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Appendices

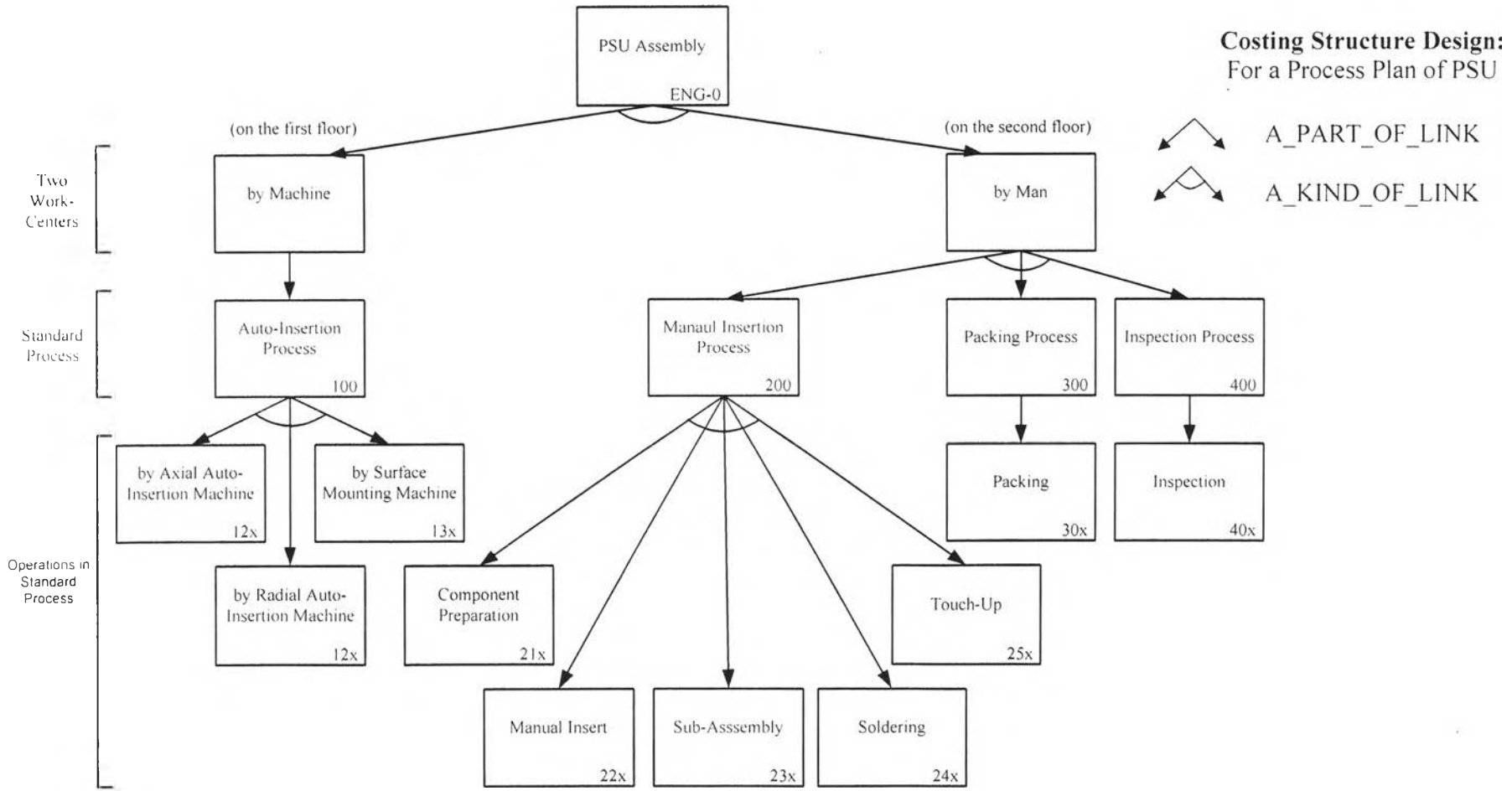
Appendix 1

Author's Detailed Standard Process Plan

(Thesis's Result#1 from the author's preparation of workflow for PDM)

The Company Name	Document No: WI-EC03-060	Rev: 0	Revised Date: -	Effective Date: 1-Nov-03	Page: 1 of 8

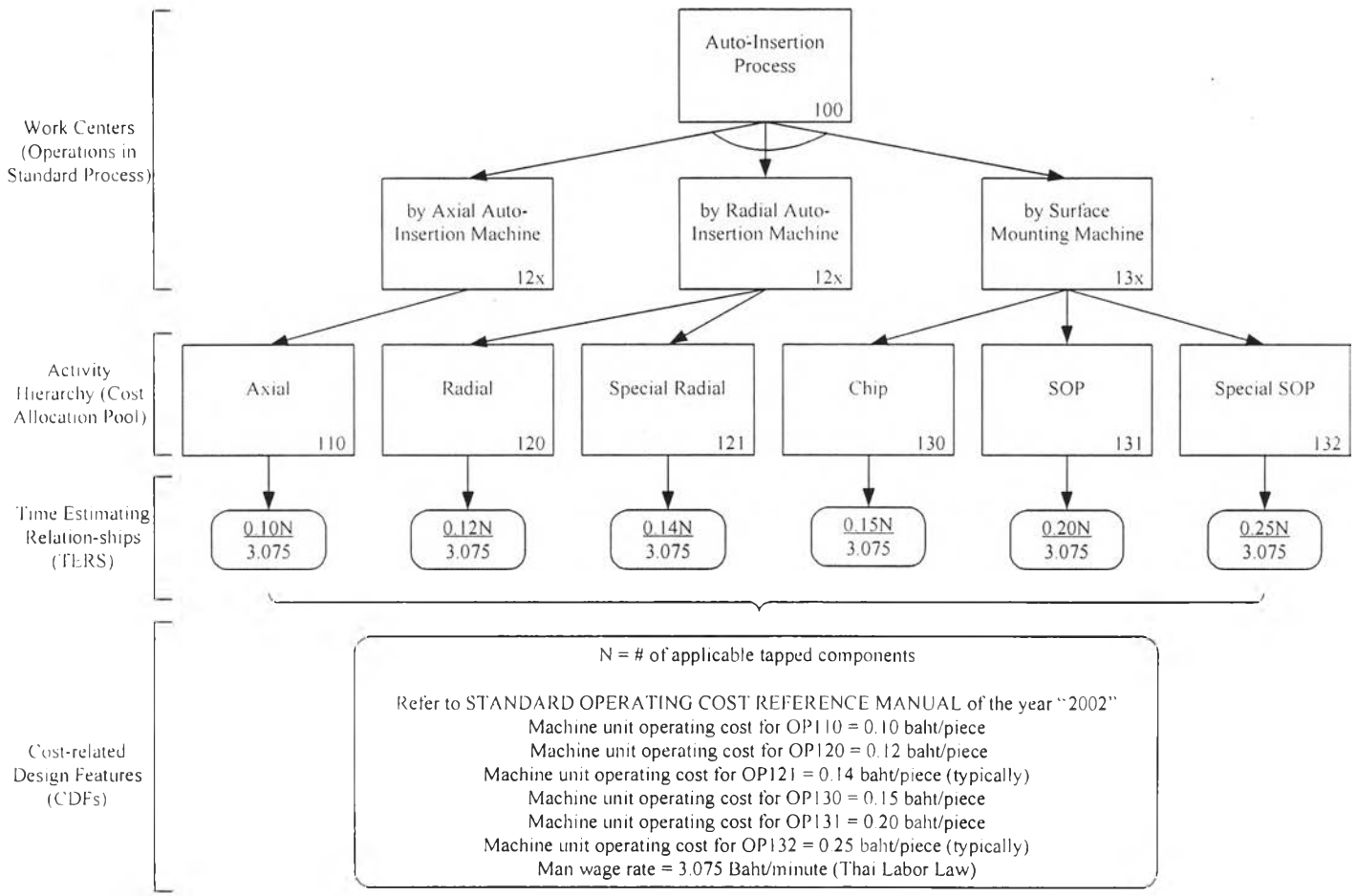
Subject: Detailed Standard Process Plan for Power Supply Unit



Prepared by: Janejira Kulpanaves	Approved by: Cheera Chamngam	BKK Engineering Department

The Company Name	Document No: WI-EC03-060 Rev: 0	Revised Date: -	Effective Date: 1-Nov-03	Page: 2 of 8

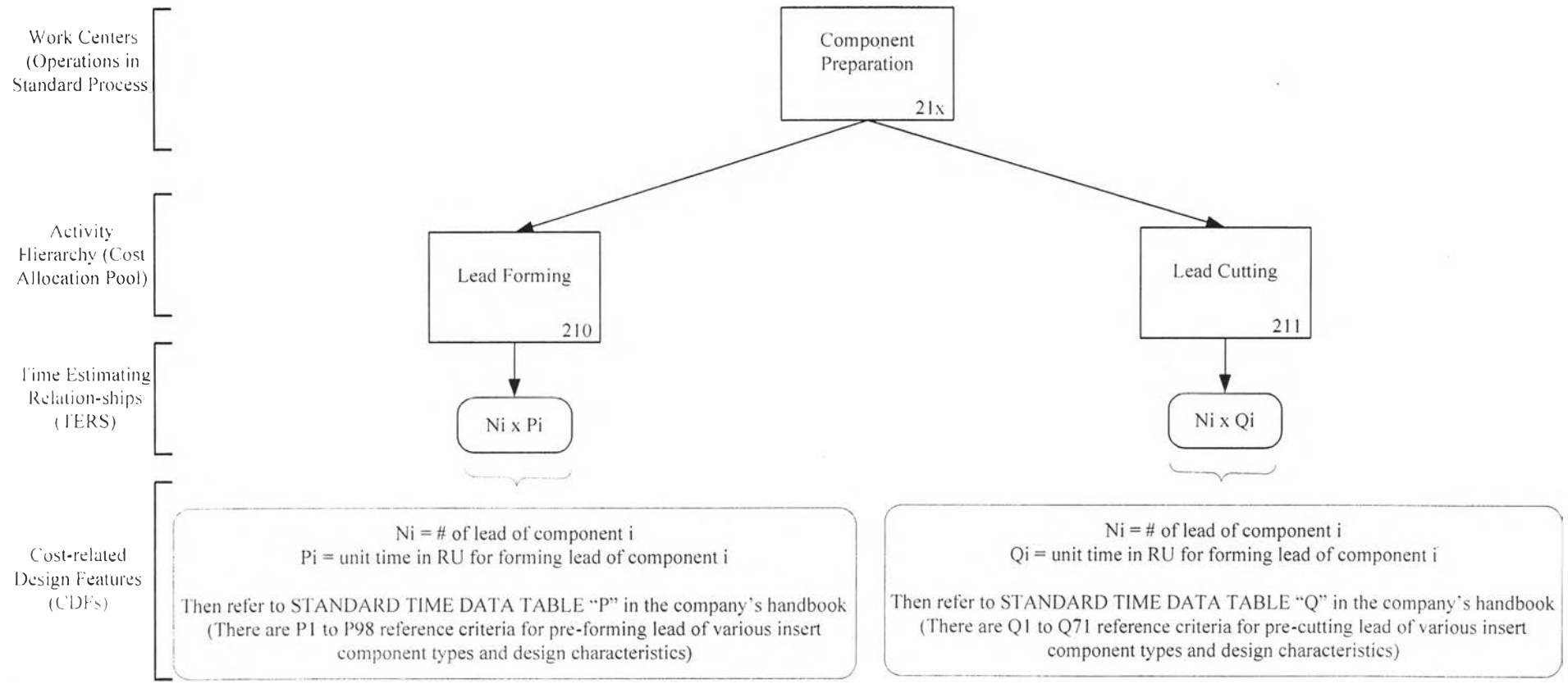
Subject: Detailed Standard Process Plan for Power Supply Unit



Prepared by: Janejira Kulpanaves	Approved by: Cheera Chamngam	BKK Engineering Department

The Company Name	Document No: WI-EC03-060	Rev: 0	Revised Date: -	Effective Date: 1-Nov-03	Page: 3 of 8

Subject: Detailed Standard Process Plan for Power Supply Unit



Note:
1 RU = 0.001 minute
The term "lead" = also often commonly known as "leg" or "solder point" in the case study

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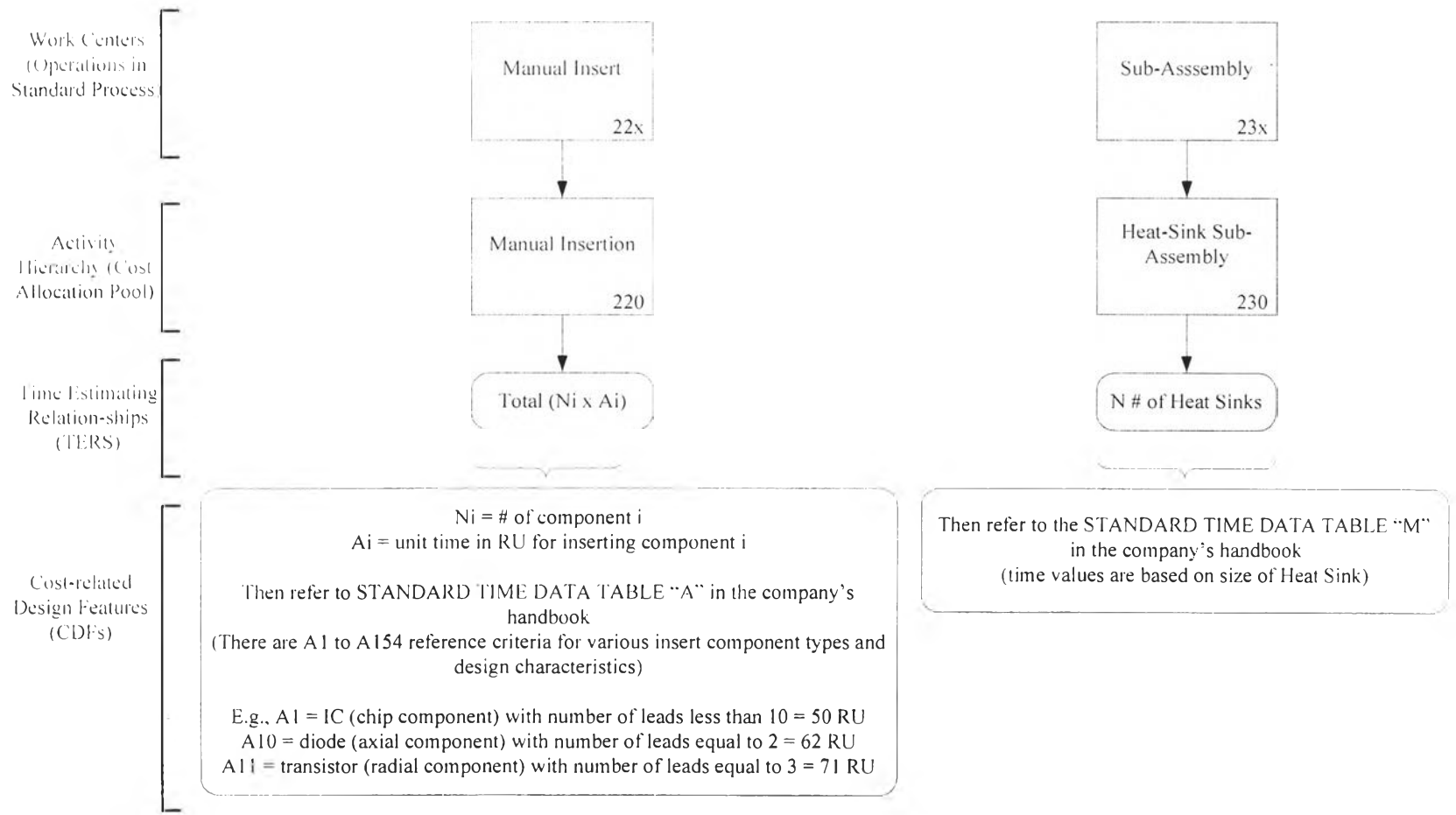
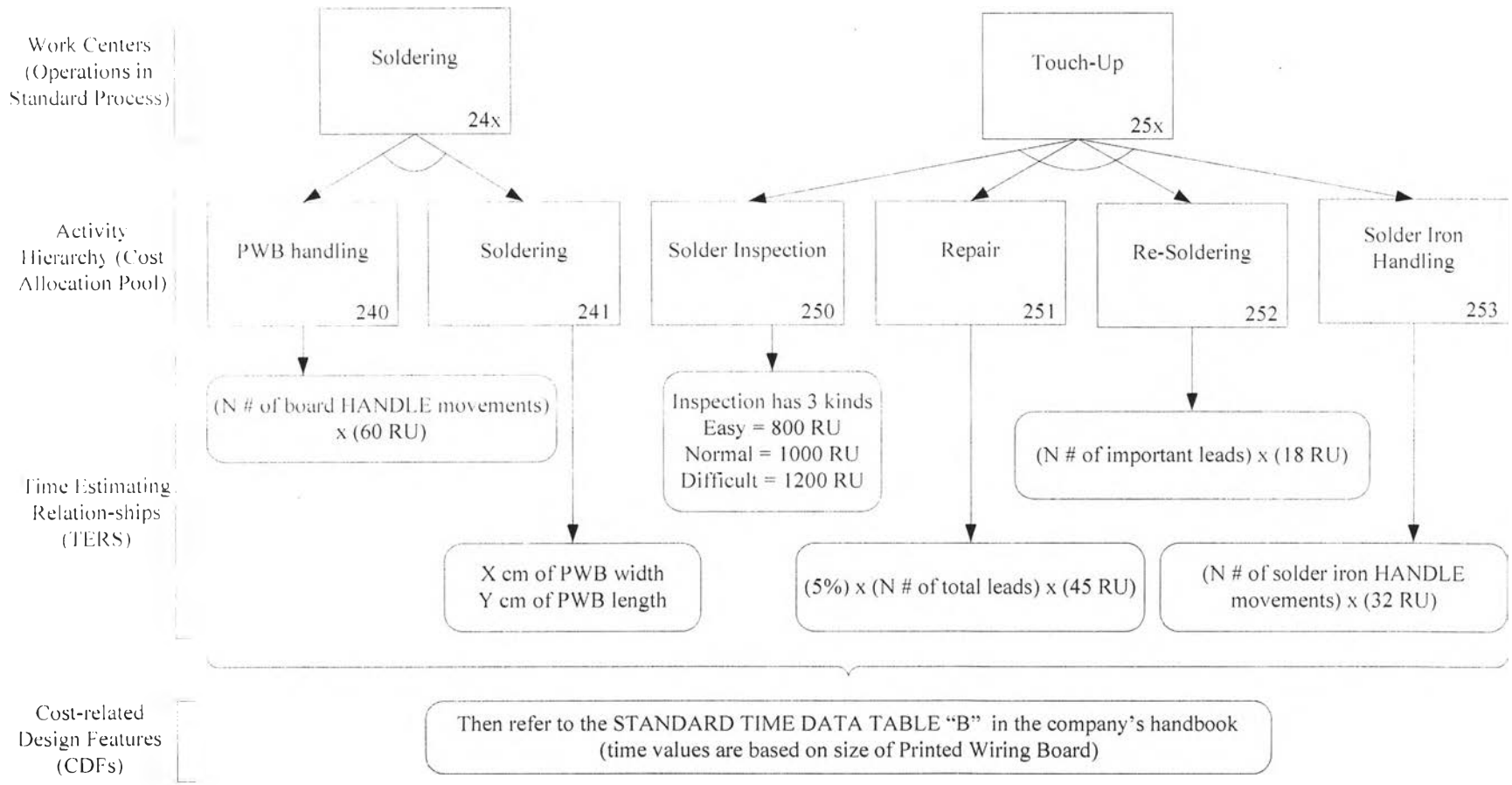

Work Centers (Operations in Standard Process)
Activity Hierarchy (Cost Allocation Pool)
Time Estimating Relation-ships (TERS)
Cost-related Design Features (CDFs)
Manual Insert
22x
Manual Insertion
220
Total (Ni x Ai)
Sub-Asssembly
23x
Heat-Sink Sub-Assembly
230
N # of Heat Sinks
Ni = # of component i
Ai = unit time in RU for inserting component i
Then refer to STANDARD TIME DATA TABLE "A" in the company's handbook
(There are A1 to A154 reference criteria for various insert component types and design characteristics)
E.g., A1 = IC (chip component) with number of leads less than 10 = 50 RU
A10 = diode (axial component) with number of leads equal to 2 = 62 RU
A11 = transistor (radial component) with number of leads equal to 3 = 71 RU
Then refer to the STANDARD TIME DATA TABLE "M" in the company's handbook
(time values are based on size of Heat Sink)

The Company Name	Document No: WI-EC03-060	Rev: 0	Revised Date: -	Effective Date: 1-Nov-03	Page: 5 of 8

Subject: Detailed Standard Process Plan for Power Supply Unit



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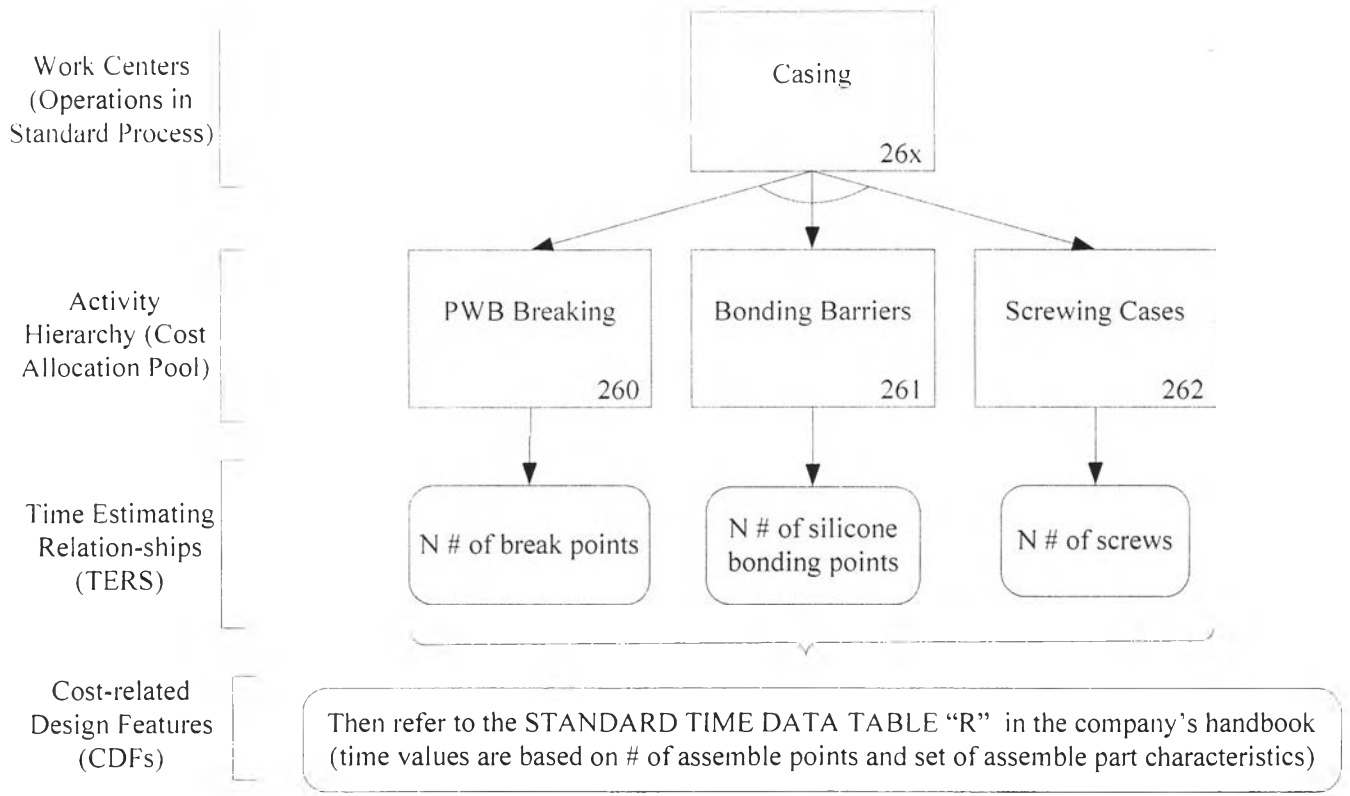
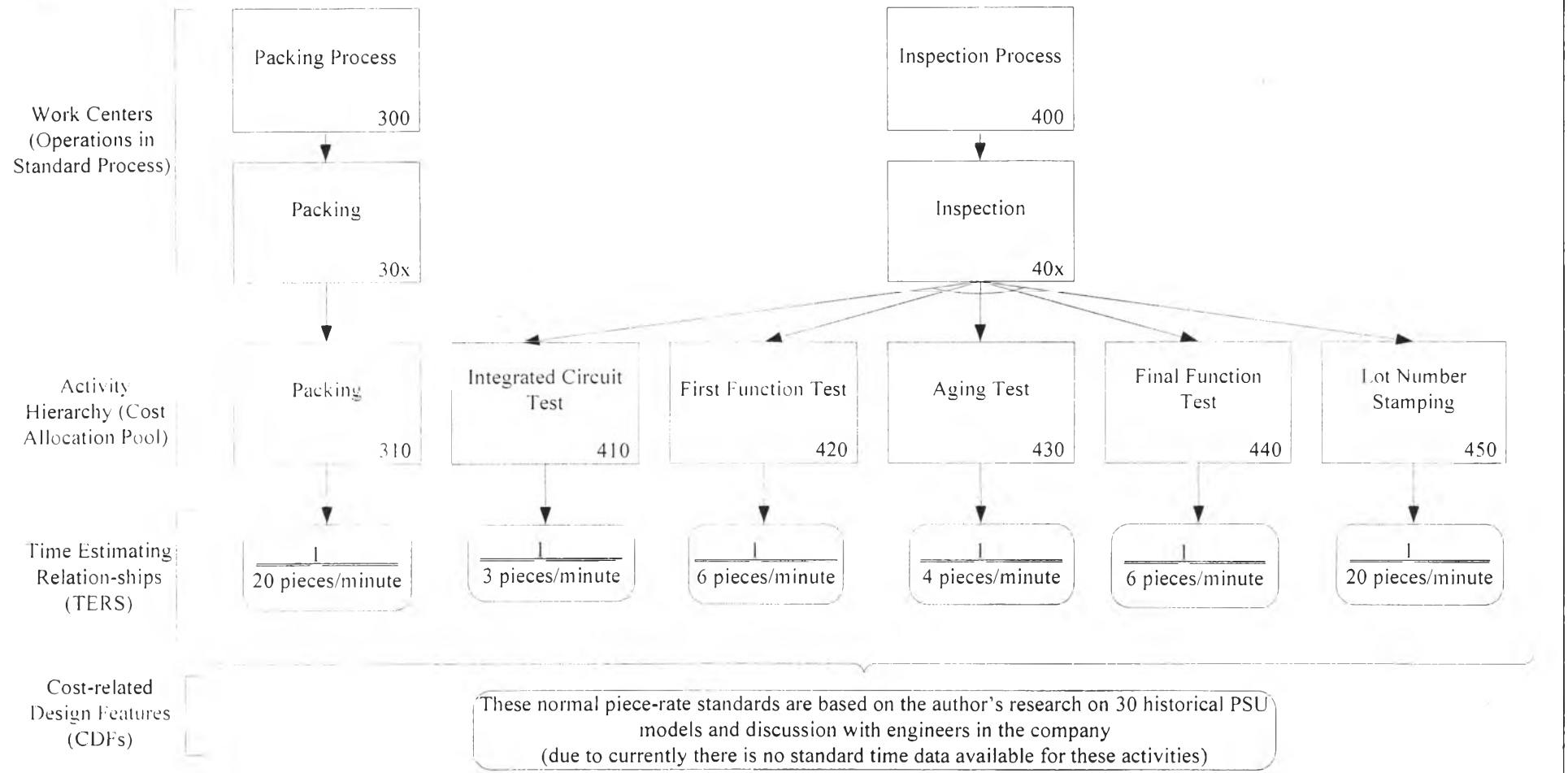

Work Centers (Operations in Standard Process)
Activity Hierarchy (Cost Allocation Pool)
Time Estimating Relation-ships (TERS)
Cost-related Design Features (CDFs)
Casing
26x
PWB Breaking
260
Bonding Barriers
261
Screwing Cases
262
N # of break points
N # of silicone bonding points
N # of screws
Then refer to the STANDARD TIME DATA TABLE "R" in the company's handbook
(time values are based on # of assemble points and set of assemble part characteristics)

The Company Name	Document No: WI-EC03-060	Rev: 0	Revised Date: -	Effective Date: 1-Nov-03	Page: 7 of 8

Subject: Detailed Standard Process Plan for Power Supply Unit



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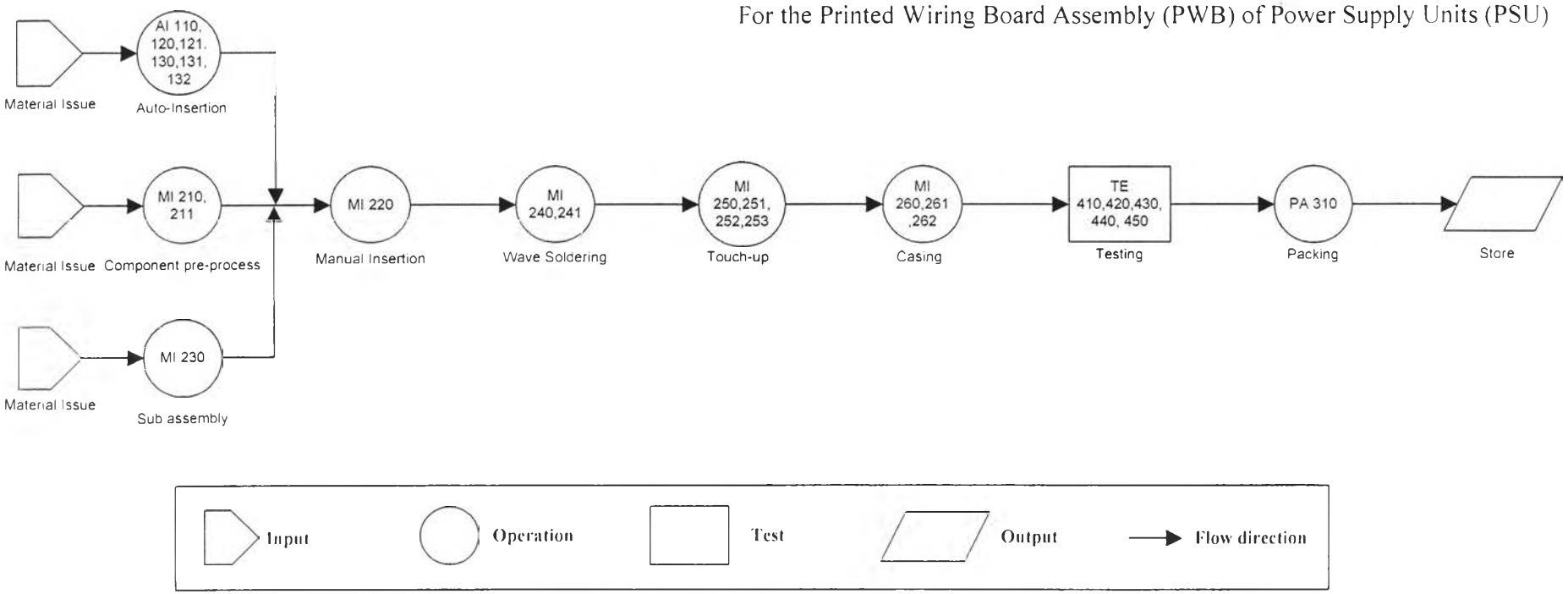
The Company Name	Document No: WI-EC03-060	Rev: 0	Revised Date: -	Effective Date: 1-Nov-03	Page: 8 of 8

Subject: Detailed Standard Process Plan for Power Supply Unit

A Process Flow Diagram (PFD)
For the Printed Wiring Board Assembly (PWB) of Power Supply Units (PSU)



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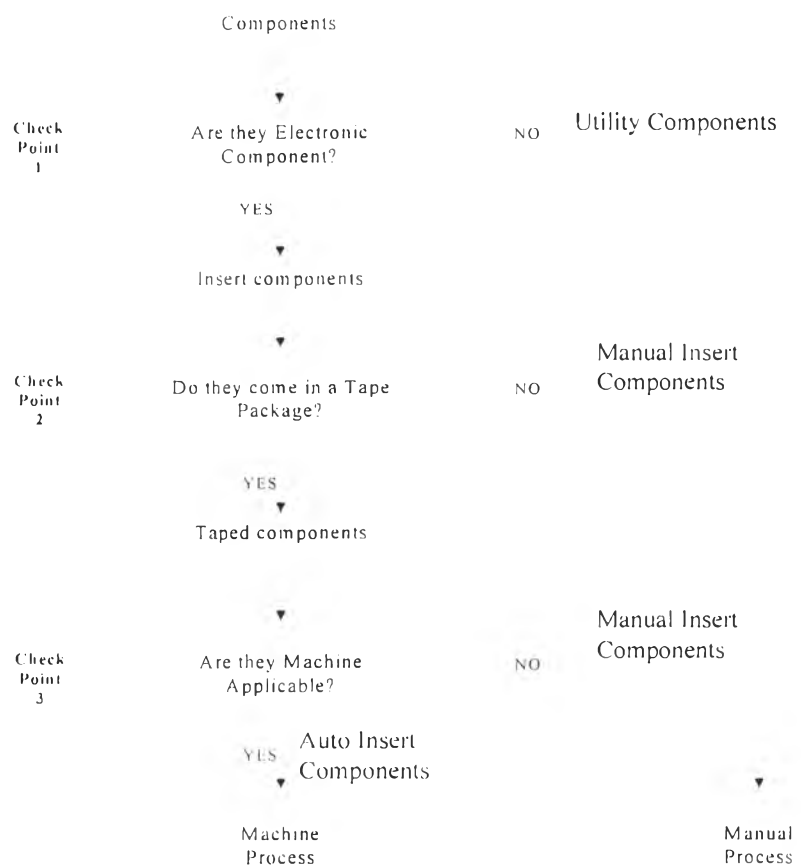
Appendix 2

Author's Guideline for Locating New Parts to Operations in the Detailed Standard Process Plan

(Thesis Result# 2 from the preparation of algorithm for PDM)

The Company Name	Document No: WI-EC03-061	Rev: 0	Revised Date: -	Effective Date: 1-Nov-03	Page: 1 of 4

Subject: Guideline for Locating Parts to Standard Processes



STEP 1 – Once the engineer receive Parts-List, engineers will need to perform a primary check to see that they are an electronic components and not utility components (such as solder, flux, glue, screen, nuts and bolts and etc) in which they are then passed to the following STEP 2.

STEP 2 – A secondary check is for components package, to see if they come in bulk or taped (Ammunition packaging), if the package docs comes in bulk of individual components then they can only be inserted manually by hand, thus passing to Manual Insertion, while ammo package they are directed to Auto Insertion machine, however, further inspection shall be carried out.

STEP 3 – Further check upon the ammo package is to check against machine's capability to see if the components that come in ammo pack can still be inserted by machine, if not they will be redirected to Manual Insertion work center.

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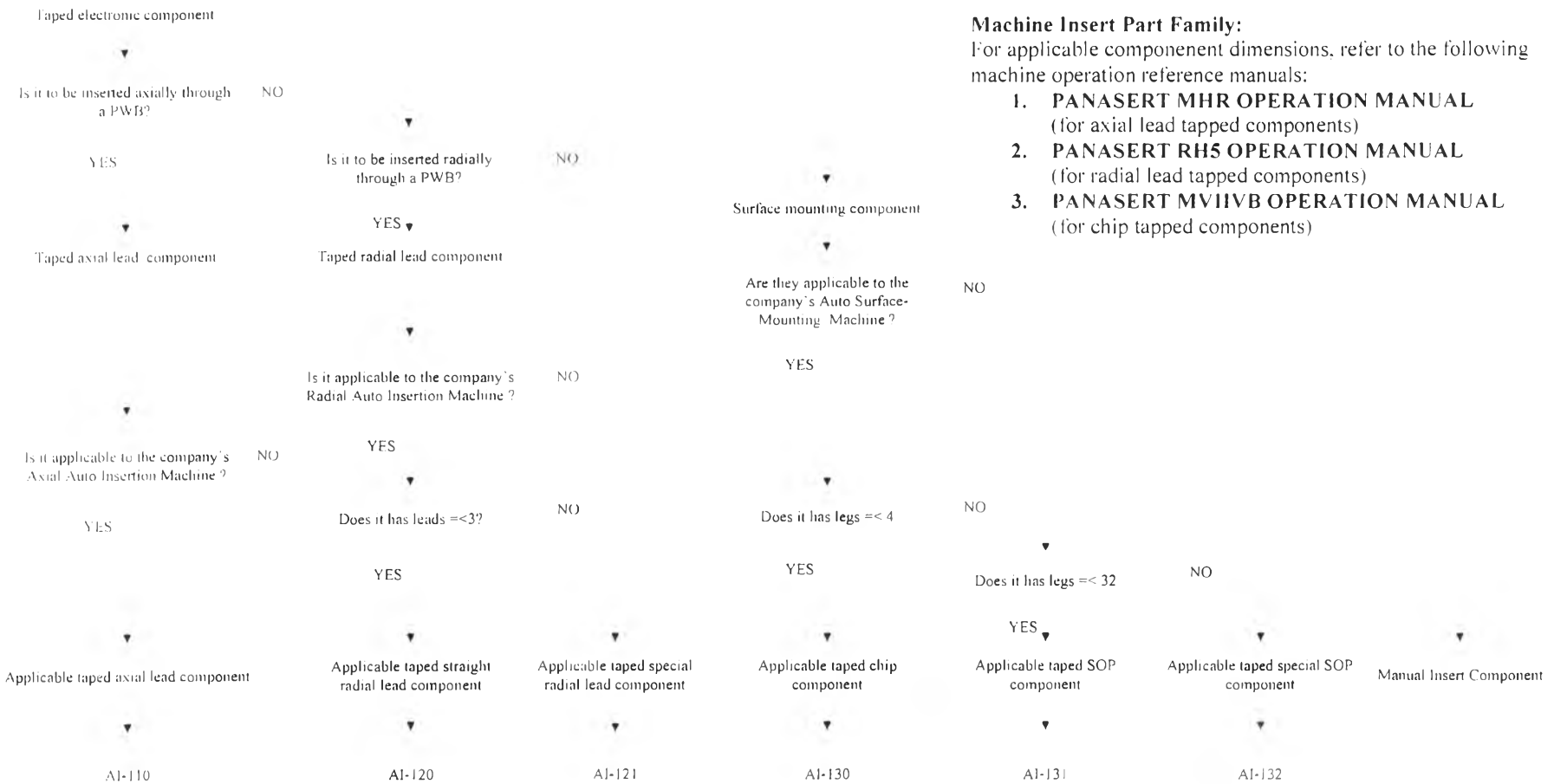
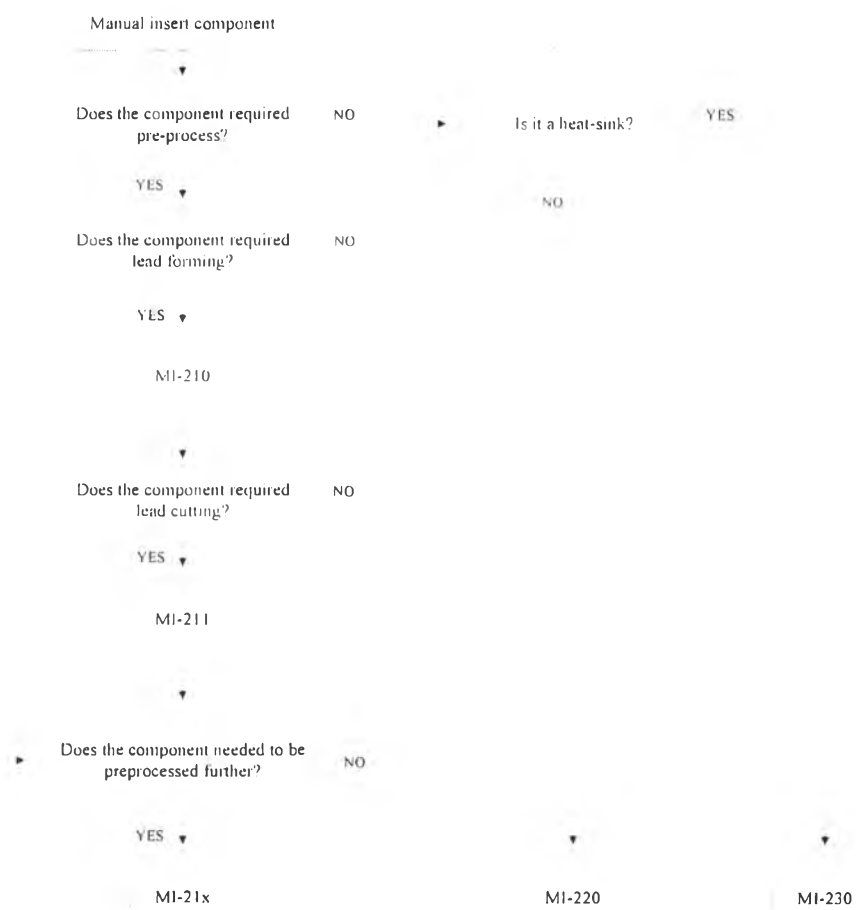
Subject: Guideline for Locating Parts to Standard Processes



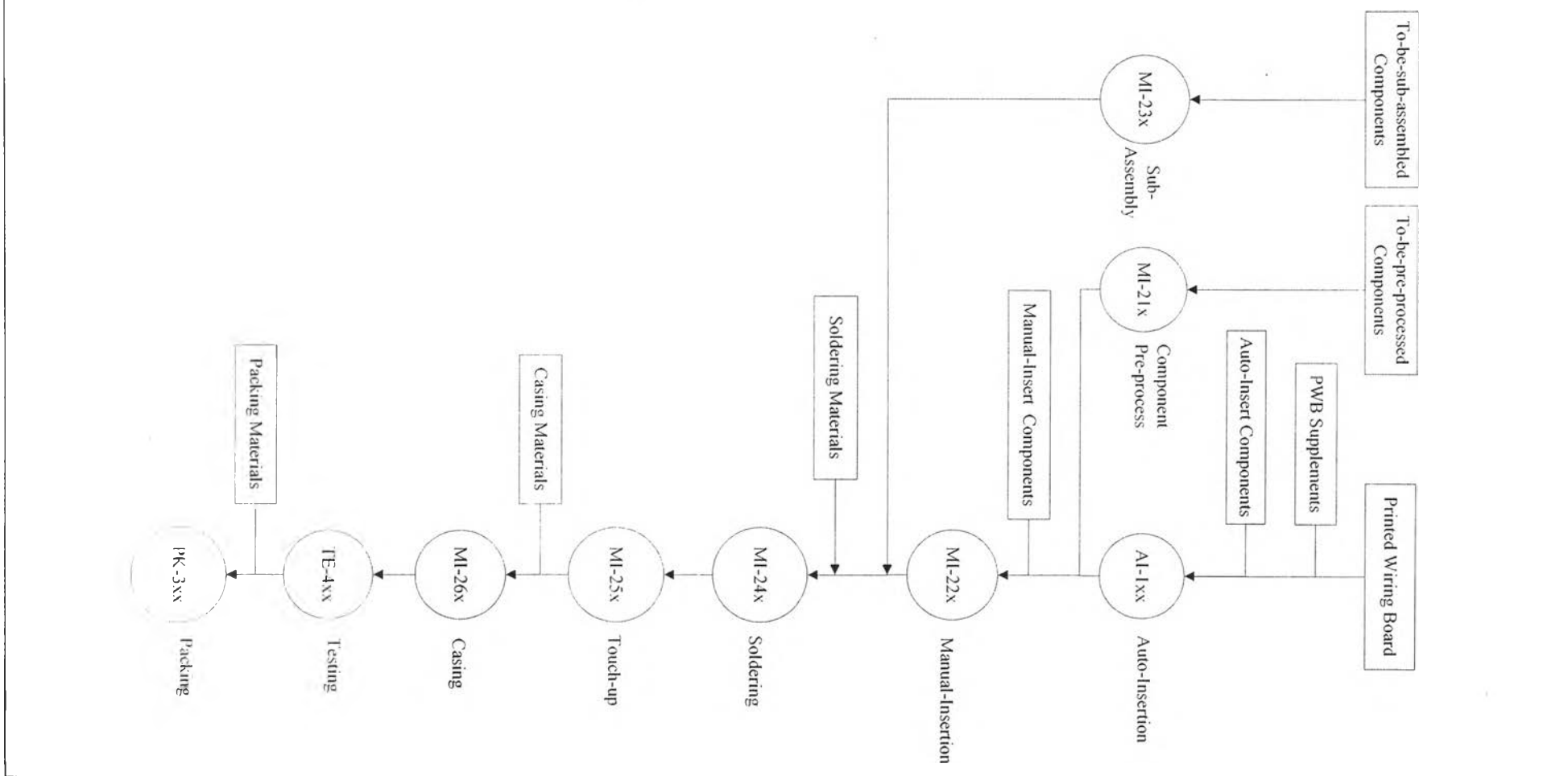
Machine Insert Part Family:
For applicable componenent dimensions, refer to the following machine operation reference manuals:

1. **PANASERT MHR OPERATION MANUAL**
   (for axial lead tapped components)
2. **PANASERT RH5 OPERATION MANUAL**
   (for radial lead tapped components)
3. **PANASERT MVIIVB OPERATION MANUAL**
   (for chip tapped components)


Manual insert component
Does the component required pre-process?
NO
Is it a heat-sink?
YES
NO
YES
Does the component required lead forming?
NO
YES
MI-210
Does the component required lead cutting?
NO
YES
MI-211
Does the component needed to be preprocessed further?
NO
YES
MI-21x
MI-220
MI-230

The Company Name	Document No: WI-EC03-061	Rev: 0	Revised Date: -	Effective Date: 1-Nov-03	Page: 4 of 4

Subject: Guideline for Locating Parts to Standard Processes



Prepared by: Janejira Kulpanaves	Approved by: Cheera Chamngam	BKK Engineering Department

Appendix 3

Author's Catalogue of Historical Electronic Parts for Quick Reference in the Future

(Thesis Result# 3 from the preparation of product data for PDM database)

The Company Name	Document No: FM-EC03-0022	Rev: 00	Date 12 Oct 2003

Index of Material Specification Master List (*sample*)

Part Name TRANSISTOR

Part Code	Part No.	Maker	Op	File	Status
R-UAA0122AK	2SA933ASTP	ROHM	120	BA-010001	
R-UAY0082AK	2SB1561-T100	ROHM	130	BA-010002	
R-UAC0034EL	2SC1740S-TP	ROHM	120	BA-010003	Obsolete
R-UAY0134AK	2SC2411K-T146R	ROHM	130	BA-010004	
R-UAY0144AK	2SC4081 T 106R	ROHM	120	BA-010005	
....	....	....	....	....	....
....	....	....	....	....	....
...	...	...	...	...	...
R-UAG0186AM	FS10ASJ-06-1	MITSUBISHI	220	BA-020001	Discontinued
R-UAG0186BZ	FS10ASJ-06-A1	MITSUBISHI	120	BA-020002	
R-UAG0166BZ	FS10KM-10	MITSUBISHI	220	BA-020003	
R-UAG0166SZ	FS10KM-10-204	MITSUBISHI	220	BA-020004	
....	....	....	....	....	....
....	....	....	....	....	....
...	...	...	...	...	...

Prepared By: Jancjira Kulpanaves	Approved By: Cheera Chamngam	Engineering Department

The Company Name	Document No: FM-EC03-0023	Rev: 00	Date 18 Oct 2003

Index of Material Specification Master List (*sample)*

Part Name **DIODE**

Part Code	Part No.	Maker	OP	File	Status
R-UBC0102BL	REB84-009V1	FUJI	110	BB-010001	
R-UBC0264BE	ERB32-02V1	FUJI	110	BB-010002	
....	....	....	....	....	....
....	....	....	....	....	....
...	...	...	...	...	...
R-UBC0151DL	10E6-TA2B2	NIHON	110	BB-020003	
R-UBC0013AZ	10E4	NIHON	220	BB-020004	
R-UBC0182BK	10ELS2 TA2	NIHON	110	BB-020005	
....	....	....	....	....	....
....	....	....	....	....	....
...	...	...	...	...	...

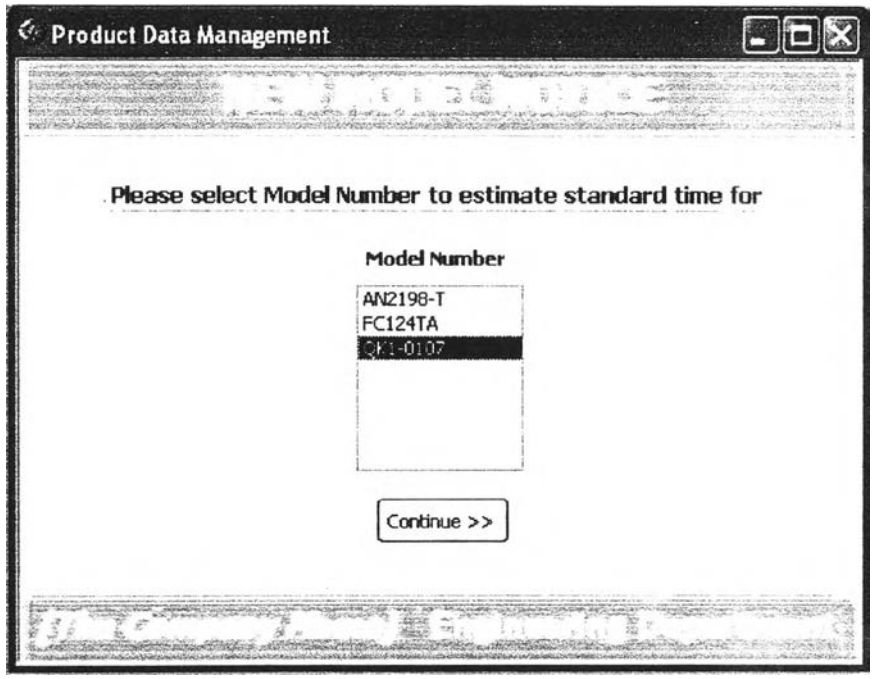
Prepared By: Janejira Kulpanaves	Approved By: Cheera Chamngam	Engineering Department

Appendix 4

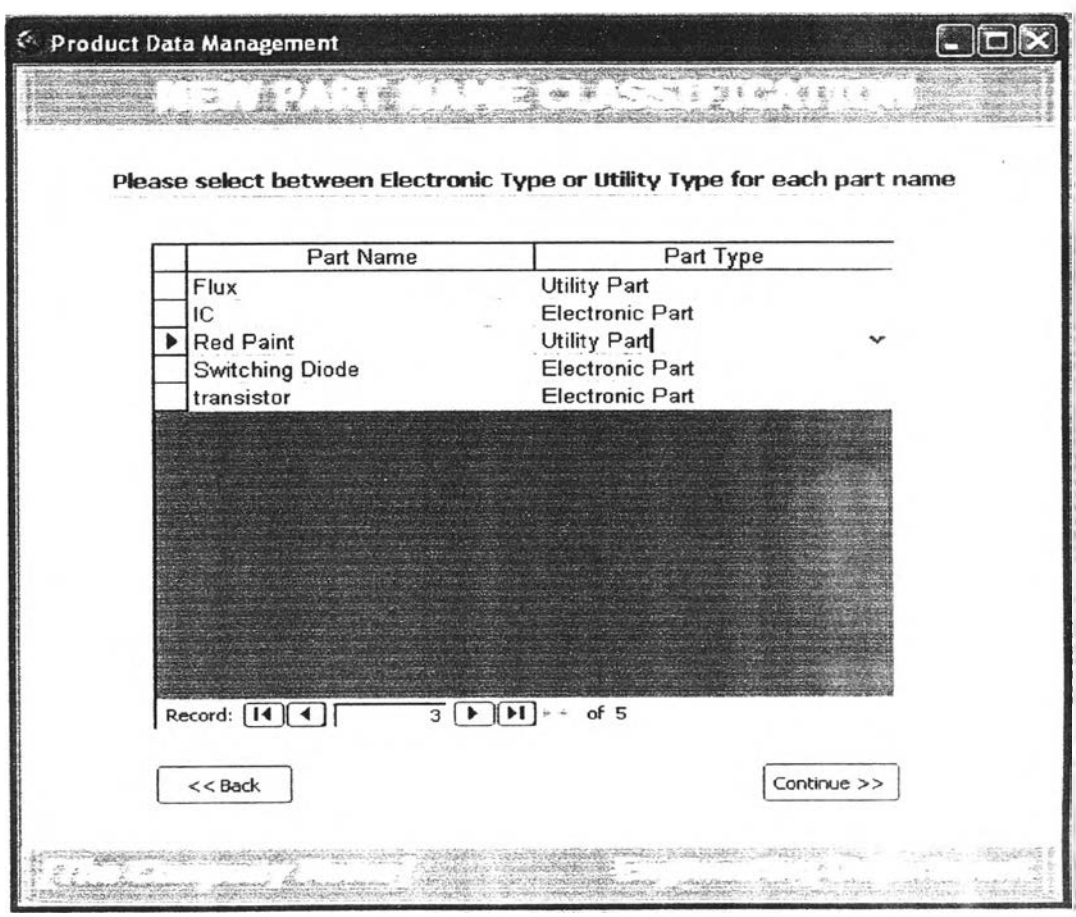
Author's Application of Standard Time Estimation in Product Data Management System

(Thesis Result # 4 as the development of PDM program)

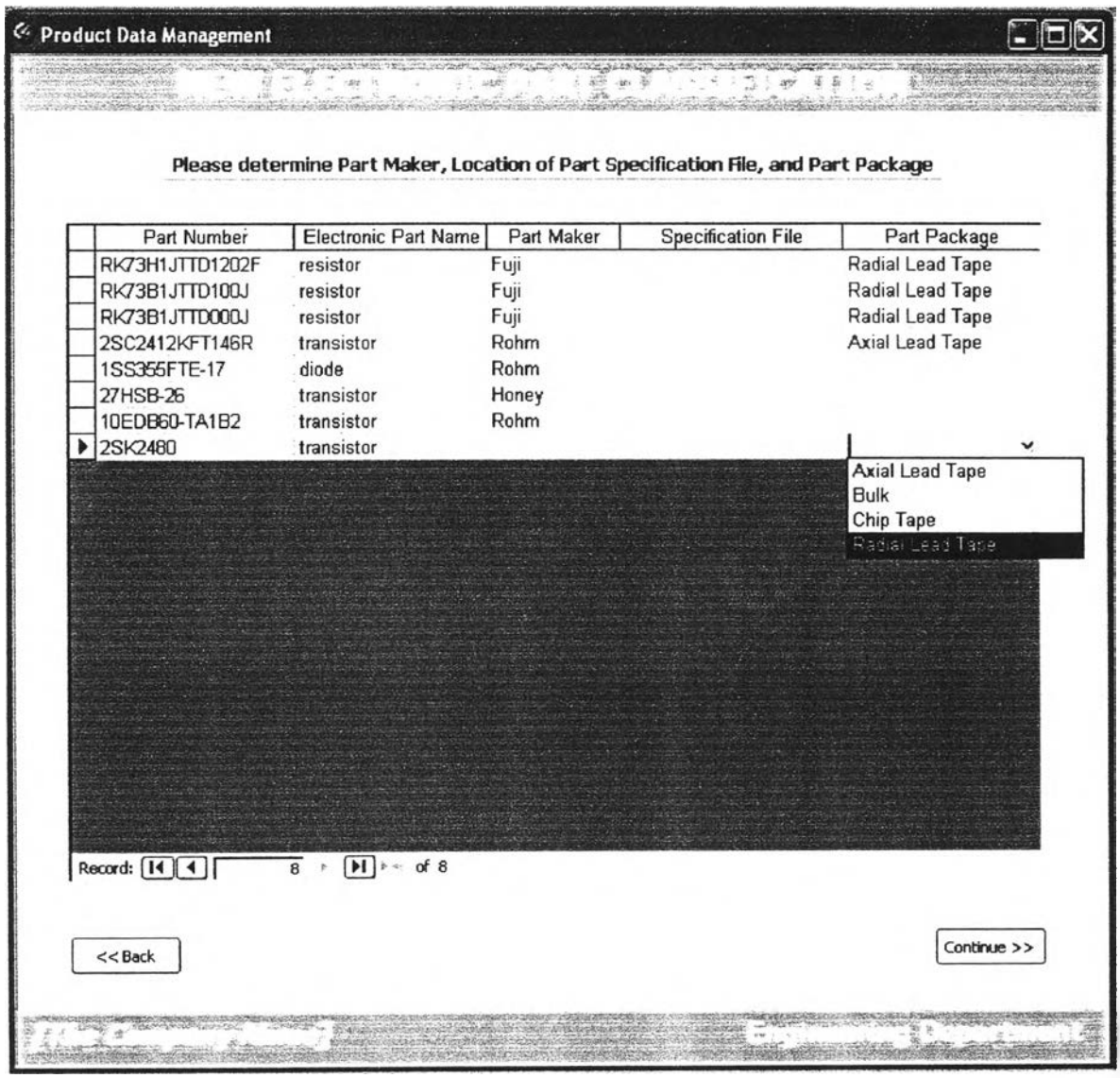
Step 1: Import New Model to PDM



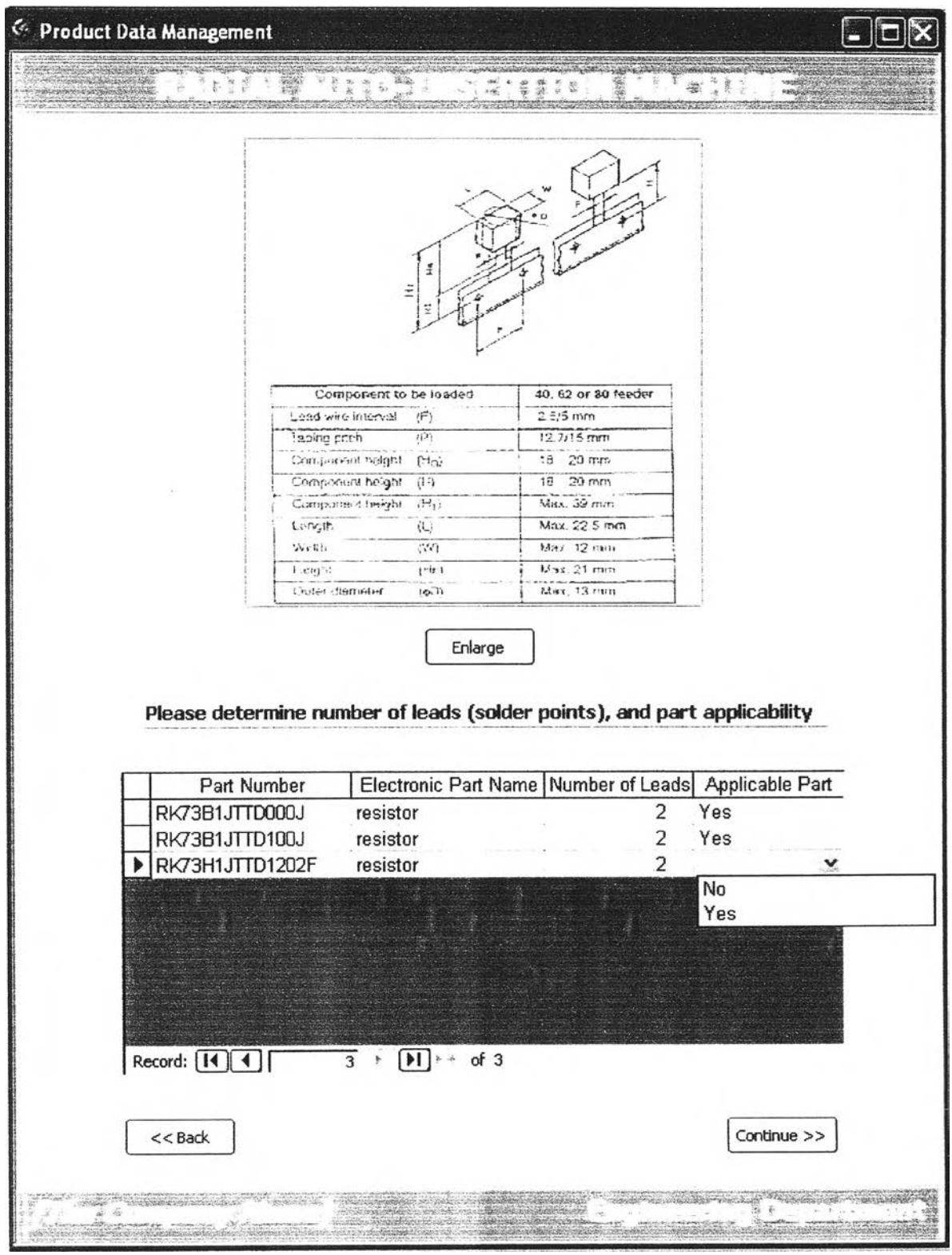
Step 2: Determine Type of new part names whether they are Electronic or Utility Parts



Step 3: Determine Part Maker, Specification File, and Part Package



Step 4: Determine Part's Number of Leads and check if part is machine applicable



AI-110		AXIAL INSERT PART (A)			
Loc	Ins	Part name	Part No	Code No	Leads
D1	A	DIODE	10EDB60-TA1B2 (L)	UBF0002AK	2
D2	A	DIODE	10EDB60-TA1B2 (L)	UBF0002AK	2
D3	A	DIODE	10EDB60-TA1B2 (L)	UBF0002AK	2
D4	A	DIODE	10EDB60-TA1B2 (L)	UBF0002AK	2
D8	A	DIODE	ERA18-02V1 (L)	UBF0001AK	2
ZD1	A	ZENER DIODE	27HSB-26 (L)	UBHAA270A	2
R2	A	METAL FILM RESISTOR	MOS1/2GR36T (L)	UEFCR36DB	2
R6	A	RESISTOR	RCR16CT52R184J	UEZ0814ZZ	2
J3	A	SOLDER COATED WIRE	TA 0.6	DAZ0356ZZ	2
J4	A	SOLDER COATED WIRE	TA 0.6	DAZ0356ZZ	2
		Total No. Of Axial Auto Insert Part =		**10**	
		Total No. Of Axial Auto Insert Solder Point =		**20**	

AI-120		RADIAL INSERT PART (R)			
Loc	Ins	Part name	Part No	Code No	Leads
IC2	R	IC	TL431CLP (L)	UCB0241AZ	3
C5	R	CERAMIC CAPACITOR	DEA1X3A101JP2A	UGZ1095ZZ	2
C7	R	CAPACITOR	KZE35VB33MTDE11 (L)	UGDE330BA	2
C10	R	CAPACITOR	KZE10VB680MTDJ12 (L)	UGDB680BA	2
C11	R	CAPACITOR	KZE10VB680MTDJ12 (L)	UGDB680BA	2
C15	R	CAPACITOR	KZE10VB220MTDF11 (L)	UGDB220BA	2
		Total No. Of Radial Auto Insert Part =		**6**	
		Total No. Of Radial Auto Insert Solder Point =		**13**	

AI-130		CHIP INSERT PART (C)			
Loc	Ins	Part name	Part No	Code No	Leads
Q6	C	TRANSISTOR	2SC2412K-T146R (L)	UAY0148CK	3
D5	C	DIODE (CHIP)	1SS355TE-17	UBY0020AK	2
D7	C	DIODE (CHIP)	1SS355TE-17	UBY0020AK	2
R3	C	RESISTOR (CHIP)	RK73B1JTTD102J	UEXBAW102	2
R4	C	RESISTOR (CHIP)	RK73B1JTTD331J	UEXBAW331	2
R5	C	RESISTOR (CHIP)	RK73B1JTTD104J	UEXBAW104	2
R7	C	RESISTOR (CHIP)	RK73B2ETTD100J	UEXJAY100	2
R8	C	RESISTOR (CHIP)	RK73B1JTTD330J	UEXBAW330	2
R13	C	RESISTOR (CHIP)	RK73B1JTTD102J	UEXBAW102	2
R14	C	RESISTOR (CHIP)	RK73B1JTTD222J	UEXBAW222	2

R15	C	RESISTOR (CHIP)	RK73B1JTTD102J	UEXBAW102	2
R16	C	RESISTOR (CHIP)	RK73B1JTTD104J	UEXBAW104	2
R17	C	RESISTOR (CHIP)	RK73H1JTTD2202F	UEYCN2202	2
R18	C	RESISTOR (CHIP)	RK73H1JTTD1202F	UEYCN1202	2
R19	C	RESISTOR (CHIP)	RK73B1JTTD100J	UEXBAW100	2
R21	C	RESISTOR (CHIP)	RK73B2BTTD105J	UEXDBA105	2
R22	C	RESISTOR (CHIP)	RK73B2BTTD105J	UEXDBA105	2
R23	C	RESISTOR (CHIP)	RK73B2BTTD105J	UEXDBA105	2
R24	C	RESISTOR (CHIP)	RK73B1JTTD473J	UEXBAW473	2
PH1	C	POSISTOR (CHIP)	PRF18BB471QB1RB	UEZ0815ZZ	2
C6	C	CAPACITOR (CHIP)	MCH185CN102KK	UGXJQF102	2
C8	C	CAPACITOR (CHIP)	MCH182CN104KK	UGXJXD104	2
C12	C	CAPACITOR (CHIP)	MCH182CN104KK	UGXJXD104	2
C14	C	CAPACITOR (CHIP)	GRM21BB11E474K	UEXAED474	2
J5	C	RESISTOR (CHIP)	RK73B1JTTD000J	UEXBAW000	2
		Total No. Of Chip Auto Insert Part =		**25**	
		Total No. Of Chip Auto Insert Solder Point =		**51**	

AI-220		**MANUAL INSERT PART (M)**			
Loc	**Ins**	**Part name**	**Part No**	**Code No**	**Leads**
T1	M	BUILT-IN TRANSFORMER	PTTX84-KTT	829583002	11
L1	M	LINE FILTER	0R5333F20Y	UKZ1192ZZ	4
L2	M	COIL	TC05WN0740	826585001	4
Q1	M	F E T	2SK2480 (L)	UAG0238AZ	3
IC1	M	IC	FA5507P	UCB0239AZ	8
D9	M	DIODE	FCH20B06 (L)	UBG0001AK	2
PC1	M	PHOTO COUPLER	PC123FY2 (L)	UDC0740ZZ	4
TH1	M	THERMISTOR	M8R207CS	UEZ0585ZZ	2
C1	M	FILM CAPACITOR	PA104-ZC (L)	UGFM104NL	2
C2	M	CAPACITOR	KLG400VB100M40 (L)	UGDQ100AZ	2
C3	M	FILM CAPACITOR	PA104-ZC (L)	UGFM104NL	2
C4	M	CERAMIC CAPACITOR	DE1E3KX222MN5A	UGCM222FR	2
F1	M	CURRENT FUSE	SG501302.5P	PJCZZ0169	2
CN1	M	INLET	AC-M11PB52	PEZ0125ZZ	2
MT 1	M	HEAT SINK	AF291-5001AT	LRZ7014ZQ	0
MT 2	M	HEAT SINK	AF291-5002AT	LRZ7015ZK	0
CD 1	M	DC CORD	AF291-7501AT (L)	EHU0600ZZ	2
		Total No. Of Manual Insert Part =		**25**	
		Total No. Of Manual Insert Solder Point =		**50**	

MODEL	QK1-0107-T							
		STANDERD TIME						
NO	TASK	TASK DETAILS	REF.	SOLDER POINT	INSERT POINT	UNIT RU	NET RU	Sec.
	AUTO INSERT							
		AXIAL		0	20			
		RADIAL		0	6			
		SMT		0	51			
		SUB TOTAL		0				
	PRE PROCESS							
		HS ASSEMBLY					**170**	10.20
		C2 FORMING					100	6.00
		C2 CUT LEG					50	3.00
							150	
	MANUAL INSERT							
1		T1	11 pin	11	1	162	162	9.72
2		L1		4	1	105	105	6.30
3		L2		4	1	105	105	6.30
4		Q1	A11	3	1	71	71	4.26
5		IC1	A1	8	1	50	50	3.00
6		D9	A10	2	1	62	62	3.72
7		PC1	A1	4	1	50	50	3.00
8		TH1		2	1	40	40	2.40
9		C1,C3		2	2	40	80	4.80
10		C2		2	1	83	83	4.98
11		C4	pitch 10 mm	2	1	55	55	3.30
12		F1		2	1	44	44	2.64
13		CN1		2	1	66	66	3.96
14		CD1		2	1	40	40	2.40
		SUB TOTAL		50	15	973	**1,013**	60.78
	SOLDERING	PWB HANDLING	247 X 123				60	3.60
		DIPPING SOLDERING	B16				240	14.40

	REPAIR	SOLDERING INSPECT				1,000	1,000	60.00
		REPAIRING	5%	3		45	113	6.75
		RE SOLDERING	2HS,D9,T1,Q1	18		18	324	19.44
		SOLDER IRON TAKE				32	32	1.92
							1,469	88.11
	INSPECTION							
		ICT	0.3 minute/pc			330	330	19.80
		1'ST FUNTION TEST				167	167	10.02
		AGING	40 set 10 min			250	250	15.00
		FINAL FUNTION TEST				167	167	10.02
		STAMPING					50	3.00
							964	
	ASSEMBLING							
		PWB BRAKING	3R13.8R8				545	32.7
		BONDING (+ BARRIER)	4 points				194	11.64
		CASING+ SCREWING					167	10.02
							906	54.36
	PACKING	20 PCS					**50**	3

Case Study Name.....					PE DEPARTMENT	
STANDARD TIME CALCULATION FORM						
REV No		PRODUCT	QK1-0107-T		DATE	.....
FG CODE	37858560	CUSTOMER	CANON			
PROCESS NAME	INSERT Q'TY	UNIT COST (BHT)	INSERTCOST (BHT)		CATEGORY	
[Auto Ins]						
Ax	10	0.10	1.00			
Rd	6	0.12	0.72			
Special Rd			0.00			
CHIP	25	0.15	3.75			
SOP		0.20	0			
Special SOP						
TOTAL			5.47			
PROCESS	NET RU	COEFFICIENT	STD TIME (MIN)			
[Manufactur']						
Pre Forming	150	1.2241	0.1836			
Heat Sink	170	1.2241	0.2081			
Manual Ins	1,013	1.3156	1.3327			
Soldering	300	1.3156	0.3947			
Repairing	1,469	1.3156	1.9320			
Assembling	906	1.3156	1.1919			
TOTAL			5.2430			
Packing	50		0.0500			
Inspection	964		0.9640			
TOTAL			6.2570			
ADJUSTING COEFFICIENT						
	S.T ×	COEFFICIENT	RECORD TIME	WAGE RATE	WAGE	
ASSEMBLY	5.2430	1	5.2430	3.075	16.1222	
PACKING	0.0500	1	0.0500	3.075	0.1538	
INSPECTION	0.9640	1	0.9640	3.075	2.9643	
TOTAL	6.2570		6.2570		19.2402	
MANUFACT'	IM	5.47		Standard WAGE		Standard Time
COST	WAGE	19.2402		24.7102		8.0359

BIOGRAPHY

Miss Janejira Kulpanaves was born on 8 February 1980 in Bangkok, Thailand. In 2001, she has obtained her Bachelor's Degree in Industrial Engineering from Sirindhorn International Institute of Technology (SIIT), Thammasat University. A year after, she continued her Master Degree in Engineering Business Management at Regional Centre for Manufacturing System Engineering (RCMSE), Chulalongkorn University and University of Warwick.