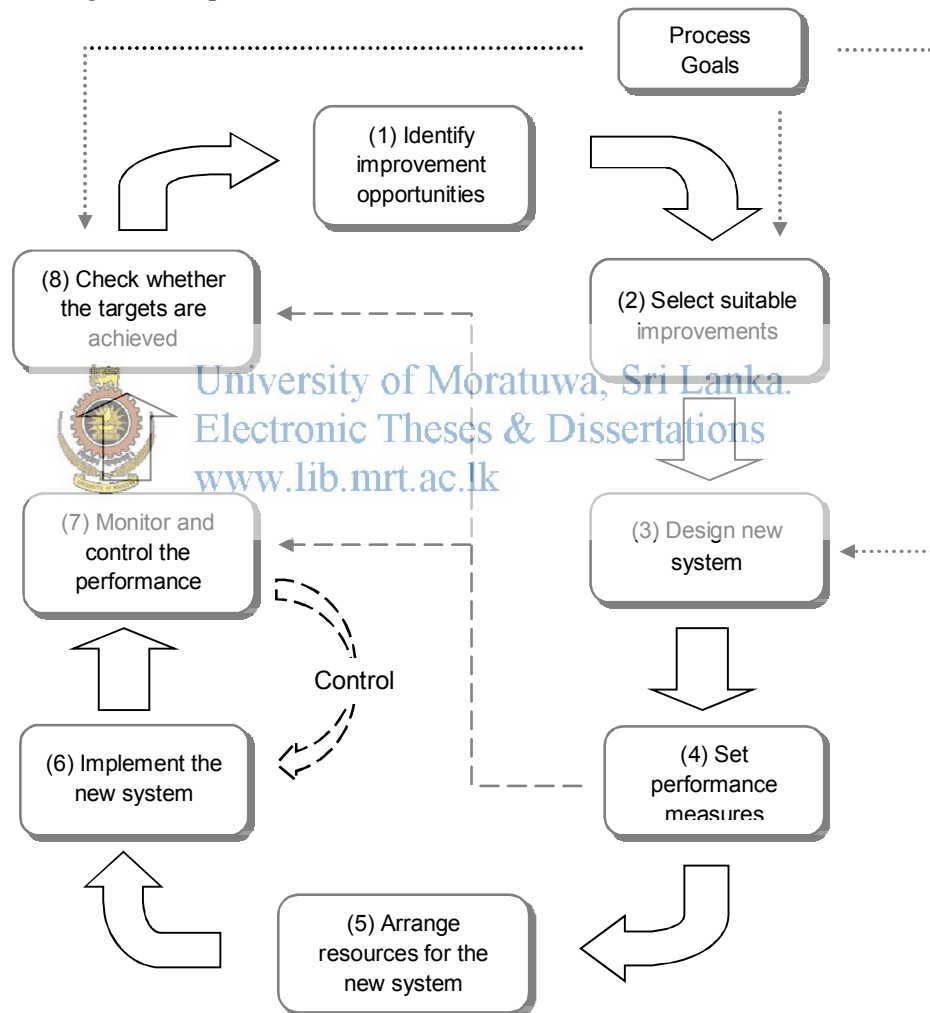
Figure J1.1.1: Proposed lifecycle to execute BPM initiatives

- ✓ Number of lifecycles that needs to be executed to implement all selected best practices depends on the interrelationship among them, based on the levels of success (Annex G1.11.5)

	No relationship	Execute separate lifecycles
0	No relationship	Execute separate lifecycles
+	Weak relationship	Can consider together, if organization is willing to do so
++	Moderate relationship	Better to consider together
+++	Strong relationship	Strongly recommended to consider together

Interrelationship between best practices to be applied within the example sub-process

Table J1.1.3: Interrelationship status among the best practices selected to be applied within the targeted sub-process

	BP_06	BP_09	BP_36	BP_37	BP_48
BP_06	-	++	0	0	0
BP_09		-	+	+	+
BP_36			-	+++	0
BP_37				-	0
BP_48					-

If BP_06 is decided to implement at the first attempt, it is required to check its interrelationships with the other selected best practices. Since it has a relationship only with BP_09, and it is moderately strong, it is better to consider BP_09 along with BP_06 when executing the lifecycle steps for BP_06. After executing first 7 steps, in addition to checking the achievement of expected targets of BP_06, it is also needed to check the same for BP_09 as it is also considered in executing the lifecycle for BO_06. If the expected targets are not reached for either best practice, then another iteration of the lifecycle should be executed for those best practices.

- Lifecycle execution techniques
  - ✓ Set of techniques applicable for each step of the lifecycle is recommended by the proposed BPM implementation framework (Annex G1.1)
  - ✓ Organization can select more than one technique for each step, depending on organization-specific requirements

  For the example sub-process, best practice chosen to implement during the first attempt

  BP_48 - Perform parallel work wherever possible to reduce the total lead time

Since BP_48 only has a relationship with BP_09 and it is a weak relationship, organization can decide whether to incorporate BP_09 when executing the lifecycle for BP_48. For instance, assume that organization has decided to execute the lifecycle only for BP_48; hence execution of the lifecycle steps of BP_48 is as follows.

Lifecycle Step 1: Identify the improvement opportunities of the existing process

✓ Techniques used (refer Annex G1.1)

ID 1	Observe the existing system and record necessary information in real time
ID 4	Map the system with necessary information
ID 5	Compare the existing system with what needs to be achieved

✓ Map the workflow of the targeted process at high-level (Figure J1.1.2)

✓ Opportunities identified for improvement within the targeted sub-process are

Opportunity 1: As per the 1st sub-goal of the process, material specifications and supplier details are not received by the purchasing executive within the day from the order confirmation. This delays the raising of PO, thereby taking more than one day to send the PO to supplier. Hence it makes difficult to meet the 1st sub-goal of the process.

Opportunity 2: Purchasing process has to follow a rigid structure. Even though the PO is both electronically generated and approved, purchasing executive is liable for keeping a printed copy of the accepted PO. This issue does not create a major impact on the process goals as purchasing executive does it in batch-wise during his leisure time.

Opportunity 3: Less effective and less efficient use of resources available for checking the quality of purchased raw materials. This is a serious issue as under-utilization of resources has created a huge barrier on on-time performance of quality checking part of the process.
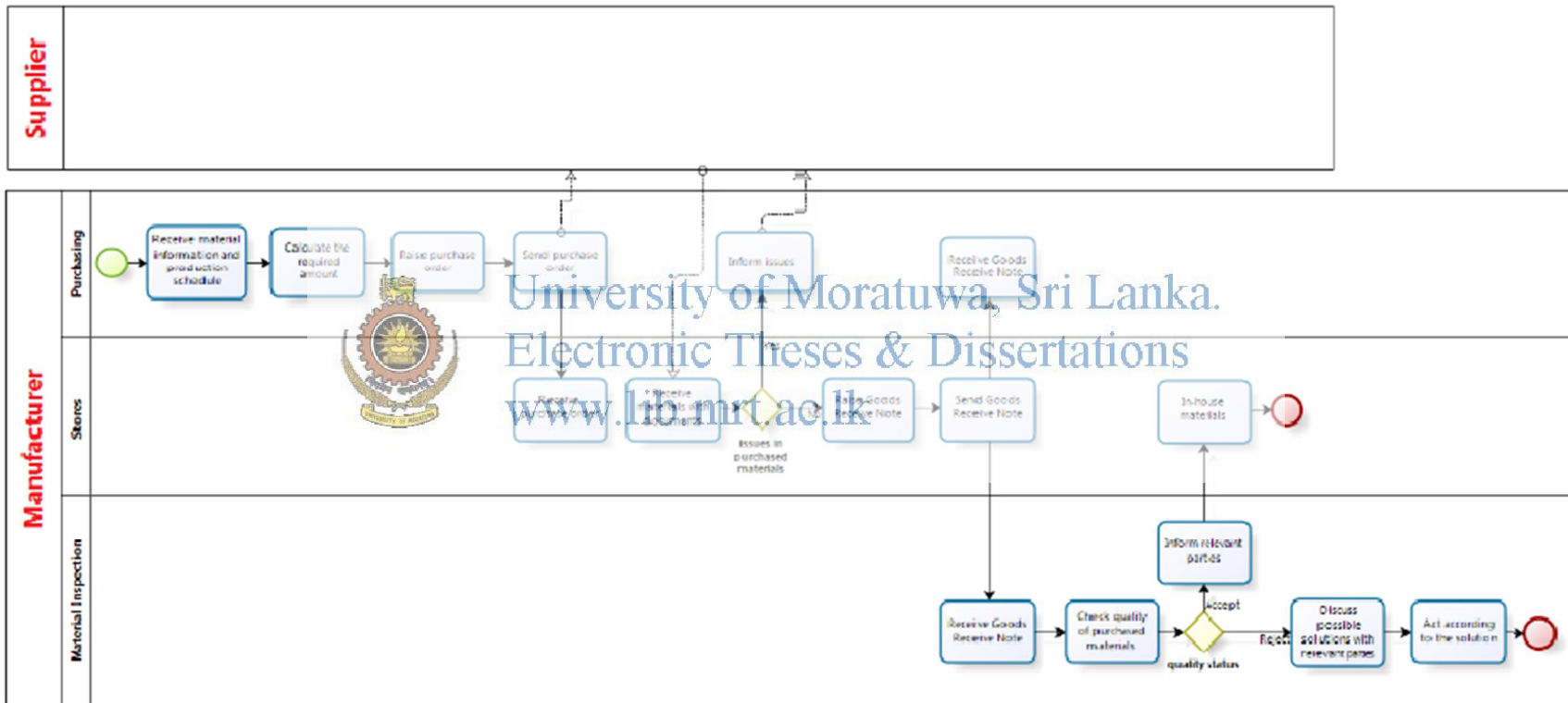
Figure J1.1.2: Raw Material Purchasing & Quality Assurance Process at high level

Lifecycle Step 2: Select appropriate improvements to the available opportunities

✓ Techniques used (refer Annex G1.1)

SEL 1 Find the root causes of the available improvement opportunities

SEL 3 Use the experts' knowledge

SEL 4 Study the best practices used and succeeded in similar areas

SEL 5 Get improvement ideas from parties involved in new system

✓ Check for the opportunities (mentioned above) that have a direct impact on process goals & sub-goals and can be solved through the selected best practice.

Table J1.1.4: Improvement opportunities that can create an impact on process goals and can be solved by the selected best practices

Opportunity	Create an impact on process goals	Can be solved by the selected best practice
1	Yes	Yes
2	-	-
3	Yes	Yes

Only *Opportunity 1* and *3* can create an impact on process goals as well as they can be solved through BP_48, thus Opportunity 2 is not considered from this point onwards.

✓ Prioritize opportunities based on organization-specific and process-specific parameters such as criticality, feasibility. Assume that *Opportunity 1* is selected from the prioritization.

✓ Detailed workflow of the part of the targeted sub-process where the *Opportunity 1* is generated is shown in figure X.4

✓ Root causes of *Opportunity 1*
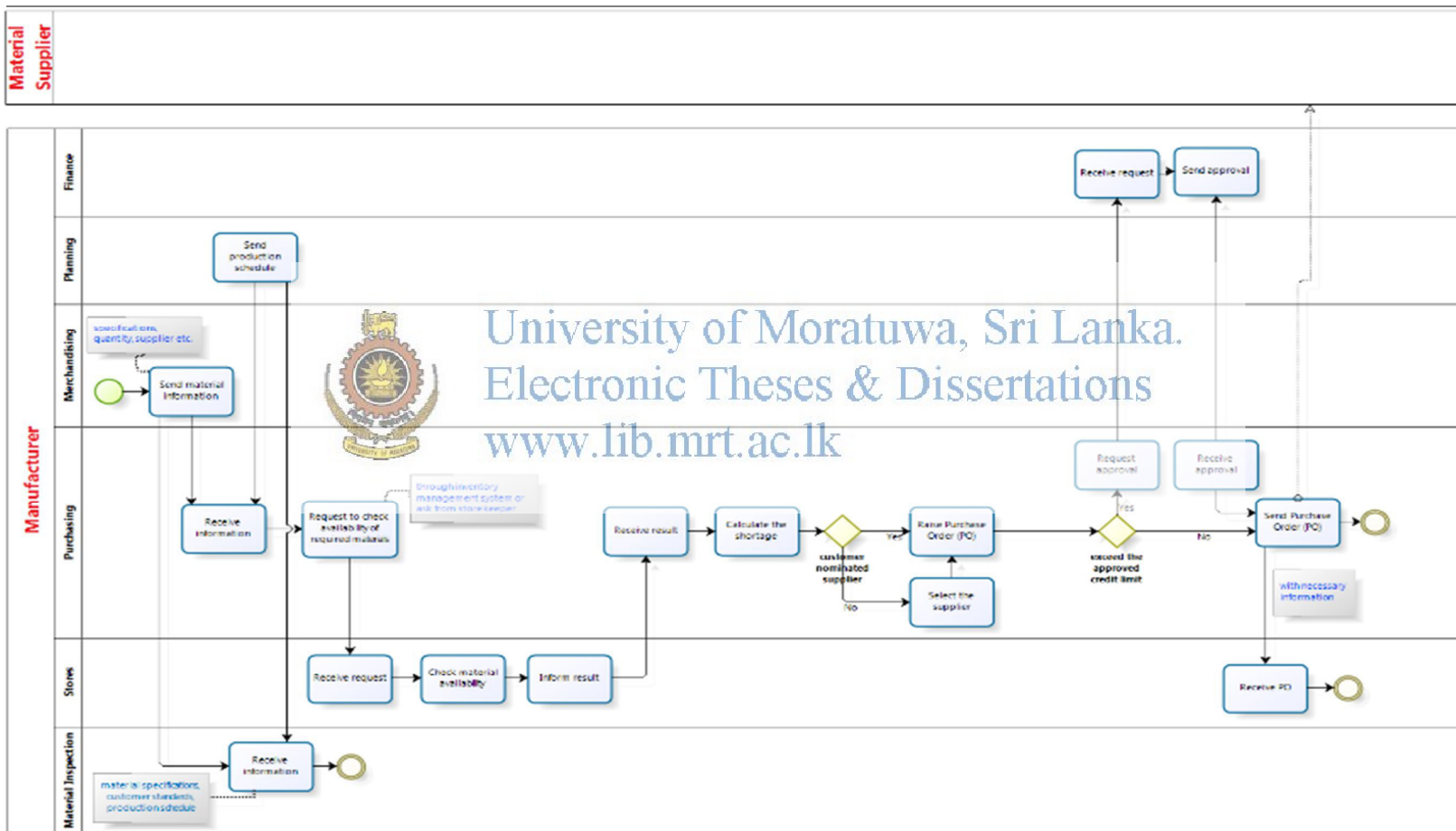
Figure J1.1.3: Detailed process map of raw material purchasing process from receiving material information till sending PO

Cause 1: Purchasing executive is not informed about the status of the order

In existing procedure, purchasing executive is not directly informed about the order status. Normally he gets to know it only when the marketing executive sends material specifications and supplier information of that particular order.

Cause 2: Marketing executive forgets to send required information to the purchasing executive soon after the order is confirmed

It is rather common that due to his heavy workload, the marketing executive may forget to send raw material specifications and supplier details as soon as the order is confirmed.

Besides, the purchasing executive is not aware about the status of the order; whether it is confirmed or not, he is unable to remind the marketing executive about sending information.

Cause 3: Purchasing executive does not have direct contact with the customer as he receives information through an intermediary (marketing executive)

Normally, purchasing executive is not given authority to directly contact the customer, therefore all the issues related to raw materials are communicated to customer through the marketing executive who acts as the intermediate body.

✓ Determine suitable improvements to overcome root causes of *Opportunity 1*

Improvement 1: Updating the purchasing executive about the status of the order regularly

This improvement will have a definite impact on both causes *1* and *2*. Updating the purchasing executive about the order status in a regular manner will let him know whether the order is confirmed or not. Repeat type order is an order with similar characteristics of a previously manufactured order within the company, by the same customer. If the order is confirmed and if it is of repeat type, then by experience, purchasing executive knows most of the raw materials that are required to manufacture the order. Therefore until marketing executive sends the specifications of the raw materials of the repeat

order with supplier details, purchasing executive can conduct purchasing process for those types of raw materials. While ordering these materials, he also can make marketing executive inform about information on other materials.

Improvement 2: Let purchasing executive to directly contact the customer
This improvement leads towards a critical change of the information structure. Besides, it has an impact on both *Cause 2* and on *Cause 3*. By letting the purchasing executive to contact customer, he can directly communicate issues related to ordering raw materials with the customer rather than communicating them through an intermediate party. This helps in saving a lot of time on communication while enhancing the efficiency of the entire sub-process.

Lifecycle Step 3: Design the new process with suitable improvements

✓ Techniques used (refer Annex G1.1)

DES 1   Design several alternative models for the improvement
DES 2   Simulate the selected, suitable models

✓ Create separate alternative designs for each improvement

✓ Evaluate the alternatives based on feasibility of applying them in real world

- Implementing *Improvement 2* has few limitations compared to the *Improvement 1*.

- In *Improvement 2,* it is essential to inform customer about the change as he directly involves in the change and also he should agree upon sending information to purchasing executive directly. To negotiate these issues with the customer, process owner needs much time.

- Implementing *Improvement 1* is an internal organizational change where customer does not directly involve. Therefore it can be quite easily implemented than *Improvement 2*.

- *Improvement 1* is selected as the best alternative for improving the existing system within the considered constraints. The alternative designed for the

targeted process by incorporating the selected improvement is shown in Figure X.5.

Lifecycle Step 4: Set performance measures to appropriate locations of the new process

✓ Techniques used (refer Annex G1.1)

MEAS 1   Evaluate the importance of each operation to the value of the output

MEAS 2   Discuss with the involved parties

MEAS 3   Refer past information

✓ Set performance measures and target values for the new design based on the improvement objectives and process goals

Improvement objective: To reduce the time taken to send purchase order to the supplier since the order is confirmed

Sub-goal catered by the improvement: To send the Purchase Order (PO) to supplier within one day (9 hours) from order confirmation

Table X.5: Performance measures and the target values set for the new design

Material type	Performance measure	Target value
Common	Time taken by the purchasing executive to send PO to supplier since order confirmation	Max 5 hours
New	Number of reminders sent by purchasing executive to marketing executive	Max 3
	Time taken by the purchasing executive to send PO to supplier since order confirmation	Max 7 hours

Lifecycle Step 5: Train performers to work in the new process

✓ Techniques used (refer Annex G1.1)

TRAIN 1   Conduct training sessions about new changes

TRAIN 2   Educate involved parties about the new system

TRAIN 3   Communicate and share information systematically
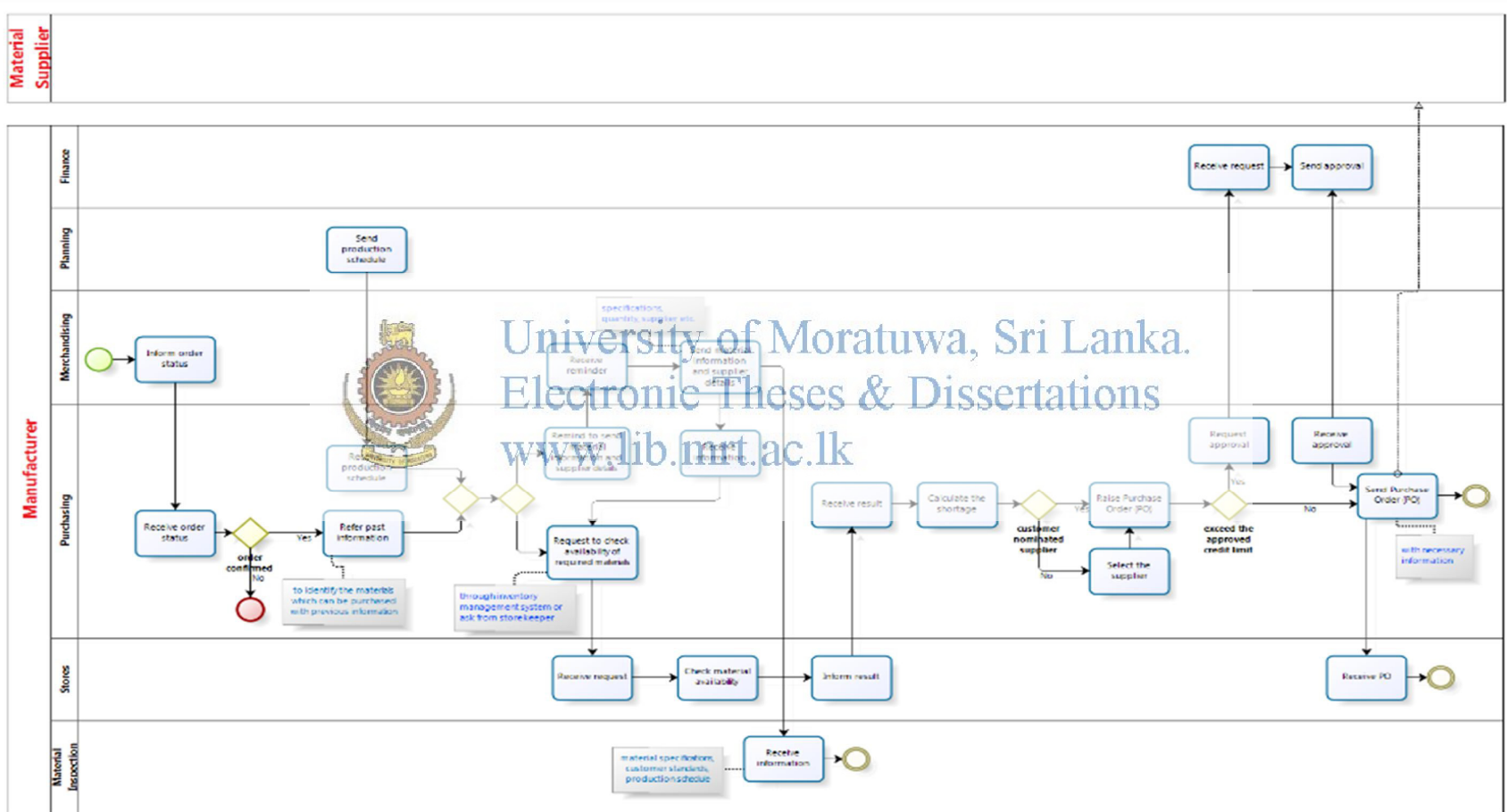
Figure X.5: New process alternative designed for *Improvement 1*

- ✓ Major concern is on human aspect; hence process performers and other involved parties such as internal and external customers, internal and external suppliers are majorly considered during this step

- ✓ Train and educate process performers about the nature of the new design, importance of the changes, what they need to do and how their work is evaluated

- ✓ Share information with external parties about the changes took place and how those changes would affect their work

Lifecycle Step 6: Implement the new process

- ✓ Techniques used (refer Annex G1.1)

IMPLE 2	Conduct a pilot run
IMPLE 3	Implement the new system parallel to old, for some period
IMPLE 4	Discuss with involved parties about the system

- ✓ Use four orders from two loyal customers; two from each, to test the new design, with the permission of the customers

- ✓ Discuss with involved parties about their feeling about the changes and the problems occurred while performing in new process

Lifecycle Step 7: Monitor and control the performance of the new process

- ✓ Techniques used (refer Annex G1.1)

EVAL 1	Use visual controls and audio signals
EVAL 2	Measure performance on regular basis
EVAL 4	Use statistical techniques to analyze measured data
EVAL 5	Display updated performance results where relevant parties can easily see

- ✓ Process owner is responsible in monitoring and controlling the process performance

- ✓ Measure performance regularly, on the performance measures set in *Step 4*

- ✓ Use target values of the performance measures set at *Step 4* as the reference to monitor and control the performance of the new process

✓ Need to measure both the performance of the new process and its impact on the entire process

Lifecycle Step 8: Check whether the improvement targets are achieved

✓ Assess actual results of the part of the process subjected to change against the performance measures set for that part of the process

Table J1.1.5: Desired values and the actual values received for the performance measures during the execution of new design

Material type	Performance measure	
Common	Time taken by the purchasing executive to send PO to supplier since order confirmation	
	Desired value	**Actual value**
	≤ 5 hours	≤ 3.8 hours
New	Number of reminders sent by purchasing executive to marketing executive	
	Desired value	**Actual value**
	≤ 3 reminders	2.5 reminders
	Time taken by the purchasing executive to send PO to supplier since order confirmation	
	Desired value	**Actual value**
	≤ 7 hours	≤ 6.3 hours

✓ Assess the actual results obtained for overall process after the implementation of the changes, against the process goals and sub-goals

Table J1.1.6: Assessment of the achievement of expected targets in terms of process goals and sub-goals

Process goal	To in-house the required quantity of trims in the required quality, within four days from the order confirmation	
	Desired value	**Actual value**
	≤ 4 days	3.6 days
Affected sub-goal	To send the Purchase Order (PO) to supplier within one day from order confirmation	
	Desired value	**Actual value**
	≤ 9 hours	5.4 hours

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Lifecycle Step 9: Perform process improvement steps continually

- ✓ Beginning of another lifecycle
- ✓ If expected targets are achieved, then can start catering another improvement opportunity beneath the same best practice
- ✓ If expected targets are not achieved, then need to cater the same improvement opportunity, with a different approach

Phase III – Process Management Maturity Assessment

- Phase III must be performed at the completion of Phase I and Phase II
- Contains five key domains to measure the BPM maturity;

  Organizational Structure (OS), Process Design and Documentation (PDD), Process Ownership (PO), Performance Measurement and Management (PMM) and Performance Improvement (PI)

  - ✓ Maturity is assessed in domain-wise, using a set of measuring variables
- Thirty-five measuring variables for all 5 domains
  - ✓ Each variable depicts the ideal status of maturity
  - ✓ Variables are assessed based on a seven-point scale

    0 - Totally disagree with the statement

    1 - Very weakly agree with the statement

    2 - Weakly agree with the statement

    3 - Moderately agree with the statement

    4 - Strongly agree with the statement

    5 - Very strongly agree with the statement

    6 - Totally agree with the statement

- Framework and the measuring mechanism –Annexes K1.1 and K1.2
  - ✓ Formulas to calculate domain-wise maturity level

    Response Score = Variable Weight * Variable Rating

    Response Score (min) = Variable Weight * Minimum Variable Rating (0)

    Response Score (max) = Variable Weight * Maximum Variable Rating (6)

    $$\text{Category Score} = \frac{\text{Total Response Score}}{[\text{Total response score (max) - Total response score (min)}]} *20$$

Table J1.1.7: Categorization of the BPM maturity level

Category score (a)	Maturity level
0 < a < = 4	Very Low
4 < a < = 8	Low
8 < a < = 12	Moderate
12 < a < = 16	High
16 < a < = 20	Very High

E.g. Calculating the maturity of the category *Organizational Structure*

Table J1.1.8: Calculating the maturity level of Organizational Structure

Variable	Variable Weight	Rating	Response Score	Response Score	Response Score (max)
OS-1	1	2	2	(1*0) = 0	(1*6) = 6
OS-2	1	2	2	0	6
OS-3	2	3	6	0	12
OS-4	2	2	4	0	12
OS-5	2	2	4	0	12
OS-6	2	3	6	0	12
Total			24	0	60
Category Score	24/(60-0)*20 = 8.00				
Maturity Level	**LOW**				

Table J1.1.8: Application of BPM maturity measuring framework for the case

Category	Sub-category	Variable	Rating						
			0	1	2	3	4	5	6
OS	Organization of the structure	Organizational structure of the company is illustrated as a collection of cross-functional teams (OS-1)			√				
		All the activities of the company are operated as cross-functional teams (OS-2)			√				
	Roles and responsibilities	Job roles are designed based on cross-functional teams (OS-3)				√			
		Jobs are multi-dimensional instead of one simple task (OS-4)			√				
		Job roles are clearly defined and documented (OS-5)			√				
		Employees are well trained to perform in cross-functional teams (OS-6)				√			
PDD	Process focus	Employees use process terms such as process, process owners in their daily work; communicating, documenting etc. (PDD-1)			√				
		Employees of all levels share a common understanding about process terms (PDD-2)				√			
		Employees have a clear understanding about their work, how it affects other processes and the entire organization (PDD-3)				√			
		Employees view a process as a collection of cross-functional teams and the business as a collection of processes (PDD-4)		√					
		Corporate goals of the organization are considered in deciding process goals (PDD-5)					√		
		Resources are allocated based on the process design (PDD-6)				√			
	Process definition	Process is defined and documented with all necessary details; tasks, workflow, resources etc. (PDD-7)					√		
		Process documentation is periodically reviewed and updated (PDD-8)				√			
		Process documentation is used when performing the tasks of the process (PDD-9)			√				
		Process documentation is used when training and educating process performers (PDD-10)		√					
PO	Assignment	Owner is assigned for the entire process, not for the functional units of the process (PO-1)				√			
		Process owner is selected without being biased to any functional unit of the process (PO-2)			√				
	Responsibility and authority	Process owner has a good understanding and knowledge about every aspect of his process as well as other processes (PO-3)				√			
		Process owner is responsible for all aspects of his process (PO-4)			√				
		Process owner has full controlling power over his process (PO-5)			√				
		Process owners responsibilities and authorities are well defined and documented (PO-6)		√					
		Process performers are clearly communicated about process owner's responsibilities and authorities (PO-7)		√					
PMM	Focus	Performance measures are set for the entire process, not the functional units (PMM-1)			√				
		Performance measures are set to measure the outcome of the process, not tasks or employees (PMM-2)			√				
		Measurement results are used to monitor and optimize the process performance (PMM-3)				√			
		Process performers are rewarded based on process performance results (PMM-4)					√		
	Definition	Performance measures are set based on company's corporate goals (PMM-5)			√				
		Performance measures and target values are clearly defined and documented (PMM-6)			√				
		Performance measures and target values are periodically reviewed and updated (PMM-7)			√				
		Process performance is measured in regular basis (PMM-8)				√			
PI	Focus	Improvement efforts are focused to optimize both process and company performance (PI-1)					√		
		Improvement efforts are focused on the process not on its functional units (PI-2)			√				
	Employee involvement	Process performers are trained on process improvement techniques (PI-3)			√				
		Process performers are encouraged to propose improvement ideas (PI-4)			√				

Table J1.1.9: Application of BPM maturity measuring mechanism for the case

Category	Variable Code	Variable Weight	Response Rating	Response Score		Response Score(min)		Response Score(max)		Category Score(20)	Maturity Level
OS	OS-1	1	2	2		0		6			
	OS-2	1	2	2		0		6			
	OS-3	2	3	6		0		12			
	OS-4	2	2	4		0		12			
	OS-5	2	2	4		0		12			
	OS-6	2	3	6	24	0	0	12	60	8.00	Low
PDD	PDD-1	1	2	2		0		6			
	PDD-2	2	3	6		0		12			
	PDD-3	1	3	3		0		6			
	PDD-4	1	1	1		0		6			
	PDD-5	2	4	8		0		12			
	PDD-6	2	3	6		0		12			
	PDD-7	1	4	4		0		6			
	PDD-8	1	3	3		0		6			
	PDD-9	2	2	4		0		12			
	PDD-10	2	1	2	39	0	0	12	90	8.67	Moderate
PO	PO-1	2	3	6		0		12			
	PO-2	2	2	4		0		12			
	PO-3	2	3	6		0		12			
	PO-4	2	2	4		0		12			
	PO-5	2	2	4		0		12			
	PO-6	2	1	2		0		12			
	PO-7	2	1	2	28	0	0	12	84	6.67	Low
PMM	PMM-1	2	2	4		0		12			
	PMM-2	2	2	4		0		12			
	PMM-3	2	3	6		0		12			
	PMM-4	2	4	8		0		12			
	PMM-5	2	2	4		0		12			
	PMM-6	2	2	4		0		12			
	PMM-7	2	2	4		0		12			
	PMM-8	2	3	6	40	0	0	12	96	8.33	Moderate
PI	PI-1	2	4	8		0		12			
	PI-2	2	2	4		0		12			
	PI-3	2	2	4		0		12			
	PI-4	2	2	4	20	0	0	12	48	8.33	Moderate

Category Score(20)	Maturity Level
0 <= x <= 4	VERY LOW
4 < x <= 8	LOW
8 < x <= 12	MODERATE
12 < x <= 16	HIGH
16 < x <= 20	VERY HIGH
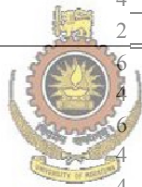
Table J1.1.10: Categorization of the BPM maturity level

Category score (a)	Maturity level
0 < a < = 4	Very Low
4 < a < = 8	Low
8 < a < = 12	Moderate
12 < a < = 16	High
16 < a < = 20	Very High

E.g. Calculating the maturity of the category *Organizational Structure*

Table J1.1.11: Calculating the maturity level of Organizational Structure

Variable	Variable Weight	Rating	Response Score	Response Score	Response Score (max)
OS-1	1	2	2	(1*0) = 0	(1*6) = 6
OS-2	1	2	2	0	6
OS-3	2	3	6	0	12
OS-4	2	2	4	0	12
OS-5	2	2	4	0	12
OS-6	2	3	6	0	12
Total			24	0	60
Category Score	24/(60-0)*20 = 8.00				
Maturity Level	**LOW**				

Annex J1.2: Validation Survey: BPM implementation framework
Survey to validate the proposed BPM implementation framework

This survey is a part of the postgraduate research progressing at present, at the University of Moratuwa.

The research is to develop a framework to implement Business Process Management (BPM) principles to the Sri Lankan Apparel Industry. The proposed framework is a detailed guideline about applying the key BPM principles to the Sri Lankan Apparel Industry. It includes guidelines about

- Introducing process orientation to the apparel manufacturing business process
- Set of performance improvement best practices applicable to the industry
- Lifecycle to implement process improvement and management efforts within apparel manufacturing organizations
- Techniques applicable in executing each step of the lifecycle and which are suitable to be applied within the industry
- Framework to assess the process management maturity among apparel manufacturing organizations

The **key aims of this survey** are

- To confirm the enhancement of the effectiveness of process management initiatives within the Sri Lankan Apparel Industry througheach key element of the proposed BPM implementation framework

- To confirm the enhancement of the effectiveness of process management initiatives within the Sri Lankan Apparel Industry by the overall BPM implementation framework

Your honest and dedicated participation to the survey by filling the following questionnaire is highly appreciated. It will definitely help to increase the success of the survey and the accuracy level of the information revealed by the survey. **All the information you provide will be treated in the strictest confidence**. Only the aggregated results will be published and used in future work.

This questionnaire would take maximum 20 minutes to complete. Take time to read and understand the question and the given answers.

Thank you for participating and spending your time in the survey.

Tolusha Yapa
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Faculty of Engineering
University of Moratuwa

For inquiries please contact: tolusha.research@gmail.com

Company you are currently working

Working experience in Process Improvement	Less than 1 year	1 – 3 years	3 – 6 years	6 – 9 years	9 years or more
	☐	☐	☐	☐	☐

QUESTIONNAIRE: Rate key features of the BPM implementation framework proposed for the Sri Lankan Apparel Industry based on the level the effectiveness of process management implementation efforts are enhanced by the proposed framework. Use the scale given below in rating each feature under the 3 effectiveness measures provided.

Scale 0 - Does not improve   1 - Merely improve   2 - Significantly improve   3 – Largely improve

Definitions of effectiveness measures

Accuracy – ability to be precise and avoid errors

Adaptability – ability to be changed for different conditions and purposes

Performance – ability to behave as expected

Effectiveness measure / Feature	Accuracy				Adaptability				Performance			
	0	1	2	3	0	1	2	3	0	1	2	3
Structuring the business as a collection of processes instead of a collection of departments	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Designing process as a collection of activities where workers from different departments perform those activities with a common focus	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Assigning a process leader in addition to the department leaders	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Setting goals and the performance measures for processes instead of departments	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Aligning process goals with corporate business objectives	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Defining process elements, boundaries, activities and their sequence	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Defining job roles of process workers and the resources required to perform those job roles	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Providing a mechanism to select critical processes to apply process management	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Providing a set of best practices applicable to the Sri Lankan Apparel Industry for improving the selected processes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Selecting best practices suitable to apply in improving the selected processes, based on organization-specific parameters	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Providing a lifecycle to execute BPM within the selected processes, through best practices	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Considering the interrelationships among selected best practices, when executing the lifecycle	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Providing a set of techniques applicable for the Sri Lankan Apparel Industry, to execute each step of the lifecycle	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Providing a framework to assess the maturity of the process management efforts	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Annex K1.1: Reliability and Validity of questionnaire

Reliability

Reliability is a measurement of the consistency of a survey instrument (Bryman and Bell, 2007). In fact, it measures the degree of stability when a measurement is repeated under identical conditions (Michael and Miller, n.d.). Among the four types of reliability measures, *internal consistency* was used in this study, in order to test the reliability of the self-administered questionnaire surveys carried out in collecting data.

Cronbach's alpha, which denotes how well the different items complement each other in the measurement of different aspects of the same variable or quality, was used to check for internal consistency of data (Cronbach, 1951). In general, an interpretation of correlation coefficient which is greater than 0.70 (Nunnally, 1967), is treated as a good and reliable form.

Reliability Analysis - Survey to identify the Process Improvement Status of Sri Lankan Apparel Manufacturing Industry - Executive Questionnaire (Annex F1.1)

Q1: The steps follow in implementing a process improvement project based on the effort that industry put

Based on the responses received for Q1, SPSS indicated a Cronbach's alpha value of 0.7933, which depicts an acceptable level of internal consistency.

When analysing the column *Cronbach's Alpha if Item deleted* in Table K1.1.1, it is seen that removal of any question except question 1, 4, and 8 (`IDENTIFY,MEASURE, CHECK`) would result in a lower Cronbach's alpha. Even the removal of question 1, 4 and 8 is not necessary as would only lead to small improvements in Cronbach's alpha.

Table K1.1.1: Item-total Statistics table 1

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
IDENTIFY	30.4667	20.2667	.2383	.4843	.8093
SELECT	30.2000	20.6000	.4033	.3675	.7836
DESIGN	30.2667	18.6381	.6152	.6608	.7574
MEASURE	30.8000	21.4571	.1361	.6064	.8177
TRAIN	30.2000	15.6000	.8655	.8393	.7103

IMPLEMEN	30.0000	17.7143	.7436	.7024	.7398
EVALUATE	30.1333	16.5524	.7514	.9141	.7312
CHECK	30.2000	20.4571	.2917	.5967	.7970
CONTINUE	30.2667	19.0667	.4137	.7627	.7832

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   9 items

Alpha =   .7933   Standardized item alpha =   .7948

Q2: The steps follow in implementing a process improvement project based on the effort that industry put.

Based on the responses received for Q2, SPSS indicated a Cronbach's alpha value of 0.9404, which is a very high level of internal consistency.

When the column *Cronbach's Alpha if Item deleted* of Table K1.1.2 is considered, it is evident that removal of any item except items ID2, ID8, SEL3, DES1, DES2, DES3 and EVAL1 would result in a lower Cronbach's alpha value. Therefore, it is not necessary to remove any of these items since removal of items ID2, ID8, SEL3, DES1, DES2, DES3 and EVAL1 would lead to small improvements in Cronbach's alpha.

Table K1.1.2: Item-total Statistics table 2

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
ID1	137.8000	421.1714	.5250	.	.9389
ID2	138.2667	422.7810	.3269	.	.9418
ID3	137.4667	428.5524	.4628	.	.9394
ID4	137.2000	422.1714	.8333	.	.9375
ID5	137.5333	425.1238	.4763	.	.9392
ID6	137.8000	431.3143	.3378	.	.9403
ID7	137.6000	428.5429	.4420	.	.9395
ID8	138.3333	437.3810	.1155	.	.9429
SEL1	137.6000	416.9714	.7138	.	.9374
SEL2	138.2667	419.2095	.7202	.	.9375
SEL3	138.4000	439.9714	.0781	.	.9427
SEL4	138.0667	429.3524	.5771	.	.9389
SEL5	137.7333	421.3524	.5394	.	.9387
SEL6	138.1333	397.5524	.7459	.	.9367
DES1	138.8000	443.0286	.0184	.	.9426

```
DES2              138.8000      434.0286      .2383         .          .9412
DES3              139.3333      429.2381      .2088         .          .9434
MEAS1             137.8000      419.6000      .6661         .          .9378
MEAS2             137.6000      413.4000      .8128         .          .9366
MEAS3             138.0000      423.1429      .5166         .          .9389
MEAS4             138.1333      412.9810      .6640         .          .9376
MEAS5             138.0667      430.4952      .5317         .          .9391
TRAIN1            137.6667      413.5238      .7687         .          .9369
TRAIN2            137.7333      412.0667      .7741         .          .9367
TRAIN3            137.8000      415.4571      .6207         .          .9380
IMPLE1            137.8667      415.5524      .6925         .          .9374
IMPLE2            137.6667      408.8095      .8289         .          .9362
IMPLE3            137.9333      410.0667      .8132         .          .9364
IMPLE4            137.6667      419.9524      .8337         .          .9372
IMPLE5            138.4000      426.8286      .3832         .          .9401
EVAL1             138.4667      435.6952      .1431         .          .9428
EVAL2             138.4000      422.8286      .5637         .          .9386
EVAL3             138.5333      423.1238      .5818         .          .9385
EVAL4             138.2000      407.6000      .8357         .          .9360
EVAL5             138.4000      424.6857      .5124         .          .9390
CHECK1            137.4667      419.1238      .6796         .          .9377
CHECK2            137.6000      421.6857      .7202         .          .9377
CHECK3            137.6000      414.9714      .7074         .          .9373
```

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   38 items

Alpha =   .9404   Standardized item alpha =   .9479

Reliability Analysis - Survey to identify the Process Improvement Status of Sri Lankan Apparel Manufacturing Industry - Manager Questionnaire (Annex E1.2)

Q2: Best practices that an organization has used to improve the performance of the business process

1) Questionnaire responses for level of use of best practices

Based on the responses received for Q2-*level of use*, SPSS indicated a Cronbach's alpha value of 0.9446, which is a very high level of internal consistency.

When analysing the column *Cronbach's Alpha if Item deleted* of Table K1.1.3, it can be seen that removal of any question except items BW2_LOU, EE3_LOU, GT1_LOU, GT4_LOU, JIT1_LOU, KB2_LOU, STD1_LOU, STD2_LOU, SUR2_LOU and TPM4_LOU would result in a lower Cronbach's alpha value. As in the above cases, it is not necessary to remove these

items since removal of them would only lead towards very small improvements in Cronbach's alpha.

Table K1.1.3: Item-total Statistics table 3

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
FS1_LOU	175.2667	1078.7810	.4338	.	.9439
FS2_LOU	175.1333	1079.9810	.4129	.	.9440
FS3_LOU	175.0667	1080.6381	.4270	.	.9439
BIQ1_LOU	175.7333	1041.4952	.7672	.	.9419
BIQ2_LOU	175.6000	1035.8286	.7707	.	.9418
BIQ3_LOU	175.0000	1053.5714	.7116	.	.9424
BIQ4_LOU	174.8000	1081.6000	.4663	.	.9439
BIQ5_LOU	175.6667	1058.0952	.4531	.	.9438
BIQ6_LOU	176.0000	1030.1429	.7938	.	.9415
BW1_LOU	175.5333	1064.2667	.4607	.	.9437
BW2_LOU	175.6000	1087.9714	.1675	.	.9455
CF1_LOU	175.9333	1043.9238	.6102	.	.9427
CI1_LOU	175.6667	1066.6667	.5734	.	.9432
CI2_LOU	175.6667	1076.5238	.3441	.	.9443
CI3_LOU	175.4667	1074.1238	.4713	.	.9437
CI4_LOU	175.7333	1046.3524	.6448	.	.9426
EE1_LOU	177.1333	1052.1238	.5634	.	.9431
EE2_LOU	176.3333	1048.0952	.5579	.	.9431
EE3_LOU	175.8000	1086.4571	.2468	.	.9447
EE4_LOU	175.3333	1066.8095	.7699	.	.9428
EE5_LOU	176.0667	1056.9238	.5009	.	.9435
GT1_LOU	176.0667	1091.4952	.1057	.	.9463
GT2_LOU	175.5333	1080.5524	.3138	.	.9444
GT3_LOU	175.5333	1070.9810	.5137	.	.9435
GT4_LOU	175.0000	1097.4286	.1531	.	.9449
GT5_LOU	175.0667	1081.9238	.4033	.	.9440
JIT1_LOU	176.5333	1062.4095	.3617	.	.9447
JIT2_LOU	176.2667	1065.6381	.4484	.	.9438
KB1_LOU	175.9333	1043.9238	.6102	.	.9427
KB2_LOU	176.5333	1066.9810	.3290	.	.9448
MP1_LOU	175.7333	1031.9238	.8149	.	.9415
MP2_LOU	175.6667	1049.0952	.7052	.	.9423
MP3_LOU	176.2667	1031.3524	.7211	.	.9419
MP4_LOU	176.6000	1046.4000	.5977	.	.9428
OTH1_LOU	175.2667	1075.2095	.4961	.	.9436

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
PFD1_LOU	175.5333	1070.9810	.3478	.	.9444
PFD2_LOU	175.1333	1080.6952	.6071	.	.9436
STD1_LOU	175.2000	1093.4571	.2143	.	.9447
STD2_LOU	176.8667	1121.9810	-.1819	.	.9485
STD3_LOU	175.8667	1061.1238	.5234	.	.9433
STD4_LOU	175.7333	1074.6381	.4170	.	.9439
SUR1_LOU	176.0667	1058.2095	.5067	.	.9434
SUR2_LOU	175.8667	1083.6952	.2280	.	.9451
SUR3_LOU	175.6000	1052.9714	.7394	.	.9423
SUR4_LOU	175.8667	1068.5524	.4805	.	.9436
SUR5_LOU	175.6667	1049.6667	.7854	.	.9421
TPM1_LOU	176.0000	1061.2857	.4464	.	.9438
TPM2_LOU	176.0000	1049.2857	.5392	.	.9432
TPM3_LOU	175.6667	1044.2381	.6989	.	.9423
TPM4_LOU	176.4667	1065.9810	.3210	.	.9450
VC1_LOU	175.1333	1053.9810	.7986	.	.9422
VC2_LOU	176.0000	1022.0000	.8269	.	.9412

```
Reliability Coefficients    52 items

Alpha =   .9446          Standardized item alpha =   .9492
```

2) Questionnaire responses for level of success of best practices

Similarly, based on the responses received for Q2-*level of success*, SPSS generated a Cronbach's alpha value of 0.9559, which again is a very high level of internal consistency.

When the column *Cronbach's Alpha if Item deleted* of Table K1.1.4 is considered, it is evident that removal of any question except few items would result in a lower Cronbach's alpha value. It is not necessary to remove those items since removal of them would only result a small improvement in Cronbach's alpha.

<div align="center">Table K1.1.4: Item-total Statistics table 4</div>

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
FS1_LOS	177.3333	1277.0952	.6973	.	.9545
FS2_LOS	176.9333	1306.9238	.3035	.	.9559
FS3_LOS	176.9333	1292.6381	.6820	.	.9548
BIQ1_LOS	177.5333	1254.2667	.7657	.	.9539
BIQ2_LOS	177.4667	1267.4095	.7220	.	.9542

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BIQ3_LOS	177.2000	1279.7429	.6430	.	.9546
BIQ4_LOS	177.1333	1285.8381	.6220	.	.9548
BIQ5_LOS	177.2000	1293.6000	.4579	.	.9553
BIQ6_LOS	177.5333	1263.9810	.6620	.	.9544
BW1_LOS	177.6667	1278.3810	.5339	.	.9550
BW2_LOS	177.6667	1274.6667	.4914	.	.9553
CF1_LOS	177.4667	1274.1238	.5342	.	.9550
CI1_LOS	177.4667	1276.5524	.6890	.	.9545
CI2_LOS	177.6000	1266.5429	.6625	.	.9544
CI3_LOS	177.4000	1264.5429	.7623	.	.9541
CI4_LOS	177.5333	1261.2667	.8394	.	.9538
EE1_LOS	178.7333	1248.4952	.7003	.	.9541
EE2_LOS	178.0000	1237.0000	.8113	.	.9535
EE3_LOS	177.6667	1314.6667	.1687	.	.9565
EE4_LOS	177.3333	1281.9524	.7412	.	.9545
EE5_LOS	178.0000	1273.8571	.5234	.	.9551
GT1_LOS	177.8000	1295.1714	.3260	.	.9560
GT2_LOS	177.0000	1325.4286	.0725	.	.9564
GT3_LOS	177.2000	1302.8857	.4329	.	.9555
GT4_LOS	176.9333	1321.2095	.1724	.	.9561
GT5_LOS	176.9333	1309.9238	.4167	.	.9556
JIT1_LOS	177.7333	1263.4952	.5468	.	.9550
JIT2_LOS	177.8667	1262.4095	.6442	.	.9545
KB1_LOS	177.4667	1274.1238	.5342	.	.9550
KB2_LOS	178.0667	1268.2095	.4865	.	.9554
MP1_LOS	177.6000	1258.6857	.6906	.	.9542
MP2_LOS	177.4000	1266.4000	.7829	.	.9540
MP3_LOS	177.7333	1261.6381	.5802	.	.9548
MP4_LOS	178.2000	1239.8857	.7530	.	.9538
OTH1_LOS	177.3333	1270.8095	.6576	.	.9545
PFD1_LOS	177.5333	1279.6952	.4586	.	.9554
PFD2_LOS	177.2000	1281.4571	.7955	.	.9544
STD1_LOS	177.4000	1295.1143	.4779	.	.9553
STD2_LOS	179.0000	1350.8571	-.1998	.	.9592
STD3_LOS	177.4667	1278.8381	.6581	.	.9546
STD4_LOS	177.6667	1274.3810	.6746	.	.9545
SUR1_LOS	178.0667	1297.9238	.2522	.	.9567
SUR2_LOS	178.4000	1301.4000	.2323	.	.9567
SUR3_LOS	177.4000	1281.5429	.6747	.	.9546
SUR4_LOS	177.7333	1265.4952	.6802	.	.9543
SUR5_LOS	177.5333	1272.9810	.7341	.	.9543
TPM1_LOS	177.5333	1284.5524	.4450	.	.9554
TPM2_LOS	177.9333	1275.0667	.4865	.	.9553
TPM3_LOS	177.0000	1296.1429	.5713	.	.9551
TPM4_LOS	178.2667	1291.4952	.2807	.	.9567

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VC1_LOS      177.2667      1286.3524      .5425        .          .9550
VC2_LOS      177.9333      1257.9238      .6985        .          .9542


Reliability Coefficients    52 items

Alpha =   .9559          Standardized item alpha =   .9600
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Validity

The *validity* of a survey indicates how well a survey measures what it sets out to measure (Bryman and Bell, 2007). Validity can be measured in four forms; Face validity, Content validity, Criterion validity and Construct validity (Carmines and Zeller, 1979). In this study, all the questionnaires were exposed to the face validity by showing them to several academics and industry experts who has expert knowledge on the area targeted by the questionnaires. In addition, the content validity was checked with an organized review of the survey's contents to ensure everything required to be is covered or need to deduct any unnecessary. Content validity was also evaluated using academics and industry experts who have been specialized in the content areas as well as with the support of existing literature.