Supply Chain Management for eCommerce

TRANSFORMING SUPPLY CHAINS

Eliminate Waste. Innovate. Build Capability.

SUPPLY CHAIN
MANAGEMENT
CENTRE OF INNOVATION
REPUBLIC POLYTECHNIC

REPUBLIC
POLYTECHNIC

Centre of Innovation for Supply Chain Management (COI-SCM)

SUPPLY CHAIN MANAGEMENT
CENTRE OF INNOVATION
REPUBLIC POLYTECHNIC

Established **2012** in partnership with

EDB singapore

SPRiNG singapore
Enabling Enterprise

help Singapore-based companies
***develop and deepen
supply chain & logistics expertise***

through

*innovation in process,
and technology*

Building Capability   *Scalability for Growth*

Food Manufacturers and Distributors

Law Song Nam Vegetable Merchant   JAPAN PORK SUPPLIER PTE. LTD
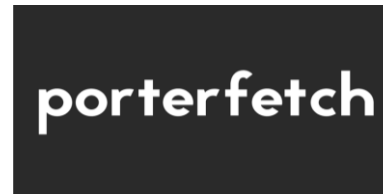
Engaged in Diverse Industries

since 2012

more than

350 projects

with Industry

Supply Chain Management for eCommerce

Food eCommerce

eCommerce Platforms

- Use **mailchimp** to **track newletters/campaign** click through and conversion statistics
- Use **Google Analytics** to track sales funnel
- Standardize
  - SKU codes/description
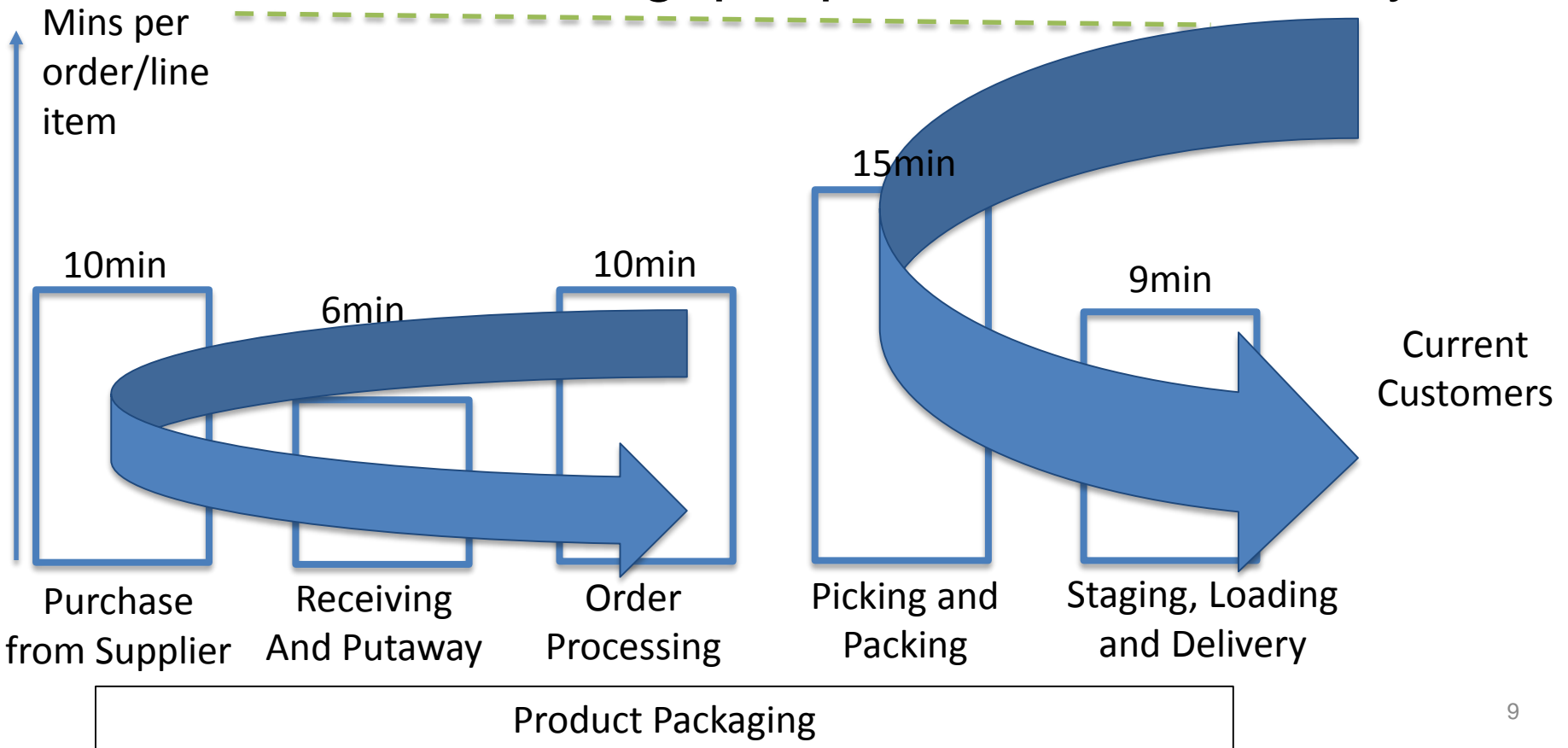   Gladna Striped Dress - **Colour : Navy Blue**, Size : XS
    Gilda Embroidered Dress - Size : S, **Colour : White**
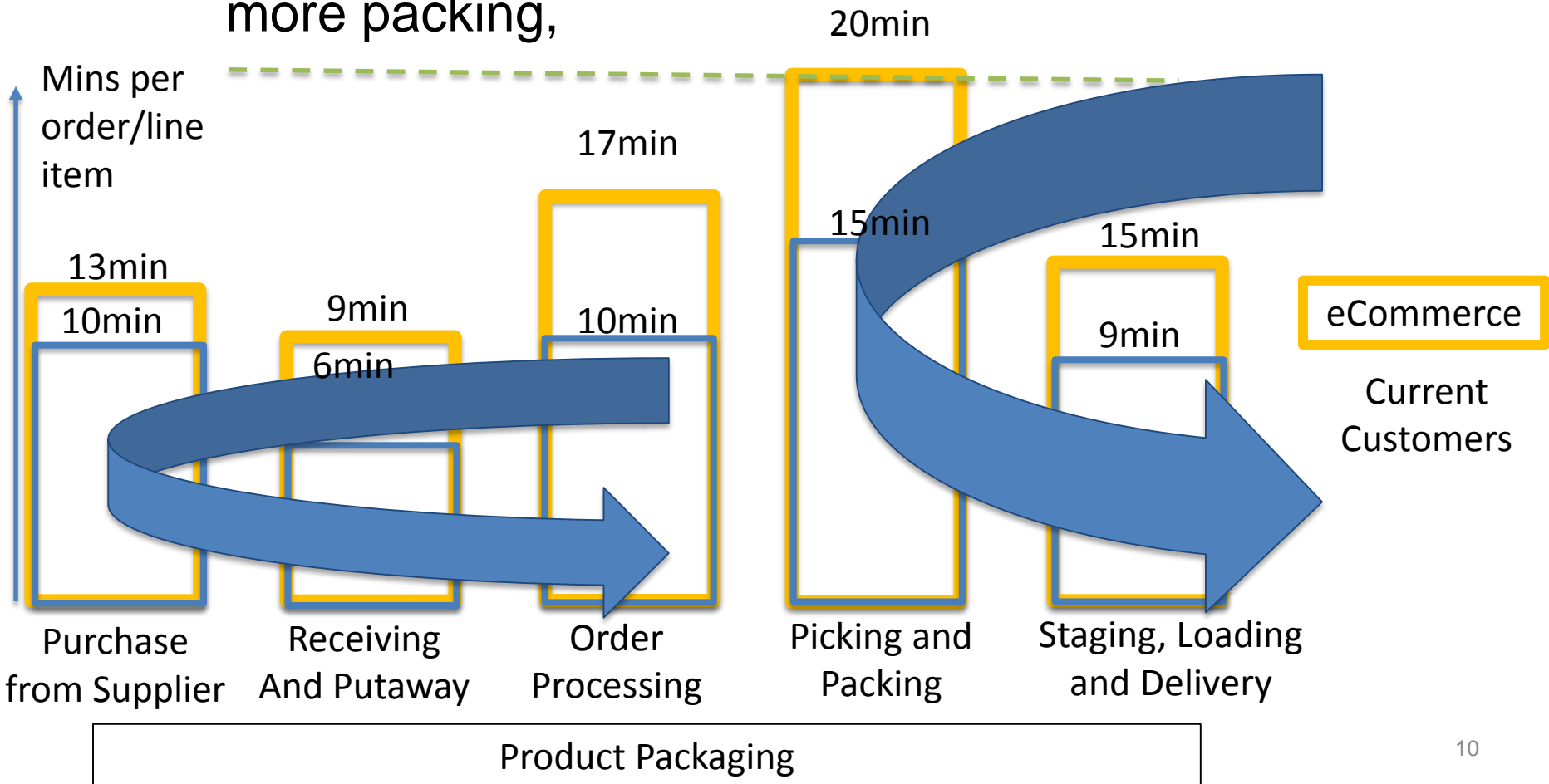 - Postal code in address

Supply Chain **LEAN Flow**

- Food Supply Chains pulls from store/warehouse
  - Store in turns pull from production and suppliers
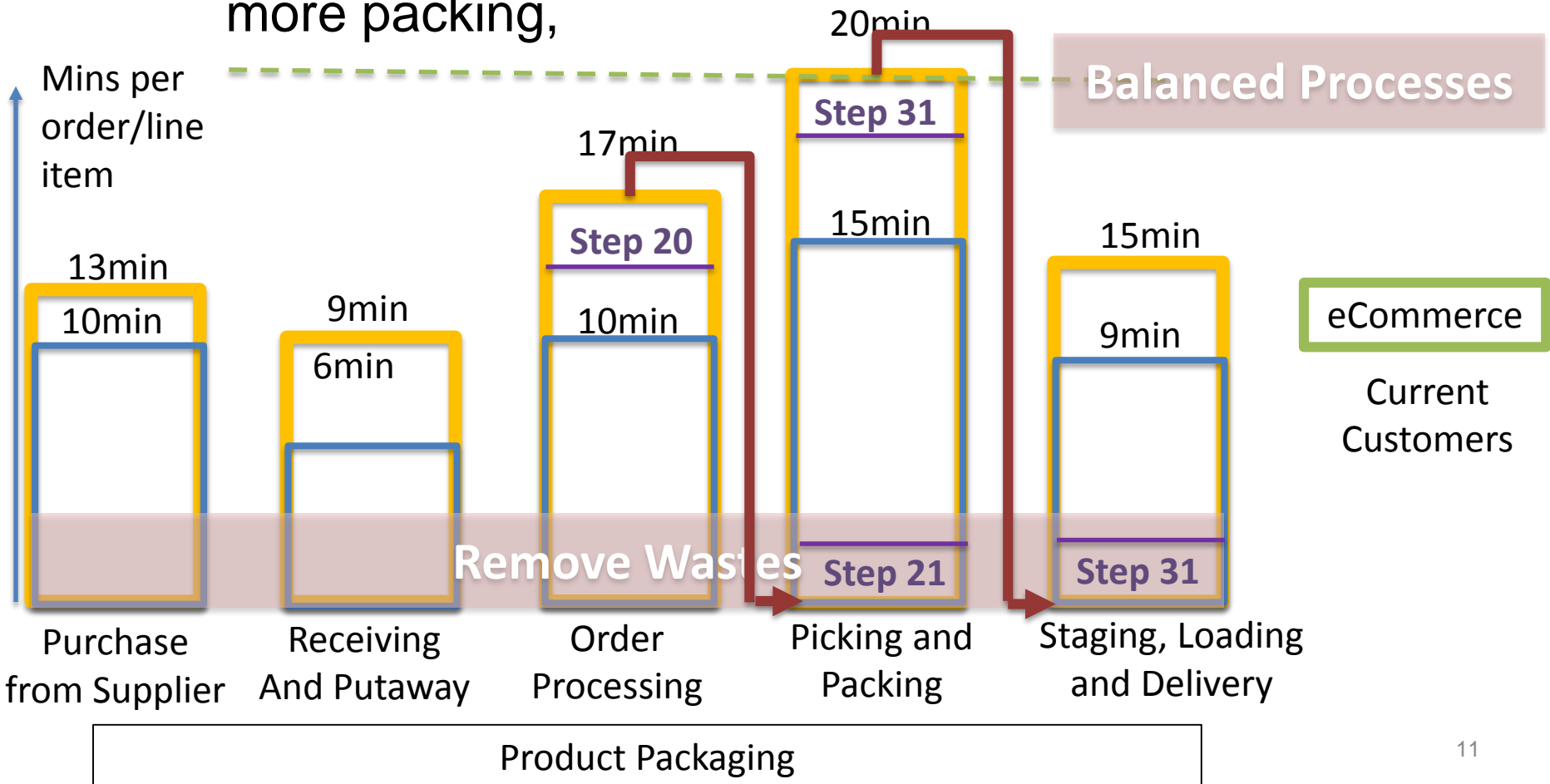- What is the throughput per line of item? Why?

Mins per order/line item

10min   6min   10min   15min   9min

Purchase from Supplier   Receiving And Putaway   Order Processing   Picking and Packing   Staging, Loading and Delivery   Current Customers

Product Packaging

Supply Chain **LEAN Flow**

- eCommerce pulls even more from the store
  - More space needed for smaller SKUs, more picking, more packing,

Mins per order/line item

			20min	
13min		17min	15min	15min
10min	9min	10min		9min
	6min			

Purchase from Supplier | Receiving And Putaway | Order Processing | Picking and Packing | Staging, Loading and Delivery

eCommerce

Current Customers

Product Packaging

Supply Chain **LEAN Flow**

- eCommerce pulls even more from the store
  - More space needed for smaller SKUs, more picking, more packing,

Mins per order/line item

Balanced Processes

Remove Wastes

eCommerce

Current Customers

13min / 10min	9min / 6min	17min / Step 20 / 10min	20min / Step 31 / 15min / Step 21	15min / 9min / Step 31	

Purchase from Supplier | Receiving And Putaway | Order Processing | Picking and Packing | Staging, Loading and Delivery

Product Packaging

11

Product Packaging - Better Visual Management

1	2	3	4	5	6	7	9
1	2	3	4	5	6	7	9

- Helps to identify the product **faster for putaway and picking**
- **Less mistakes**

Product Packaging - Better Visual Management

ABCDEFG T20 Tablet 28's

ABCDEFG T20 *Tablet* 28's

1	2	3	4	5	6	7	9

1	2	3	4	5	6	7	9

SIZE

M

REGULAR FIT

AIR JORDAN 11 RETRO

BLACK/VARSITY RED-WHITE
NOIR/RPRO-BLANC

MADE IN CHINA / FABRIQUE EN CHINE /
HECHO EN CHINA

378037 010

8⁵

UK 7.5   EUR 42
cm 26.5   BR 40

JUMPMAN23.COM

- Products
- Inner cartons
- Outer cartons
- Storage/picking locations
- etc…

- Helps to identify the product **faster for putaway and picking**
- **Less mistakes**

Product Packaging - Better Visual Management

For inbound, outbound, QC, urgent orders, number of pieces

- Helps to identify the shipments, orders, groups of orders **faster for putaway and picking**
- **Less mistakes**

Product Packaging - Better Visual Management

- Can **visual management** be applied?

- Can visual management be applied to your **product packaging**, and your **operations**?

Product Packaging - Inner and Outer Packaging

- Outer packaging can help **faster piece picking** for ecommerce and at retail level

Product Packaging – use Free Bar and QR codes

Product Packaging – use Free Bar and QR codes

Product Code

Location

Vehicle

Invoice/Document number

Name

- Use **barcodes and QR codes** to speed up product identification, with minimal mistakes
- barcodes and QR codes is **free** on Excel and with google chart apis

Product Packaging – GS1 bar code for international shipments

1. Bar 條
Vertical bars and spaces of varying widths which represent digits
代表數字的直線條及空白位

2. Code 碼
Unique GS1 identification number (also known as product identity card number)
獨一無二的GS1國際貨品編碼
（又稱為貨品的身份證號碼）

4 891668 326689

GS1 Prefix
GS1地區字首

GS1 Company Number[1]
GS1公司編號[1]

GS1 Company Prefix   GS1公司字首

Item Reference[2] 產品參考編號[2]

Check Digit 終檢碼

amazon

Shopee

淘宝网
Taobao.com

ebay

Identify

Global Location Number

GLN

Manufacturer   Item   Case   Pallet

Global Location Number

GLN

Transport   Distributor   Transport   Pallet

Global Location Number

GLN

Distribution Center   Transport   Case   Item

Global Location Number

GLN

Store   Customer

GTIN
Global Trade Item Number

SSCC   SSCC
Serial Shipping Container Code

GTIN
Global Trade Item Number

Product Packaging for Logistics Cost Savings

Original Configuration	New Configuration
41.75	45.00
35.00 45.25	39.00 45.00
Number of Cartons = 120 **Area Efficiency = 77%**	**Number of Cartons = 300** **Area Efficiency = 91%**
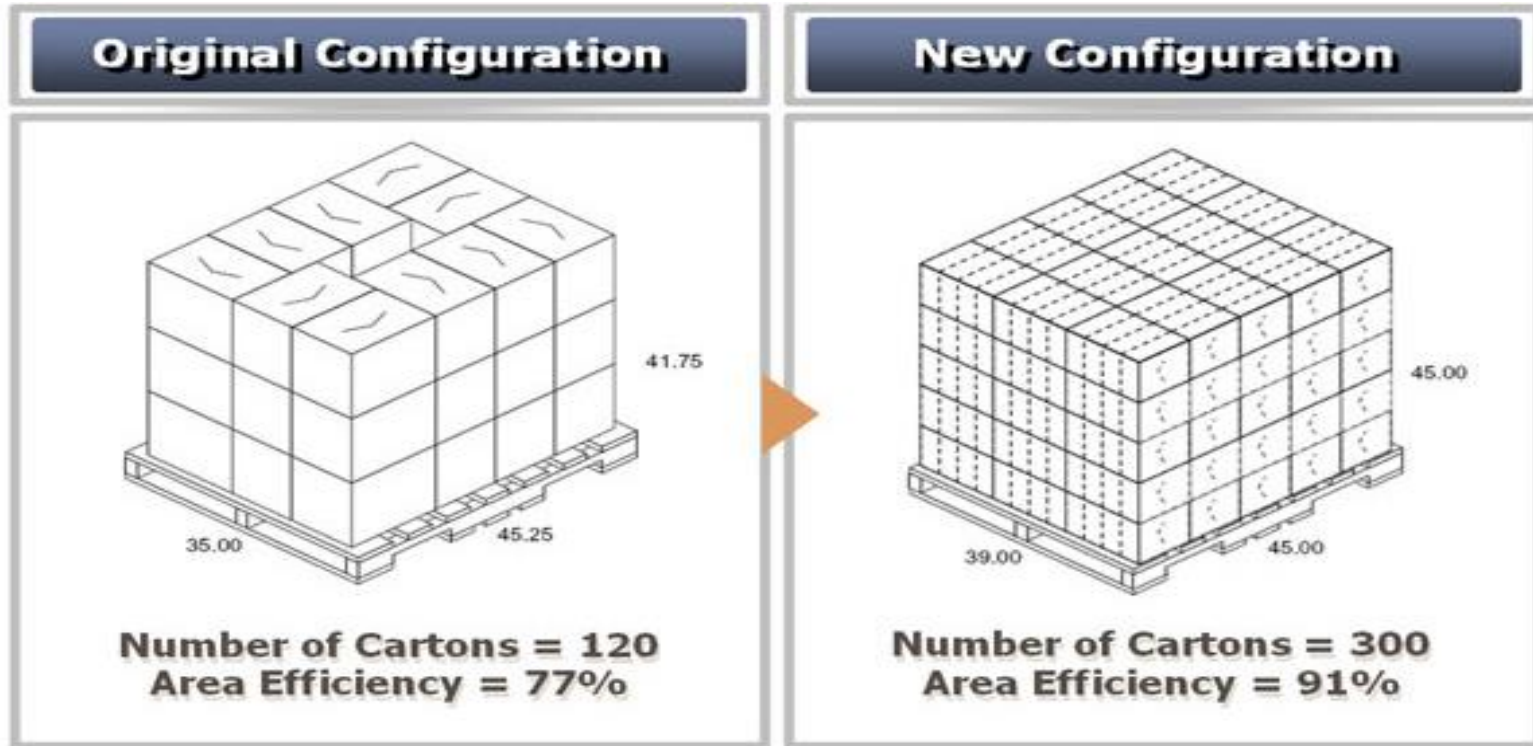
- Savings as **more products are moved and stored**
- More cost savings **efficient material handling** with a full pallet
- **Standardization of packaging** reduces cost in managing different packaging types

Order Processing - eCommerce
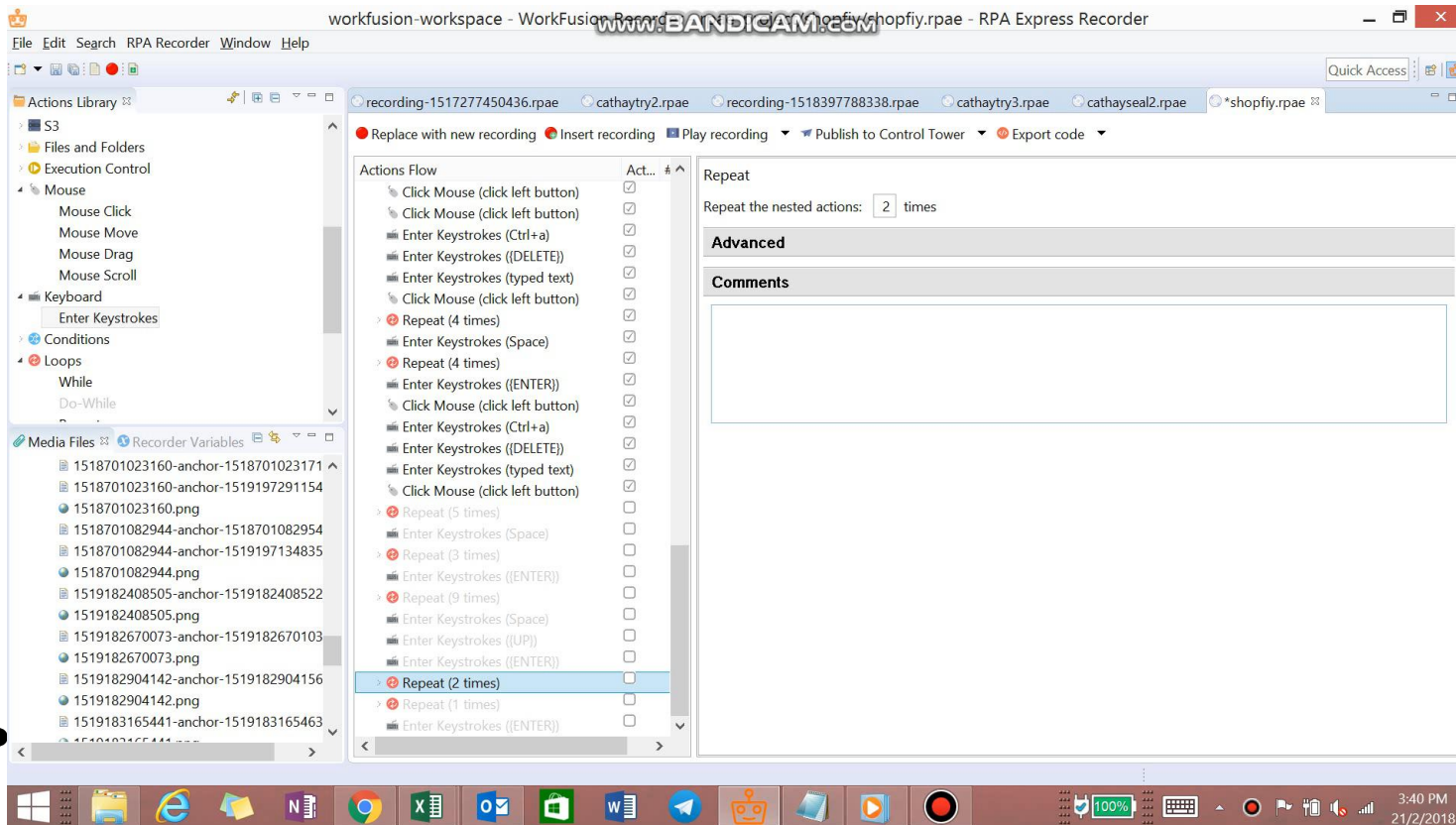
- **consolidate picking for multiple orders** is always faster

Order Processing - eCommerce

- Consolidated Picklist for Pick and Pack

- VLOOKUP SKUs to where its storage location

	A	B	C
1	sku	bin location	
2	ABC0005	01-01-10	
3	ABC2001	01-01-10	
4	ABC2002	01-01-20	
5	ABC1002	01-01-20	
6	ABC0003	01-01-30	
7	ABC1001	01-01-30	
8	ABC0001	01-01-40	
9	ABC0002	01-01-40	

Sum of Lineitem quantity	Column Labels					
Row Labels	#1007	#1008	#1009	#1010	#1011	Grand Total
01-01-10						
ABC0005		2			3	5
ABC2001			4	2		6
01-01-10 Total		2	4	2	3	11
01-01-20						
ABC1002				3		3
01-01-20 Total				3		3
01-01-30						
ABC0003			1			1
ABC1001	2		4			6
01-01-30 Total	2		5			7
01-01-40						
ABC0001		2				2
ABC0002	3	4				7
01-01-40 Total	3	6				9
Grand Total	5	8	9	5	3	30

- **Consolidated picking** is not only faster, but minimizes errors too
- Different colour paper for each day of the week?

Robotic Process Automation (RPA) for eCommerce and Beyond

Able to **work with multiple systems** residing currently in desktops/laptops

Self-configured automation for manual, **repetitive** tasks

Flexible, scalable use – start small, increase its use at your own time and pace

Reduce errors and support checking

Order Processing

As-Is Process

| Write down orders on pre-printed paper template | Key in orders in Autocount | Write down the breakdown of orders to facilitate carton picking | Write down the breakdown of orders to facilitate non-carton picking | Write down consolidated cartons by driver to facilitate checking | Write down a orders by customer by delivery zone |

Example

To-Be Process

| Key in orders in Autocount | Consolidate orders for different companies and generate forms to facilitate picking, checking, and delivery |

- Try not to write down orders and then type in
  - Key in directly (use shortcut keys)
  - Headsets
  - Answering machine to take orders
  - Use order templates in Excel

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Order Processing

Order Information in Accounting System

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		Doc No	Doc Date	Debtor Code	Debtor Name	Delivery Date	Detail Description	Qty	Item Code	Unit Price	UOM	Area	Sub Total	Net Total	Estimated Delivery Date
2	TRUE	23849	11/1/2013	300-T008	9007 Tampines 芳芳经济米粉	11/1/2013	F-VEG.FISH CAKE 菜鱼饼10Pcs/Pkt	1	F010	3.15	PKT	1.	3.15	27.25	
3	TRUE	23855	11/1/2013	300-B009	639 Balestier 龙发西餐厅	11/1/2013	D-EGG TAUFU 蛋豆	10	D005	0.25	PCS	3.	2.5	31.5	
4	TRUE	23855	11/1/2013	300-B009	639 Balestier 龙发西餐厅	11/1/2013	O-MIXED VE…菜1Kg…	1	O001	1.8	PKT	3.	1.8	31.5	
5	TRUE	23855	11/1/2013	300-B009	639 Balestier 龙发西餐厅	11/1/2013	D-…ROUTS 芽	3	D007	1.1	KG	3.	3.3	31.5	
6	TRUE	23835	11/1/2013	300-F006	168 Bedok South 富山菜饭	11/1/2013	…OU KWA…豆干(中)	10	D002	0.33	PCS	1.	3.3	30.6	
7	TRUE	23835	11/1/2013	300-F006	168 Bedok South 富山菜饭	11/…	D-SQ…TAUFU 水豆腐	4	D004	0.65	PCS	1.	2.6	30.6	
8	TRUE	23835	11/1/2013	300-F006	168 Bedok South 富山菜饭	11/…013	…EGG TAUFU 蛋豆腐	40	D005	0.25	PCS	1.	10	30.6	
9	TRUE	23835	11/1/2013	300-F006	168 Bedok South 富山菜饭	11/1/201…	D-BEAN SPROUTS 豆芽	4	D007	1.1	KG	1.	4.4	30.6	
10	TRUE	23835	11/1/2013	300-F006	168 Bedok South 富山菜饭	11/…013	F-CHICKEN FRANK 香肠10Pcs/Pkt	4	F014	1.7	PKT	1.	6.8	30.6	
11	TRUE	23835	11/1/2013	300-F006	168 Bedok South 富山菜	11/1/2013	F-LONG FISH CAKE 长条鱼饼10Pcs/Pkt	1	F019	3.5	PKT	1.	3.5	30.6	
12	TRUE	23841	11/1/2013	300-M001	83 Ma…on 3K…	11/1/2013	D-TOUKWA (S)豆干(小)	30	D001	0.3	PCS	1	9	67.45	

- All the information is already in the accounting system

Order Processing

For Picking

For Deliveries

For Staging

- Type in customer code to quickly pick up the most recent order to quickly re-order
- Upload orders on Excel template to create sales orders
- Cloud and mobile friendly
- Pricing tiers by customer group
- Cross selling and bundling features
- Bin/storage location association
- Consolidate orders for batch picking

Order Processing – Consolidate Email Orders

Storage and Picking

Adapted from van den Berg J 2012

Storage and Picking

Pick both sides at the same time (zig-zag)
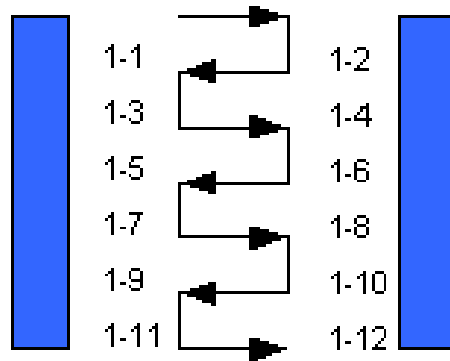
- **Name picking locations to pick left and right** as you walk through to pick
- **Pick for several orders at the same time**, shorted by location
- Use **visual management** for your storage locations too
  - For the last digit, use **10, 20, 30**, rather than 1, 2, 3

2/3/2018

Storage and Picking

Adapted from van den Berg J 2012
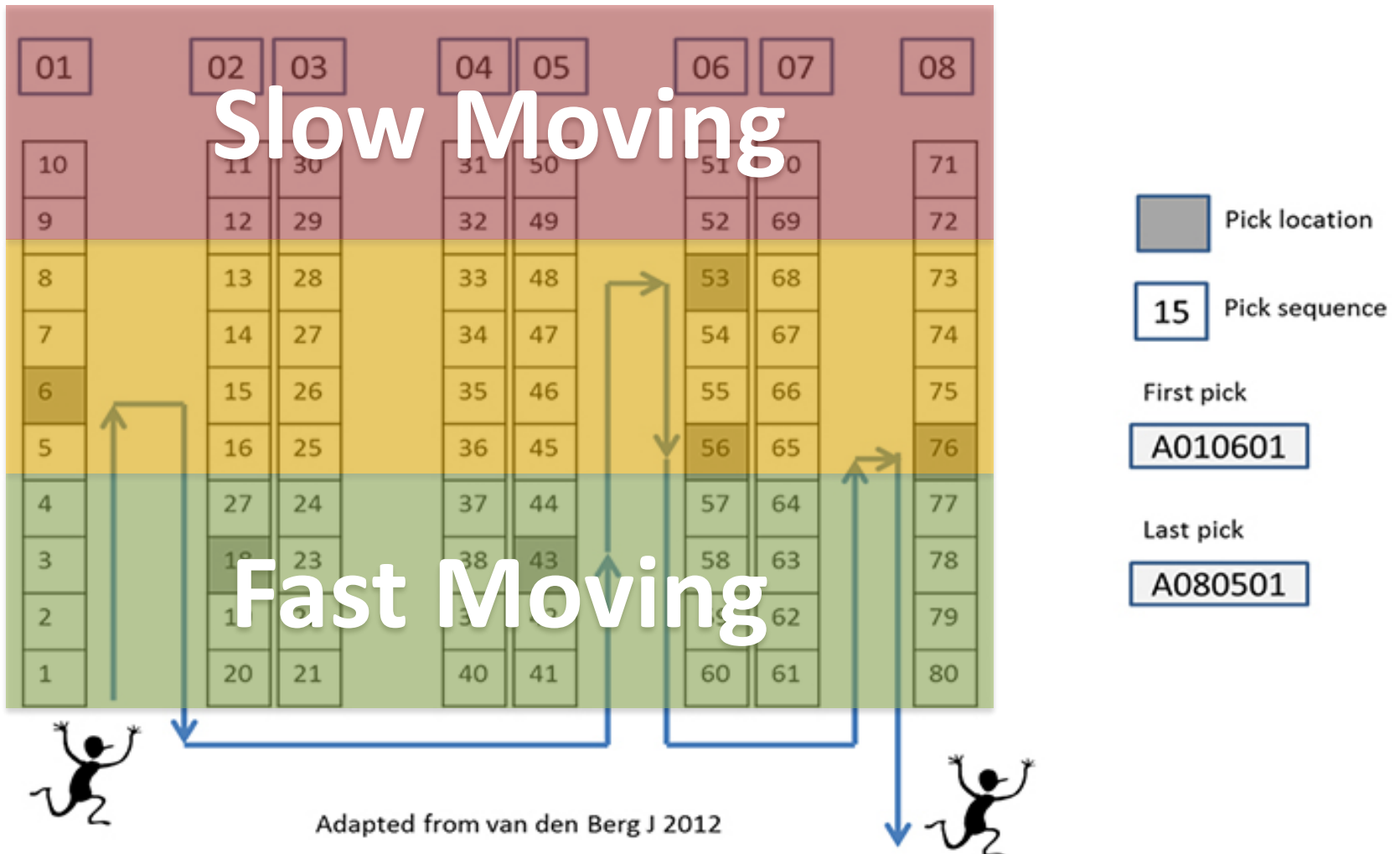
Storage and Picking

- Pick and Sort for different customers in a pick wave

Transportation and Staging
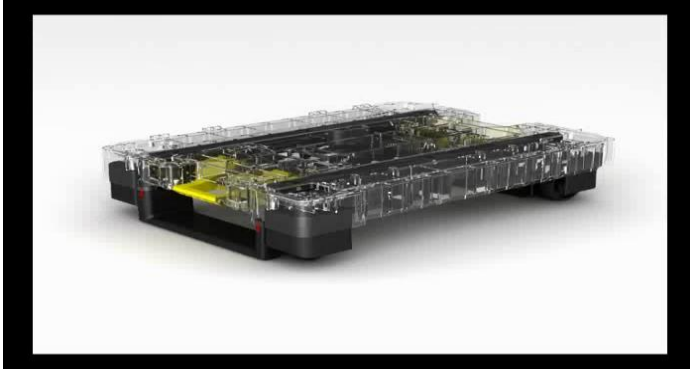
LEAN Manufacturing and Packing

- Line balancing to use minimal space and get the required throughput
  - E.g. fold carton boxes as you pack, at the same rate
- Save space, overall less work, and higher throughput

Delivery

With Permission from SPH Straits Times Classified

- Where is the biggest eCommerce postal code zone in Singapore?

Excel tool for Delivery Planning

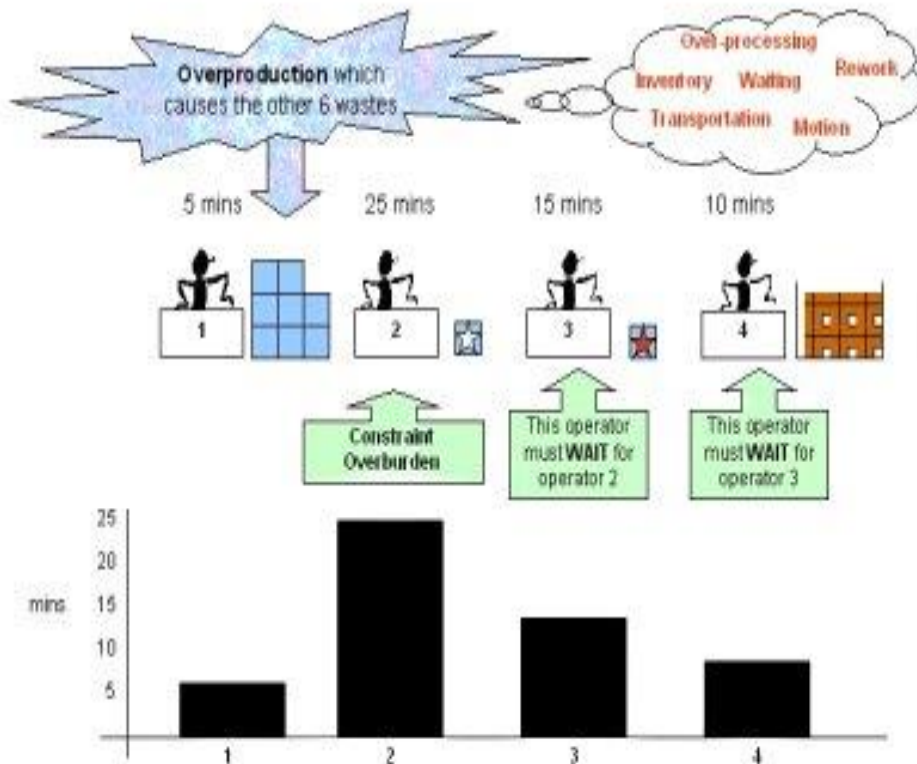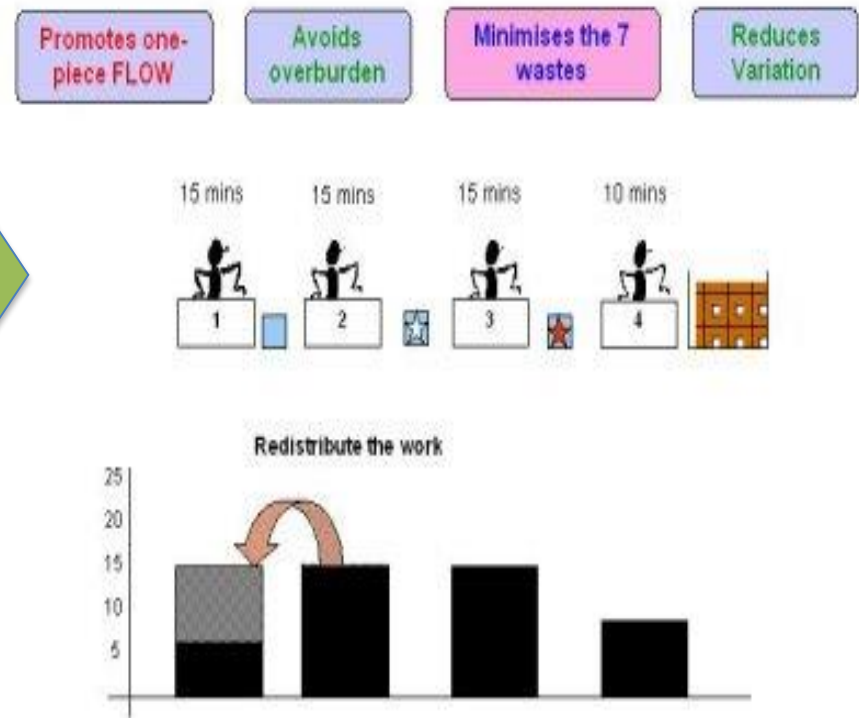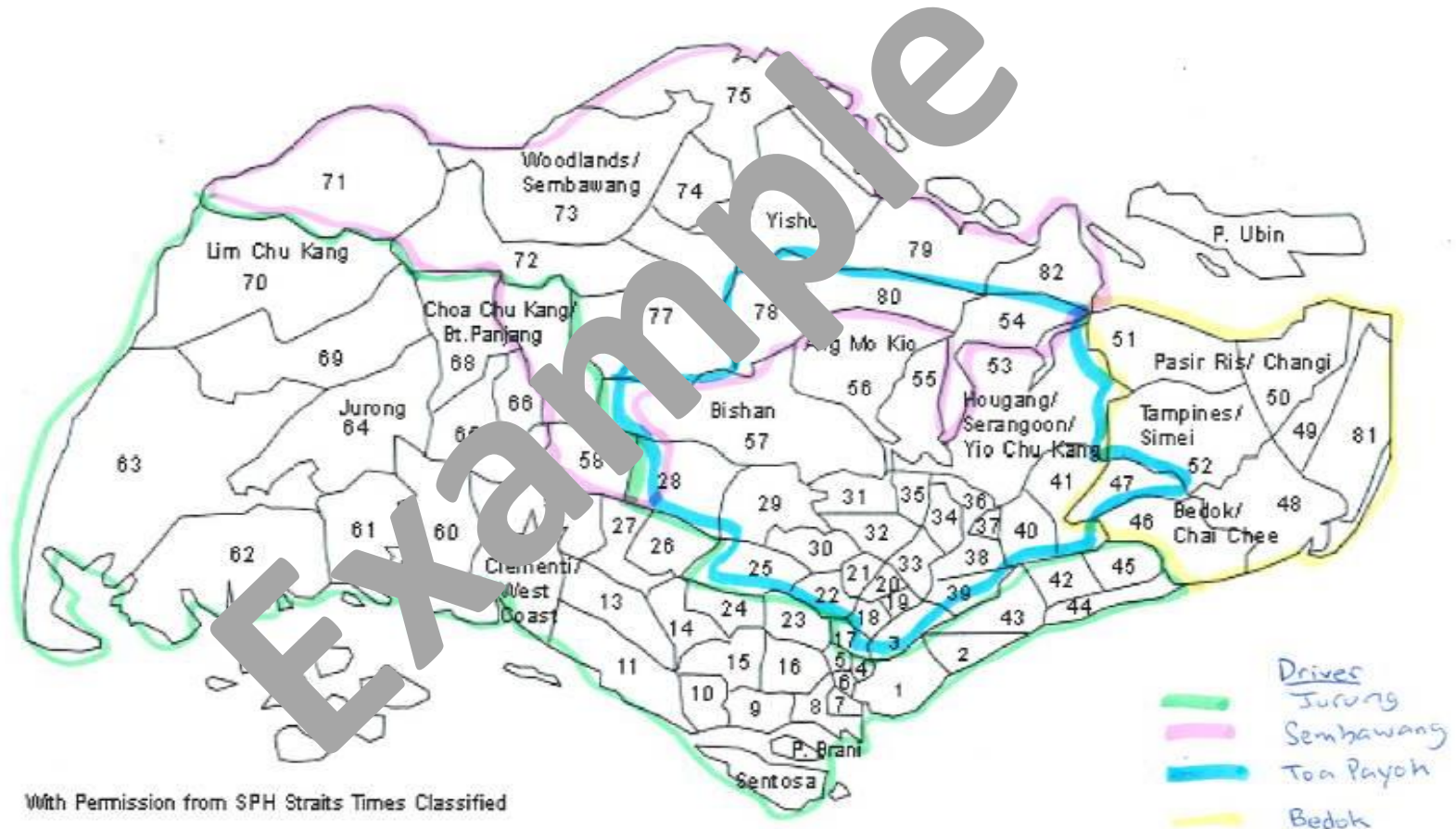|	A	B	C	D	E	F	G	H	I	J	K	L
1	Original					Sorted						
2	Address	Postal	Order ID	TSlot	Quantity	Address	Postal	Order ID	TSlot	Quantity		Postal Sequence Sorting & Routing Algorithm User Guide
3	Warehous	368355	0	0	0							Instructions
4	45 SIMS DF	380045	11308491	T12	7							1. Go to "Set-up" worksheet to set up conditions for the routing.
5	30 LORON(	388164	11359461	T10	5							2. Copy addresses, postal codes, order IDs, Tslots & number of bags into "Sheet1" columns A
6	3 GEYLANG	389779	11360162	T12	0							3. Click the button below to run the sorting & routing algorithm.
7	62 DAKOT/	390062	11359112	T10	3							
8	33 EUNOS	400033	11337967	T10	15							Run Sorting &
9	18 UBI RO/	408616	11358625	T10	1							Routing Algorithm!
10	11 UBI RO/	408723	11357441	T10	9							
11	62 UBI RO/	408734	11265574	T10	19							4. Go to "Results" worksheet.
12	81 UBI AVE	408830	11358793	T10	6							
13	11 JALAN L	409074	11291019	T10	5							© Republic Polytechnic, 2014. All Rights Reserved. Any unauthorised copying will constitute a
14	2 KAKI BUK	415942	11358002	T10	16							Notes to take
15	10 KAKI BU	415946	11275429	T10	17							* "sequenceIndex" worksheet must be in the current workbook
16	7 KAKI BUK	416239	11351253	T10	9							* "Sheet1" must be the current active worksheet
17	34 LORON(	416827	11361048	T12	0							
18	14 LORON(	417060	11360489	T12	0							
19	62 LENGKC	417455	11359210	T12	0							
20	5 JALAN M.	418924	11359759	T12	0							
21	60 SAINT P	423467	11355144	T10	8							
22	121 TELOK	423805	11337608	T10	31							
23	16 RAMBU	424292	11361069	T12	0							

Sheet1 | sequenceIndex | Set-up | Results | Sample data

Excel tool for routing

	A	B	C	D	E	F	G	H	I	J	K	L
1	Original					Sorted						Postal Sequence Sorting & Routing Algorithm User Guide
2	Address	Postal	Order ID	TSlot	Quantity	Address	Postal	Order ID	TSlot	Quantity		Instructions
3	Warehous	368355	0	0	0	Warehous	368355	0	0	0		1. Go to "Set-up" worksheet to set up conditions for the routing.
4	45 SIMS DF	380045	11308491	T12	7	4 FLORA DI	507026	11358934	T12	0		2. Copy addresses, postal codes, order IDs, Tslots & number of bags into "Sheet1" columns A
5	30 LORON(	388164	11359461	T10	5	108 PASIR	510108	11360265	T10	11		3. Click the button below to run the sorting & routing algorithm.
6	3 GEYLANG	389779	11360162	T12	0	418 Pasir R	510418	11358073	T10	11		
7	62 DAKOTA	390062	11359112	T10	3	579 PASIR	510579	11359537	T10	6		
8	33 EUNOS	400033	11337967	T10	15	760 PASIR	510760	11359670	T12	7		Run Sorting & Routing Algorithm!
9	18 UBI ROA	408616	11358625	T10	1	476A PASIF	511476	11355554	T10	6		
10	11 UBI ROA	408723	11357441	T10	9	476A PASIF	511476	11360501	T12	0		4. Go to "Results" worksheet.
11	62 UBI ROA	408734	11265574	T10	19	16 PASIR R	518166	11359922	T12	0		
12	81 UBI AVE	408830	11358793	T10	6	85 PASIR R	518212	11359170	T10	10		© Republic Polytechnic, 2014. All Rights Reserved. Any unauthorised copying will constitute a
13	11 JALAN L	409074	11291019	T10	5	11 ELIAS G	519964	11360643	T12	10		Notes to take
14	2 KAKI BUK	415942	11358002	T10	16	Click&Colle	819663	11360042	T4	2		* "sequenceIndex" worksheet must be in the current workbook
15	10 KAKI BU	415946	11275429	T10	17	9 AIRLINE F	819827	11357486	T10	8		* "Sheet1" must be the current active worksheet
16	7 KAKI BUK	416239	11351253	T10	9	3017 Bedo	486121	11347886	T10	20		
17	34 LORON(	416827	11361048	T12	0	33 CHANGI	486445	11359123	T10	17		
18	14 LORON(	417060	11360489	T12	0	38 EASTW(	486453	11359441	T10	15		
19	62 LENGKC	417455	11359210	T10	0	141 SUNBII	487199	11351158	T10	8		
20	5 JALAN M.	418924	11359759	T12	0	273 TAMPI	520273	11360146	T12	0		
21	60 SAINT P	423467	11355144	T10	8	294 TAMPI	520294	11359999	T12	5		
22	121 TELOK	423805	11337608	T10	31	427 Tampi	520427	11358497	T10	8		
23	16 RAMBU	424292	11361069	T12	0	495A TAMI	520495	11358502	T10	8		

Sheet1 | sequenceIndex | Set-up | Results | Sample data

Excel tool for routing

	A	B	C	D	E	F
1	**Address**	**Postal**	**Order ID**	**TSlot**	**Quantity**	**Assigned driver**
2	33 EUNOS CRESCENT	400033	11337967	T10	15	VE1
3	18 UBI ROAD 4	408616	11358625	T10	1	VE1
4	11 UBI ROAD 1	408723	11357441	T10	9	VE1
5	62 UBI ROAD 1	408734	11265574	T10	19	VE1
6	81 UBI AVENUE 4	408830	11358793	T10	6	VE1
7	11 JALAN UBI	409074	11291019	T10	5	VE1
8	60 SAINT PATRICK'S ROAD	423467	11355144	T10	8	VE1
9	121 TELOK KURAU ROAD	423805	11337608	T10	31	VE2
10	16 RAMBUTAN ROAD	424292	11361069	T12	0	VE2
11	175 CARPMAEL ROAD	429914	11360008	T10	6	VE2
12	66 MARINE DRIVE	440066	11358687	T10	10	VE2
13	5 SIGLAP ROAD	448908	11358880	T12	0	VE2
14	7 SIGLAP ROAD	448909	11360404	T12	0	VE2
15	1 MARINE VISTA	449025	11358927	T10	15	VE2
16	5 SIGLAP GARDENS	456111	11357984	T12	0	VE2
17	39 JEDBURGH GARDENS					
18	2-B Frankel Drive					
19	48 ELITE TERRACE					
20	9 EAST COAST TERRACE					
21	3 RHU CROSS					
22	101 HAIG ROAD					
23	163 HAIG ROAD					

Sheet1   sequenceIndex

READY

Driver Experience and Quantity of bags/orders:

Experience	No. of Cartons	No. of orders
VE	70	15
E	60	10
N	50	5

No. of VE drivers:	2
No. of N drivers:	2

Order from Supplier and Receiving – Accounting Software

- Traceability - give PO to supplier to link lot number of raw material to manufacturing batch and customers through DO/invoice
- Full bar code and QR capability to be printed on PO, workorder
- Put clear specs for supplier and do sample checks
- Supplier cannot deliver goods with an earlier expiry date
- Update reorder points for multiple/group of SKUs easily
  – For local suppliers, can order more often to save space
- Bin/storage location association
- Mobile app to associate storage location/zone

Receiving – Acceptable Quality Limits (MIL 105) Sampling Plan

- Put quality specs clearly in your PO and sample check limits
- Cannot have an earlier expiry date for goods delivered later

Most widely used:
Inspection level II → Normal Inspection

4. % defect you can accept

Lot size (Number of ordered products)			General inspection levels		
			I	II	III
2	to	8	A	A	B
9	to	15	A	B	C
16	to	25	B	C	D
26	to	50	C	D	E
51	to	90	C	E	F
91	to	150	D	F	G
151	to	280	E	G	H
281	to	500	F	H	J
501	to	1,200	G	J	K
1,201	to	3,200	H	K	L
3,201	to	10,000	J	L	M
10,001	to	35,000	K	M	N
35,001	to	150,000	L	N	P
150,001	to	500,000	M	P	Q
500,001	and over		N	Q	R

Code letter	Sample size	1.0	1.5	2.5	4.0	6.5
A	2	≤ 0	≤ 0	≤ 0	≤ 0	≤ 0
B	3	≤ 0	≤ 0	≤ 0	≤ 0	≤ 0
C	5	≤ 0	≤ 0	≤ 0	≤ 0	≤ 1
D	8	≤ 0	≤ 0	≤ 0	≤ 1	≤ 1
E	13	≤ 0	≤ 0	≤ 1	≤ 1	≤ 2
F	20	≤ 0	≤ 1	≤ 1	≤ 2	≤ 3
G	32	≤ 1	≤ 1	≤ 2	≤ 3	≤ 5
H	50	≤ 1	≤ 2	≤ 3	≤ 5	≤ 7
J	80	≤ 2	≤ 3	≤ 5	≤ 7	≤ 10
K	125	≤ 3	≤ 5	≤ 7	≤ 10	≤ 14
L	200	≤ 5	≤ 7	≤ 10	≤ 14	≤ 21
M	315	≤ 7	≤ 10	≤ 14	≤ 21	≤ 21
N	500	≤ 10	≤ 14	≤ 21	≤ 21	≤ 21
P	800	≤ 14	≤ 21	≤ 21	≤ 21	≤ 21
Q	1,250	≤ 21	≤ 21	≤ 21	≤ 21	≤ 21
R	2,000	≤ 21	≤ 21	≤ 21	≤ 21	≤ 21

2. Sample Size Code Letter

1. Total shipment quantity

3. Number to check

5. Acceptance Limit

Measure Performance for Continuous Improvement

Category	Measures	Description
Quality Measures	Shipment accuracy	Number of perfect orders shipped/Total number of orders shipped
	Inventory accuracy	Inventory Accuracy = Total physical quantity verified/Total system quantity or Total number of line items without discrepancies/Total number of line items stored
		Inventory location accuracy = Number of storage locations without discrepancies/Total number of storage locations verified
	Fill rate	Order fill rate = Total number of orders that can be fulfilled by existing inventory/Total number of orders shipped
		Line fill rate=Total nuber of line items that can be fulfilled by existing inventory/Total number of line items shipped
Productivity measures	Order processing per labour hour	Total number of line items processed/Total number of labour hours
	Order process error	% of errors in order lines processed /Total number of labour hours
	Units handled per labour hour	Total number of units handled (in and out)/Total number of labour hours
	Pick rate per hour	Total number of line items picked for shipment/Total number of labour hours or Total quantity picked for shipment/Total number of labour hours
Financial measures	Cost per unit handled	Total storage cost/Average units stored over the account period (month)
	Handling cost per unit	Total handling cost/Total throughput units over the accounting period (month)
	Order processing cost per unit	Total processing cost/Total line items processed over the accounting period (month)
Transportation	Timeliness	Number of on-time deliveries/all deliveries
	Delivery productivity	Average number of drops per truck
	Error rate	Number of deliveries in full/with errors
	Delivery productivity	Truck utilization rate
	Timeliness	What time the trucks actually reach vs what time trucks actually reach

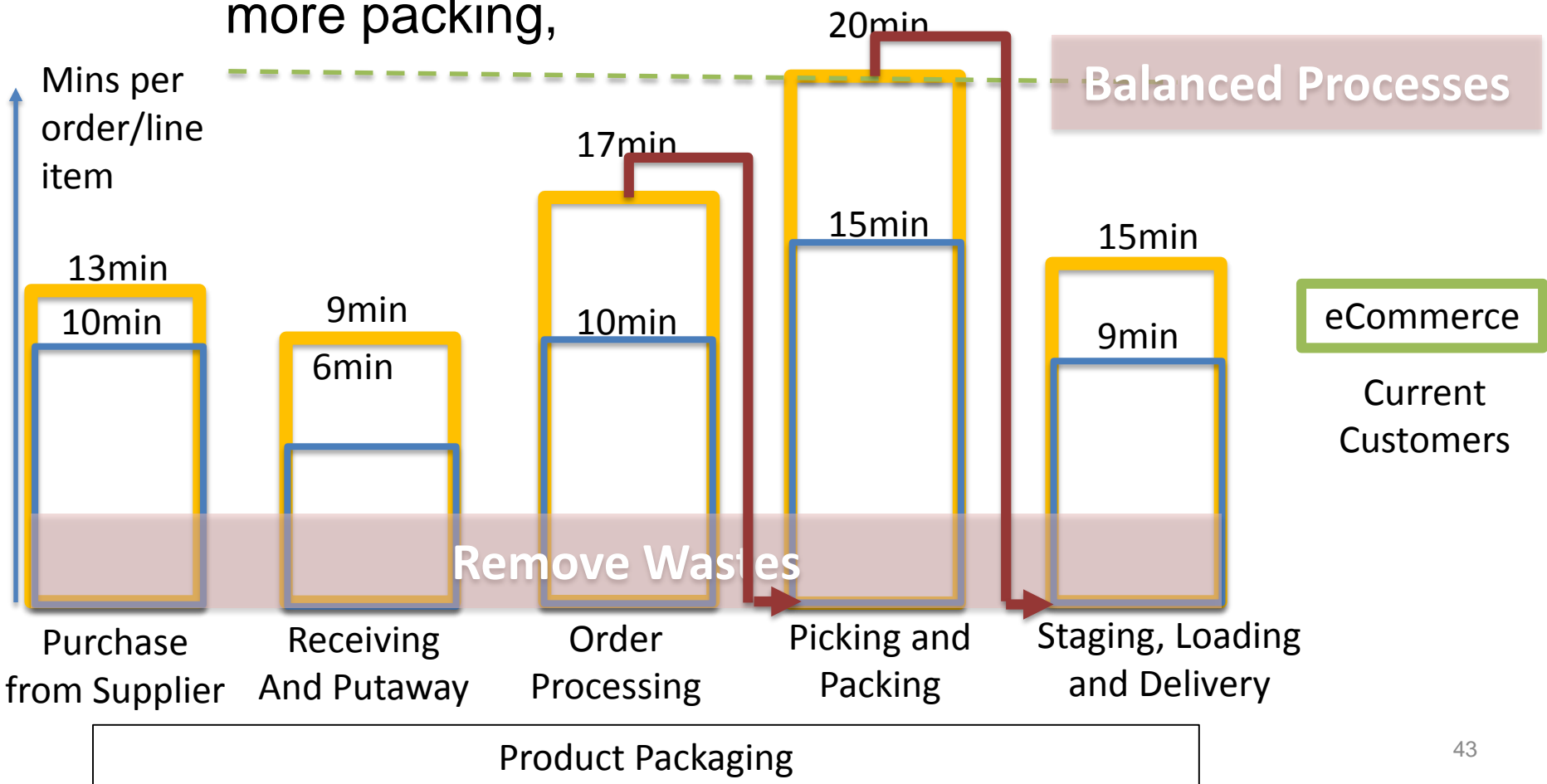# LEAN Processes – Remove Wastes
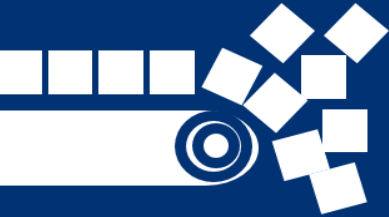
TRANSPORT	INVENTORY	MOTION	WAITING
Unnecessarily moving things, equipment, parts, tools and materials from one location to another.	Making more than customer demand, building up unnecessary stocks.	Unnecessary movement; people walking to get things which should be located closer to the point-of-use.	Delays between operations because parts are missing. Stopped work: waiting for parts, machines, or people.

OVER PRODUCTION	OVER PROCESSING	DEFECTS	SKILLS
Making too much or too many. Completing a task before it is needed. Making products that the customer hasn't ordered.	Duplicate or redundant operations, performing wasteful steps that are not required. Often because "we always do it this way."	Failing to produce a quality part the first time generating rework or scrap. Not delivering the product or service "right the first time."	Failing to use skills and capabilities of the workforce. Not listening to people, using their knowledge or learning from past mistakes/issues.

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- eCommerce pulls even more from the store
  – More space needed for smaller SKUs, more picking, more packing,

Mins per order/line item

Balanced Processes

eCommerce

Current Customers

Remove Wastes

Purchase from Supplier	Receiving And Putaway	Order Processing	Picking and Packing	Staging, Loading and Delivery
13min / 10min	9min / 6min	17min / 10min	20min / 15min	15min / 9min

Product Packaging

How COI-SCM can help

1. goRPA training and first use case implementation with food companies

   – with SPRING support for SMEs, and in some cases WSG/SSG support

2. goLEAN training and implementation

   – With SPRING support for SMEs

3. Specific Operations and/or Logistics Review Projects

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