

LAMPIRAN

Pengambilan Data

Maga

1. Receiving

a. Financial

Gaji Rp1.654.300

Jamkerja 8 Jam

26 Hari

$$\text{Upah karyawan per jam} = \frac{\text{Total Gaji}}{\text{Waktu Kerja}} = \text{Rp. 7.953 / jam}$$

Jika ada waktu penerimaanya 15 menit, dalam 1 hari ada 8 kali penerimaan barang dan membutuhkan 3 orang pekerja maka:

waktu penerimaan : 15menit x 8kali(line) = 2jam

Financial = 2 × 7.953 × 3 = Rp. 47.718 / line penerimaan

b. Productivity

Total barang yang diterima adalah 80 box, maka :

$$\begin{aligned} \text{Productivity} &= \frac{\text{Total barang yang diterima}}{\text{Jumlah pekerja penerimaan barang} \times \text{waktu penerimaan barang}} \\ &= 80 \text{ box} / (3 \text{ orang} \times 0,25 \text{ jam}) \\ &= 106,67 \text{ box/ pekerja - jam} \end{aligned}$$

c. Utilization

$$\% \text{ Utilization} = \frac{\text{Luas area penerimaan}}{\text{Luas keseluruhan area}} =$$

$$\% \text{ Utilization} = \frac{16.4 \text{ m}}{49 \text{ m}} = 33,3 \%$$

d. Quality

Dari 80 box barang diterima ada 1 cacat maka :

$$\text{Quality} = \frac{\text{Total barang sempurna}}{\text{Total barang yang diterima}} \times 100\% =$$

$$\text{Quality} = \frac{79}{80} \times 100\% = 98,75 \%$$

e. Cycle Time

$$\text{Cycle Time} = \frac{\text{Jumlah penerimaan barang} \times \text{waktu penerimaan barang}}{\text{Jumlah barang yang diterima}} =$$

$$\text{Cycle Time} = \frac{8 \text{ line} \times 15 \text{ menit}}{80 \text{ box}} = \frac{120 \text{ menit}}{80 \text{ box}} = 1,5 \text{ menit/ box}$$

2. Putaway

a. Financial

$$\text{Upah karyawan per jam} = \frac{\text{Total Gaji}}{\text{Waktu Kerja}} = \text{Rp. 7.953 / jam}$$

Jika ada waktu penerimaannya 30 menit, dalam 1 hari ada 7 kali pemindahan barang kedalam gudang dan membutuhkan 2 orang pekerja maka:

$$\text{Financial} = 3,5 \text{ jam} \times \text{Rp}7953 \times 2 \text{ org} = \text{Rp. 55.671 org / line}$$

b. Productivity

Total barang yang dipindahkan adalah 80 box, maka :

$$\begin{aligned} \text{Productivity} &= \frac{\text{Total barang yang dipindahkan}}{\text{Jumlah pekerja pemindahan barang} \times \text{waktu penerimaan barang}} \\ &= \frac{80}{2 \times 3,5 \text{ jam}} \\ &= 11,4 \text{ box/ pekerja - jam} \end{aligned}$$

c. Utilization

$$\text{Utilization} = \frac{\text{Jumlah barang yang dipindahkan}}{\text{kapasitas maximum troli}} \times 100\% = 95.24\%$$

$$= \frac{8,5 \text{ box}}{9 \text{ box}} \times 100\% = 95.24\%$$

d. Quality

Dari 80 box barang diterima ada 1 cacat maka :

$$\text{Quality} = \frac{79 \text{ box}}{80 \text{ box}} \times 100\% = 98,75 \%$$

e. Cycle Time

$$\text{Cycle Time} = 1/ \text{Productivity} = 0.087$$

3. Storage

a. Financial

$$\text{Upah karyawan per jam} = \frac{\text{Total Gaji}}{\text{Waktu Kerja}} = \text{Rp. 7.953 / jam}$$

Untuk perawatan dan pemeliharaan gudang dilakukan oleh 2 orang karyawan dan jam operasional gudang adalah 7 jam maka:

$$\text{Financial} = 7 \times 7.953 \times 2 = \text{Rp. 111.342 / line storage} : 7 = \text{Rp15.906 orang-jam}$$

b. Productivity

Total barang yang ada digudang adalah 500 box :

$$\begin{aligned} \text{Productivity} &= \frac{\text{Total barang yang ada digudang}}{\text{luas gudang yang digunakan untuk menyimpan barang}} \\ &= 500 \text{ box} / 105 \text{ m}^2 = 4,762 \text{ box} / \text{ m}^2 \end{aligned}$$

c. Utilization

Diketahui luas gudang yang digunakan untuk menyimpan barang 105 m² dan luas total keseluruhan gudang 150 m² , maka :

$$\begin{aligned} \% \text{Utilization} &= \frac{\text{Luas gudang yang digunakan}}{\text{Luas total gudang}} \times 100\% \\ &= \frac{105}{150} \times 100\% = 70\% \end{aligned}$$

d. Quality

Dari 150 m² yang tidak berfungsi sebagai tempat penyimpanan adalah 15 m² maka :

$$\text{Quality} = \frac{\text{Luas Gudang yang sesuai}}{\text{Luas Total Gudang}} \times 100\% = 90\%$$

e. Cycle Time

Inventoy days on hand merupakan = 12,5 hari

4. Order Picking

a. Financial

$$\text{Upah karyawan per jam} = \frac{\text{Total Gaji}}{\text{Waktu Kerja}} = \text{Rp. 7.953 / jam}$$

Untuk setiap order picking membutuhkan waktu 10 menit dan jumlah order picking adalah 5 kali yang dilakukan oleh 1 orang pekerja

$$\text{Financial} = 0,833 \times 7.953 \times 1 = \text{Rp. 6624 / line order picking}$$

b. Productivity

Total barang yang disiapkan 20 adalah :

Productivity

$$\begin{aligned} &= \frac{\text{Total yang akan dipersiapkan}}{\text{Jumlah Pekerja} \times \text{waktu yang digunakan untuk mempersiapkan barang}} \\ &= \frac{20}{1 \text{ org} \times 0.166 \text{ jam}} = 120 \text{ box/ pekerja – jam} \end{aligned}$$

c. Utilization

$$\begin{aligned} \text{Utilization} &= \frac{\text{Jumlah barang yang harus dipindahkan}}{\text{kapasitas maximum order picking}} \times 100\% = 75\% \\ &= 20 / 27 \times 100\% = 75\% \end{aligned}$$

d. Quality

Tidak ada barang yang rusak pada saat order picking maka :

$$\% \text{Quality} = 100\%$$

e. Cycle Time

$$\text{Cycle Time} = \frac{1}{\text{Productivity}} = 0.00833$$

5. Shipping

a. Financial

$$\text{Upah karyawan per jam} = \frac{\text{Total Gaji}}{\text{Waktu Kerja}} = \text{Rp. 7.953 / jam}$$

Untuk memindahkan barang dari gudang ke toko membutuhkan 30 menit dan dilakukan sebanyak 2 kali oleh 2 pekerja, maka :

$$\text{Financial} = 1 \text{ jam} \times \text{Rp}7.953 \text{ org.jam} \times 2 \text{ org} = \text{Rp. 15.906 / line shipping}$$

b. Productivity

Total barang yang ada digudang adalah 20 box :

Productivity

$$\begin{aligned} &= \frac{\text{Total yang akan dipindahkan}}{\text{Jumlah Pekerja} \times \text{waktu yang digunakan untuk memindahkan barang}} \\ &= 20 \text{ box/ pekerja – jam} \end{aligned}$$

c. Utilization

$$\text{Utilization} = \frac{\text{Jumlah barang yang harus dipindahkan}}{\text{kapasitas maximum shipping}} \times 100\% =$$

$$\text{Utilization} = 10 \text{ box} / 20 \text{ box} = 0.5 \times 100\% = 50\%$$

d. Quality

Tidak ada barang yang rusak pada saat order picking maka : 100%

e. Cycle Time

$$\text{Cycle Time} = \frac{1}{20} = 0.05$$

Pengumpulan Data Sama dilakukan pada Pamela, Omi dan Biru. Berikut tabel

data :

	Maga	Pamela	Omi	BiruSwalayan	Min	Max
1. Receiving						
1.1 Finansial (Rp/line receiving)	47,718	44,445	31812	70,120	31812	70120
1.2 Productivity (box/man-hour)	106.67	216	108.4	100	100	216
1.3 Utilization(%)	33.3	90	98	31.3	31.3	98
1.4 Quality(%)	98.75	100	58	99	58	100
1.5 Cycle Time	1.5	2.08	0.56	1.5	2.08	0.56
2. Put Away						
2.1 Finansial (Rp/line putaway)	55,671	88,890	47.718	43.825	43.825	88,890
2.2 Productivity (box/man-hour)	11.4	12	18	16.67	11.4	18
2.3 Utilization(%)	95.24	90	55.78	62.5	55.78	95.24
2.4 Quality(%)	98.75	100	97	100	97	100
2.5 Cycle Time	0.0875	0.0833	0.055	0.06	0.087	0.055
3. Storage						
3.1 Finansial (Rp/line storage)	15.906	23,644	19,882	35,060	15,906	35,060
3.2 Productivity (box/m ²)	4.76	2.48	7.58	10	2,480	10
3.3 Utilization(%)	70	90	95	50	50	95
3.4 Quality(%)	90	99	87	99.2	87	99.2
3.5 Cycle Time	12.5	35	20	14.2	35	12.5
4. Order picking						
4.1 Finansial (Rp/line order picking)	6624	6,222	7,953	10,956	6222	10.956
4.2 Productivity (box/man-hour)	120	193	80	125	80	193
4.3 Utilization(%)	75	50	90	50	50	100
4.4 Quality(%)	100	100	94	100	94	100
4.5 Cycle Time	0.0083	0.005	0.0125	0.008	0.0125	0.005
5. Shipping						
5.1 Finansial (Rp/line receiving)	15,906	82,134	23.859	21.912	15.906	82.134
5.2 Productivity (box/man-hour)	20	112	10	60	10	112
5.3 Utilization(%)	50	90	90	26	26	90
5.4 Quality(%)	100	100	98	100	98	100
5.5 Cycle Time	0.05	0.008	0.1	0.017	0.1	0.008

Normalisasi Snorm De Boar

Receiving

1. Financial

- Maga : $\frac{0-X}{0-100} = \frac{31812-47718}{31812-70120} = 41.5$
- Pamela : $\frac{0-X}{0-100} = \frac{31812-44445}{31812-70120} = 32.9$
- Omi : 0 (Min)
- Biru : 100 (max)

2. Productivity

- Maga : $\frac{0-X}{0-100} = \frac{100-106.67}{100-216} = 5.75$
- Pamela : 100 (max)
- Omi : $\frac{0-X}{0-100} = \frac{100-108.4}{100-216} = 7.24$
- Biru : 0 (Min)

3. Utilization

- Maga : $\frac{0-X}{0-100} = \frac{31.3-33.3}{31.3-98} = 3$
- Pamela : $\frac{0-X}{0-100} = \frac{31.3-90}{31.3-98} = 88$
- Omi : 100 (max)
- Biru : 0 (Min)

4. Quality

- Maga : $\frac{0-X}{0-100} = \frac{58-98.75}{58-100} = 97.02$
- Pamela : 100 (max)
- Omi : 0 (Min)
- Biru : $\frac{0-X}{0-100} = \frac{58-99}{58-100} = 97.6$

5. cycle Time

- Maga : $\frac{0-X}{0-100} = \frac{2.08-1.5}{2.08-0.56} = 38$
- Pamela : 0 (Min)
- Omi : 100 (max)
- Biru : $\frac{0-X}{0-100} = \frac{2.08-1.37}{2.08-0.56} = 46.5$

Nilai Normalisasi Untuk Tiap Aktivitas dan Gudang

Nilai Snorm

	Pink	Pamela	Omi	Biru
1. Receiving				
1.1 Finansial (Rp/line receiving)	41.5	32.9	0	100
1.2 Productivity (box/man-hour)	5.75	100	7.24	0
1.3 Utilization(%)	3	88	100	0
1.4 Quality(%)	97.02	100	0	97.6
1.5 Cycle Time	38	0	100	46.5
2. Put Away				
2.1 Finansial (Rp/line putaway)	26.28	100	8.6	0
2.2 Productivity (box/man-hour)	0	9.09	100	79.84
2.3 Utilization(%)	100	86.72	0	17
2.4 Quality(%)	58.33	100	0	100
2.5 Cycle Time	0	11.56	100	84.37
3. Storage				
3.1 Finansial (Rp/line storage)	0	40.4	20.75	100
3.2 Productivity (box/m ²)	30.35	0	67.82	100
3.3 Utilization(%)	44.44	88.88	100	0
3.4 Quality(%)	24.59	98.36	0	100
3.5 Cycle Time	100	0	66.66	92.4
4. Order picking				
4.1 Finansial (Rp/line order picking)	8.5	0	36.56	100
4.2 Productivity (box/man-hour)	34.51	100	0	39.82
4.3 Utilization(%)	62.5	0	100	0
4.4 Quality(%)	100	100	0	100
4.5 Cycle Time	56	100	0	60
5. Shipping				
5.1 Finansial (Rp/line receiving)	0	100	13.23	9.06
5.2 Productivity (box/man-hour)	9.8	100	0	49.01
5.3 Utilization(%)	37.5	100	100	0
5.4 Quality(%)	100	100	0	100
5.5 Cycle Time	54.3	100	0	90.2

Rekap Kuesioner. Responden 1/Maga, 2/Pamela, 3/Omi dan 4/Biru

1. AHP Receiving

- Responden 1

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime

- Responden 2

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime

- Responden 3

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime

- Responden 4

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime

4. AHP Order Picking

1. Responden 1

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime

2. Responden 2

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime

3. Responden 3

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime

4. Responden 4

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CycleTime

5. AHP Shipping

1. Responden 1

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time

2. Responden 2

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time

3. Responden 3

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time

4. Responden 4

1	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Productivity
2	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
3	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
4	Financial	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
5	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilization
6	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
7	Productivity	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
8	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
9	Utilization	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time
10	Quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cycle Time

6. AHP All Aktivitas

1. Responden 1

1	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PutAway
2	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Storage
3	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
4	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
5	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Storage
6	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
7	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
8	Storage	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
9	Storage	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
10	OrderPicking	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping

2. Reponden 2

1	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PutAway
2	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Storage
3	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
4	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
5	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Storage
6	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
7	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
8	Storage	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
9	Storage	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
10	OrderPicking	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping

3. Responden 3

1	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PutAway
2	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Storage
3	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
4	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
5	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Storage
6	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
7	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
8	Storage	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
9	Storage	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
10	OrderPicking	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping

4. Responden 4

1	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PutAway
2	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Storage
3	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
4	Receiving	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
5	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Storage
6	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
7	PutAway	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
8	Storage	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	OrderPicking
9	Storage	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping
10	OrderPicking	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Shipping

IC Tiap Responden AHP dengan Expert Choice 11

Receiving

1. Responden 1.

0.05

Financial	Productivit	Utilization	Quality	CycleTime
	2.0	3.0	2.0	2.0
		4.0	1.0	2.0
			3.0	2.0
				3.0
Incon: 0.05				

2. Responden 2

0.07

Financial	Productivit	Utilization	Quality	CycleTime
	2.0	3.0	2.0	1.0
		3.0	1.0	2.0
			2.0	2.0
				3.0
Incon: 0.07				

3. Responden 3

0.09

Financial	Productivit	Utilization	Quality	CycleTime
	4.0	3.0	2.0	2.0
		4.0	2.0	2.0
			4.0	2.0
				3.0
Incon: 0.09				

4. Responden 4

0.09

Financial	Productivit	Utilization	Quality	CycleTime
	2.0	2.0	3.0	1.0
		2.0	3.0	3.0
			3.0	3.0
				1.0
Incon: 0.09				

PutAway

1. Responden 1

0.08

Financial	Productivit	Utilization	quality	cycleTime
	3.0	5.0	2.0	3.0
		4.0	2.0	2.0
			2.0	3.0
				3.0
Incon: 0.08				

2. Responden 2
0.09

Financial	Productivit	Utilization	quality	cycleTime
	5.0	3.0	1.0	2.0
		4.0	2.0	3.0
			2.0	4.0
				2.0
Incon: 0.09				

3. Responden 3
0.08

Financial	Productivit	Utilization	quality	cycleTime
	1.0	3.0	1.0	2.0
		5.0	2.0	3.0
			3.0	2.0
				2.0
Incon: 0.08				

4. Responden 4
0.10

Financial	Productivit	Utilization	quality	cycleTime
	3.0	6.0	3.0	4.0
		7.0	2.0	2.0
			2.0	4.0
				3.0
Incon: 0.10				

Storage

1. Responden 1
0.05

Financial	Productivit	Utilization	Quality	CycleTime
	3.0	2.0	2.0	3.0
		2.0	2.0	2.0
			2.0	3.0
				2.0
Incon: 0.05				

2. Responen 2
0.09

Financial	Productivit	Utilization	Quality	CycleTime
	3.0	4.0	2.0	3.0
		3.0	3.0	2.0
			2.0	4.0
				2.0
Incon: 0.09				

3. Responen 3
0.08

Financial	Productivit	Utilization	Quality	CycleTime
	1.0	3.0	3.0	2.0
		2.0	2.0	2.0
			3.0	4.0
				1.0
Incon: 0.08				

4. Responen 4
0.09

Financial	Productivit	Utilization	Quality	CycleTime
	2.0	2.0	3.0	3.0
		2.0	3.0	2.0
			3.0	3.0
				1.0
Incon: 0.09				

Order Picking

1. Responen 1
0.07

Financial	Productivit	Utilization	Quality	CycleTime
	2.0	2.0	2.0	3.0
		2.0	2.0	2.0
			2.0	3.0
				1.0
Incon: 0.07				

2. Responden 2
0.08

Financial	Productivit	Utilization	Quality	CycleTime
	2.0	2.0	2.0	3.0
		2.0	2.0	2.0
			2.0	2.0
				2.0
Incon: 0.08				

3. Responden 3
0.05

Financial	Productivit	Utilization	Quality	CycleTime
	2.0	3.0	2.0	2.0
		2.0	2.0	3.0
			2.0	3.0
				3.0
Incon: 0.05				

4. Responden 4
0.10

Financial	Productivit	Utilization	Quality	CycleTime
	3.0	3.0	2.0	2.0
		2.0	2.0	2.0
			2.0	2.0
				3.0
Incon: 0.10				

Shipping

1. Responden 1
0.02

Financial	Productivit	Utilization	Quality	Cycle Time
	2.0	2.0	2.0	3.0
		3.0	3.0	3.0
			1.0	1.0
				2.0
Incon: 0.02				

2. Responden 2
0.08

Financial	Productivit	Utilization	Quality	Cycle Time
	2.0	3.0	3.0	2.0
		5.0	3.0	4.0
			2.0	2.0
				3.0
Incon: 0.08				

3. Responden 3
0.10

Financial	Productivit	Utilization	Quality	Cycle Time
	1.0	2.0	2.0	4.0
		2.0	3.0	3.0
			2.0	2.0
				2.0
Incon: 0.10				

4. Responden 4
0,07

Financial	Productivit	Utilization	Quality	Cycle Time
	1.0	2.0	2.0	2.0
		3.0	4.0	3.0
			2.0	3.0
				2.0
ncon: 0.07				

All Aktivitas

1. Responden 1
0.07

Receiving	PutAway	Storage	OrderPickii	Shipping
	2.0	3.0	1.0	2.0
		2.0	1.0	2.0
			2.0	2.0
				1.0
Incon: 0.07				

2. Responden 2
0.10

Receiving	PutAway	Storage	OrderPickii	Shipping
	4.0	4.0	2.0	1.0
		2.0	2.0	4.0
			3.0	2.0
				3.0
Incon: 0.10				

3. Responden 3
0.08

Receiving	PutAway	Storage	OrderPickii	Shipping
	2.0	2.0	3.0	1.0
		5.0	2.0	2.0
			2.0	3.0
				2.0
Incon: 0.08				

4. Responden 4
0.08

Receiving	PutAway	Storage	OrderPickii	Shipping
	2.0	2.0	3.0	1.0
		5.0	2.0	2.0
			2.0	3.0
				2.0
Incon: 0.08				

Ouput LINGO 11. CRS Primal

1. DMU1

Global optimal solution found.

Objective value:

0.8086574

Infeasibilities:

0.000000

Total solver iterations:

4

Variable	Value	Reduced Cost
Y1	1.617315	0.000000
Y2	0.000000	13.57593
X1	0.3964007E-02	0.000000
X2	0.000000	1.339083
X3	0.8245134E-02	0.000000

Row	Slack or Surplus	Dual Price
1	0.8086574	1.000000
2	0.000000	0.8086574
3	0.1913426	0.000000
4	1.113093	0.000000
5	0.000000	0.3303009
6	0.000000	0.5045487
7	1.617315	0.000000
8	0.000000	0.000000
9	0.3964007E-02	0.000000
10	0.000000	0.000000
11	0.8245134E-02	0.000000

2. DMU2

Global optimal solution found.

Objective value: 1.000000

Infeasibilities: 0.000000

Total solver iterations: 4

Variable	Value	Reduced Cost
Y1	0.000000	0.000000
Y2	0.8928571E-02	0.000000
X1	0.000000	0.000000
X2	0.2000000	0.000000
X3	0.000000	0.000000

Row	Slack or Surplus	Dual Price
1	1.000000	1.000000
2	0.000000	1.000000
3	0.8714286	0.000000
4	0.000000	1.000000
5	0.5707143	0.000000
6	0.1842857	0.000000
7	0.000000	0.000000
8	0.8928571E-02	0.000000
9	0.000000	0.000000
10	0.2000000	0.000000
11	0.000000	0.000000

3. DMU3

Global optimal solution found.

Objective value: 1.000000

Infeasibilities: 0.000000

Total solver iterations: 6

Variable	Value	Reduced Cost
Y1	1.333333	0.000000

Y2	0.000000	0.000000
X1	0.3267974E-02	0.000000
X2	0.000000	0.000000
X3	0.6797386E-02	0.000000

Row	Slack or Surplus	Dual Price
1	1.000000	1.000000
2	0.000000	1.000000
3	0.1577451	0.000000
4	0.9176471	0.000000
5	0.000000	1.000000
6	0.000000	0.000000
7	1.333333	0.000000
8	0.000000	0.000000
9	0.3267974E-02	0.000000
10	0.000000	0.000000
11	0.6797386E-02	0.000000

4. DMU4

Global optimal solution found.

Objective value: 1.000000

Infeasibilities: 0.000000

Total solver iterations: 4

Variable	Value	Reduced Cost
Y1	0.7543860	0.000000
Y2	0.1038012E-01	0.000000
X1	0.000000	0.000000
X2	0.2777778	0.000000
X3	0.000000	0.000000

Row	Slack or Surplus	Dual Price
1	1.000000	1.000000
2	0.000000	1.000000
3	0.8735380	0.000000
4	0.000000	0.000000
5	0.2470760	0.000000
6	0.000000	1.000000
7	0.7543860	0.000000
8	0.1038012E-01	0.000000
9	0.000000	0.000000
10	0.2777778	0.000000
11	0.000000	0.000000

Output CRS Dual Lingo 11

1. DMU1

Global optimal solution found.

Objective value: 0.7952339

Infeasibilities: 0.000000

Total solver iterations: 2

Variable	Value	Reduced Cost
Z	0.8086574	0.000000
O1	0.000000	1.553568
O2	13.57593	0.000000

I1	0.000000	0.4017985E-02
I2	1.339083	0.000000
I3	0.000000	0.5823908E-02
P1	0.000000	0.2047661
P2	0.000000	1.104796
P3	0.3303009	0.000000
P4	0.5045487	0.000000

Row	Slack or Surplus	Dual Price
1	0.7952339	-1.000000
2	0.000000	-1.554468
3	0.000000	-0.9000000E-03
4	0.000000	0.4917985E-02
5	0.000000	0.9000000E-03
6	0.000000	0.6723908E-02
7	0.000000	0.000000
8	0.000000	0.000000
9	0.3303009	0.000000
10	0.5045487	0.000000
11	0.000000	0.000000
12	13.57593	0.000000
13	0.000000	0.000000
14	1.339083	0.000000
15	0.000000	0.000000

2. DMU2

Global optimal solution found.

Objective value: 1.000000
 Infeasibilities: 0.000000
 Total solver iterations: 1

Variable	Value	Reduced Cost
Z	1.000000	0.000000
O1	0.000000	0.000000
O2	0.000000	0.8026161E-02
I1	0.000000	0.000000
I2	0.000000	0.1440200
I3	0.000000	0.000000
P1	0.000000	0.7408598
P2	1.000000	0.000000
P3	0.000000	0.5713594
P4	0.000000	0.1206924

Row	Slack or Surplus	Dual Price
1	1.000000	-1.000000
2	0.000000	-0.9000000E-03
3	0.000000	-0.8926161E-02
4	0.000000	0.9000000E-03
5	0.000000	0.1449200
6	0.000000	0.9000000E-03
7	0.000000	0.000000
8	1.000000	0.000000
9	0.000000	0.000000
10	0.000000	0.000000
11	0.000000	0.000000
12	0.000000	0.000000
13	0.000000	0.000000
14	0.000000	0.000000
15	0.000000	0.000000

3. DMU3

Global optimal solution found.

Objective value: 1.000000
Infeasibilities: 0.000000
Total solver iterations: 1

Variable	Value	Reduced Cost
Z	1.000000	0.000000
O1	0.000000	1.320433
O2	0.000000	0.000000
I1	0.000000	0.000000
I2	0.000000	0.2466576
I3	0.000000	0.000000
P1	0.000000	0.7800136
P2	0.000000	1.015988
P3	1.000000	0.000000
P4	0.000000	0.3115406

Row	Slack or Surplus	Dual Price
1	1.000000	-1.000000
2	0.000000	-1.321333
3	0.000000	-0.9000000E-03
4	0.000000	0.9000000E-03
5	0.000000	0.2475576
6	0.000000	0.9000000E-03
7	0.000000	0.000000
8	0.000000	0.000000
9	1.000000	0.000000
10	0.000000	0.000000
11	0.000000	0.000000
12	0.000000	0.000000
13	0.000000	0.000000
14	0.000000	0.000000
15	0.000000	0.000000

4. DMU4

Global optimal solution found.

Objective value: 1.000000
Infeasibilities: 0.000000
Total solver iterations: 1

Variable	Value	Reduced Cost
Z	1.000000	0.000000
O1	0.000000	0.000000
O2	0.000000	0.1575917E-01
I1	0.000000	0.8617600E-02
I2	0.000000	0.000000
I3	0.000000	0.000000
P1	0.000000	0.7493341
P2	0.000000	0.2752049
P3	0.000000	0.9529112
P4	1.000000	0.000000

Row	Slack or Surplus	Dual Price
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1	1.000000	-1.000000
2	0.000000	-0.9000000E-03
3	0.000000	-0.1665917E-01
4	0.000000	0.9517600E-02
5	0.000000	0.9000000E-03
6	0.000000	0.9000000E-03
7	0.000000	0.000000
8	0.000000	0.000000
9	0.000000	0.000000
10	1.000000	0.000000
11	0.000000	0.000000
12	0.000000	0.000000
13	0.000000	0.000000
14	0.000000	0.000000
15	0.000000	0.000000

Output VRS Lingo 11

1. DMU1

Global optimal solution found.

Objective value: 0.8862205
 Infeasibilities: 0.000000
 Total solver iterations: 2

Variable	Value	Reduced Cost
Z	0.9374707	0.000000
O1	0.000000	0.000000
O2	40.00000	0.000000
I1	0.000000	0.7839805E-02
I2	1.321721	0.000000
I3	15.62295	0.000000
P1	0.000000	0.1137795
P2	0.000000	1.004457
P3	0.000000	0.1584194
P4	1.000000	0.000000

Row	Slack or Surplus	Dual Price
1	0.8862205	-1.000000
2	0.000000	-0.9000000E-03
3	0.000000	-0.9000000E-03
4	0.000000	0.8739805E-02
5	0.000000	0.9000000E-03
6	0.000000	0.9000000E-03
7	0.000000	-0.8677705
8	0.000000	0.000000
9	0.000000	0.000000
10	0.000000	0.000000
11	1.000000	0.000000
12	0.000000	0.000000
13	40.00000	0.000000
14	0.000000	0.000000
15	1.321721	0.000000
16	15.62295	0.000000

2. DMU2

Global optimal solution found.

Objective value: 1.000000
Infeasibilities: 0.000000
Total solver iterations: 1

Variable	Value	Reduced Cost
Z	1.000000	0.000000
O1	0.000000	0.000000
O2	0.000000	0.8026161E-02
I1	0.000000	0.000000
I2	0.000000	0.1440200
I3	0.000000	0.000000
P1	0.000000	0.7408598
P2	1.000000	0.000000
P3	0.000000	0.5713594
P4	0.000000	0.1206924

Row	Slack or Surplus	Dual Price
1	1.000000	-1.000000
2	0.000000	-0.9000000E-03
3	0.000000	-0.8926161E-02
4	0.000000	0.9000000E-03
5	0.000000	0.1449200
6	0.000000	0.9000000E-03
7	0.000000	0.000000
8	0.000000	0.000000
9	1.000000	0.000000
10	0.000000	0.000000
11	0.000000	0.000000
12	0.000000	0.000000
13	0.000000	0.000000
14	0.000000	0.000000
15	0.000000	0.000000
16	0.000000	0.000000

3. DMU3

Global optimal solution found.

Objective value: 1.000000
Infeasibilities: 0.000000
Total solver iterations: 2

Variable	Value	Reduced Cost
Z	1.000000	0.000000
O1	0.000000	0.7427091E-01
O2	0.000000	0.000000
I1	0.000000	0.000000
I2	0.000000	0.2466576
I3	0.000000	0.000000
P1	0.000000	0.4684730
P2	0.000000	0.4552148
P3	1.000000	0.000000
P4	0.000000	0.000000

Row	Slack or Surplus	Dual Price
1	1.000000	-1.000000

2	0.000000	-0.7517091E-01
3	0.000000	-0.9000000E-03
4	0.000000	0.9000000E-03
5	0.000000	0.2475576
6	0.000000	0.9000000E-03
7	0.000000	-0.9346218
8	0.000000	0.000000
9	0.000000	0.000000
10	1.000000	0.000000
11	0.000000	0.000000
12	0.000000	0.000000
13	0.000000	0.000000
14	0.000000	0.000000
15	0.000000	0.000000
16	0.000000	0.000000

4. DMU4

Global optimal solution found.

Objective value: 1.000000
 Infeasibilities: 0.000000
 Total solver iterations: 1

Variable	Value	Reduced Cost
Z	1.000000	0.000000
O1	0.000000	0.000000
O2	0.000000	0.000000
I1	0.000000	0.8617600E-02
I2	0.000000	0.000000
I3	0.000000	0.000000
P1	0.000000	0.1189674
P2	0.000000	1.094682
P3	0.000000	0.1649528
P4	1.000000	0.000000

Row	Slack or Surplus	Dual Price
1	1.000000	-1.000000
2	0.000000	-0.9000000E-03
3	0.000000	-0.9000000E-03
4	0.000000	0.9517600E-02
5	0.000000	0.9000000E-03
6	0.000000	0.9000000E-03
7	0.000000	-0.9455500
8	0.000000	0.000000
9	0.000000	0.000000
10	0.000000	0.000000
11	1.000000	0.000000
12	0.000000	0.000000
13	0.000000	0.000000
14	0.000000	0.000000
15	0.000000	0.000000
16	0.000000	0.000000

