CHAPTER V

APPLICATION OF PROPOSED KEY AREA & THE RESULT OF IMPROVEMENT

5.1 General

From the objective of the research that to improve the quality and performance of the key area of the maintenance operation unit, the investigation of related concept is observed. Therefore, the implementation of this objective is separated by two major phases, which are application of proposed key area and the result of improvement. The following sections comprehensively describe the detail feedback during the implementation.

5.2 Selection of Key Area

Due to the limitation of time during the study, therefore, the goal of this phase is to make a selection of the most appropriated key area of ABC Co., Ltd. This is to fulfill the objective of the study and to serve as a framework for other key area of ABC Co., Ltd. The most appropriated key area unit for improvement should be rated with the highest impact from both customer and organization itself.

Therefore, the person, who involves in the management of maintenance unit of the company, has been invited for rated the importance of each business unit KPI indicator for the internal perspective. The evaluators are the board of executive director, garage manager, and head of the technician, each of the evaluator had experience of no less then five years on the field. Each of the evaluator is required to fill up the score for three categories. These categories are case on customer viewpoint, company objective, and personal view point. Therefore, the importance scale are ranked from 3 represented most importance to 1 represented less importance. The evaluate form was sent to each evaluator. Moreover, the sample of the evaluated form is attached in Appendix C-2 and C-3 respectively.

The result of evaluation the important of each key area for business maintenace unit

Objective	KPIs	Executive			Manager			Technician			Total
		C	O	P	C	O	P	C	O	P	
Waste Reduction	Percentage of value of material lost from used material	1	1	3	1	1	2	1	1	1	12
Quality Increasing	Average percentage of work quality	3	3	2	3	2	2	2	2	2	21
Conformity to operation process	Quality of defect per quanity of operations	3	3	1	3	3	2	3	3	2	23
The ability quality inspection	Number of customer complaint per number of job done	3	3	2	3	3	2	3	3	1	23
Availability of Resource	Number of job lacking of employee (daily)	1	1	3	1	1	3	1	1	1	13
	Number of job lacking of spare part (daily)	1	2	1	1	2	2	1	2	3	15
	Number of job lacking of equipment (daily)	1	1	1	1	1	3	1	1	3	13
Accuracy of operation time	Number of the job delay (daily)	3	3	3	3	3	3	3	3	2	26

Note: C = Customer view point
O = Company objective
P = Personal viewpoint

Table 5-1: The level of important for each key area by the management team

Time usesage in operation process is presented the highest impact for both. Therefore, the operation time process area of ABC Co., Ltd. is selected as a key area for improvement

5.3 Key Area Improvement

Maintenance unit had occupied an area of a 4 rai. It is operating on one shift basic, eight hours a day and six days per week. The unit employs a total of 43 workers, including mechanical (20), technician (5), Inspector (2), guard (4), Service Advisor (3) driver/car washer (4), garage manager (1), warehouse manager (1), and financial (3). Presently, the unit had approximate daily capacity though the full capacity of 50 jobs/day. The garage layout is shown in Figure 5-1
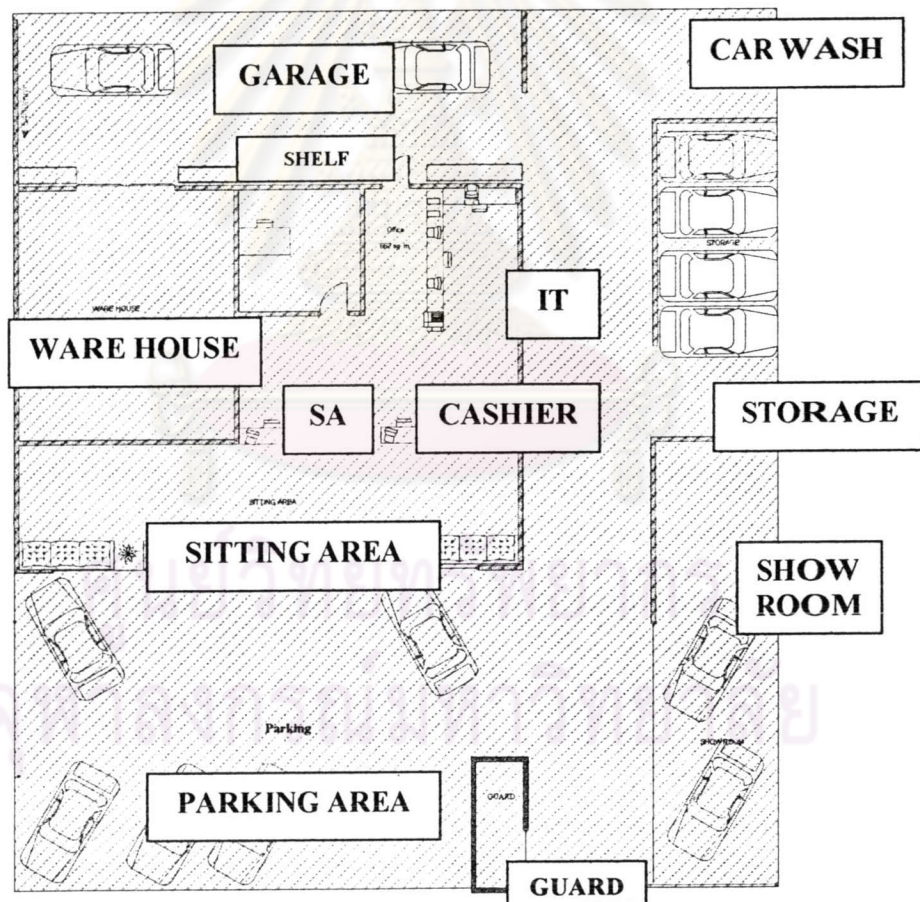

Figure 5-1: Garage layout of ABC Co., Ltd

Due to the limitation of time during the study, therefore, the researcher had select one of the job order as an example for improvement. The selected job order was selected with the highest frequency order from April 2004 to June 2004. In order to collect the number of job order (Table 5-2), an informal interview was conducted with the manager of management information system function, who is responsible for designing database of every function of the company. With the help of manager, the researcher can group the different kind of job into 5 major groups. These groups are mileage check, electronic, minor maintenance, major maintenance, and over haul parts. As the result of the interview, the mileage check is selected with the highest frequently order as shown in Figure 5-2. Mileage check are also source of income and frequently complained on lead time problem.

Number of job order from April 2004 – June 2004				
TYPE	MONTH			TOTAL
	APRIL	MAY	JUNE	
Mileage check	210	186	232	628
Minor	163	184	177	524
Electronic	124	87	106	307
Major	59	76	81	216
Overhaul	14	22	18	54
Total	570	555	614	1739

Table 5-2: Number of job order from April 2004 – June 2004

Note: Engine and Paint were not included since it is a responsible for other department
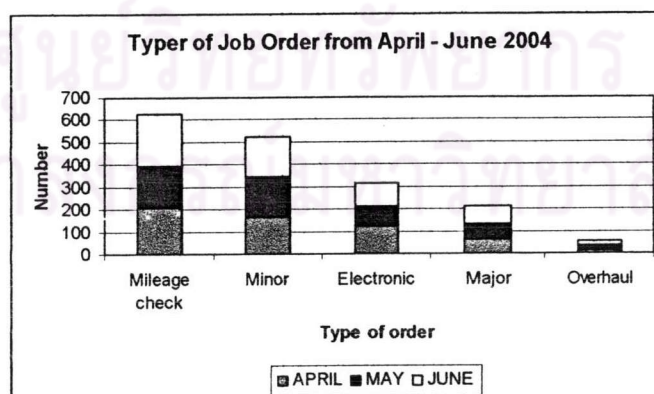

Figure 5-2: Number of job order from April 2004 – June 2004

5.4 Flow Process Chart of Mileage Check

The researcher had clearly stated the tools use in analyzes key process for quality and performance in research procedure of chapter 1.6. These tools are flow chart, process activities mapping, and E-C-R-S.

Flow process chart is a graphic, symbolic representation of the work performed or to be performed on a product as it passes through some or all of the stages of a process. Typically, the information included in the chart is quantity, distance moved, typed of work done, and equipment used. In addition, a careful, questioning attitude can help determine why the current methods are being used and can help identify potential areas for improvements. These methods and tools can be used effectively to increase productivity.

The Flow chart for mileage check is shown in Figure 5-3. Mileage check flow start from the time customer pull over and stop for their routine card. Then the guard looks for available space and signals the customer to park his/her car. Then customers are required to walk to Service advisor desk and ask for a mileage check. At this point, service advisor will inspect, record and printout the ordering job, while customers are waiting in the sitting area. Then customer can leave or wait for their car after they had received the order printout. Next the driver will transfer customer car to the garage. Technician will be the one who assign the job to mechanic and as well as give permission in ordering item for any changes. After the mechanic done with the job, driver is being called. Driver will wash the car and kept the car in the storage, where QC is ready to inspect the finished job. Customer can then have their car back after they had pay the bill.

Another useful tool is process activity mapping. The summaries Process activity mapping of mileage check is shown in Figure 5-4. Researcher decided to record time in minute unit rater then second. Since second unit is too precise for this thesis. The number of distance and time used in operation are the average from 5 jobs collected with the same model. This model is a E220 cdi. The data was collected during July 2004. There is total of 42 activities, Average total distance traveled of 293 meters, and

average total time usage of 143 minute. Appendix D-1 shows the Process activity mapping form used by the ABC Company during July 2004. Moreover, the sample and summary of data collected are show in Appendix D-2 and D-3 respectively.
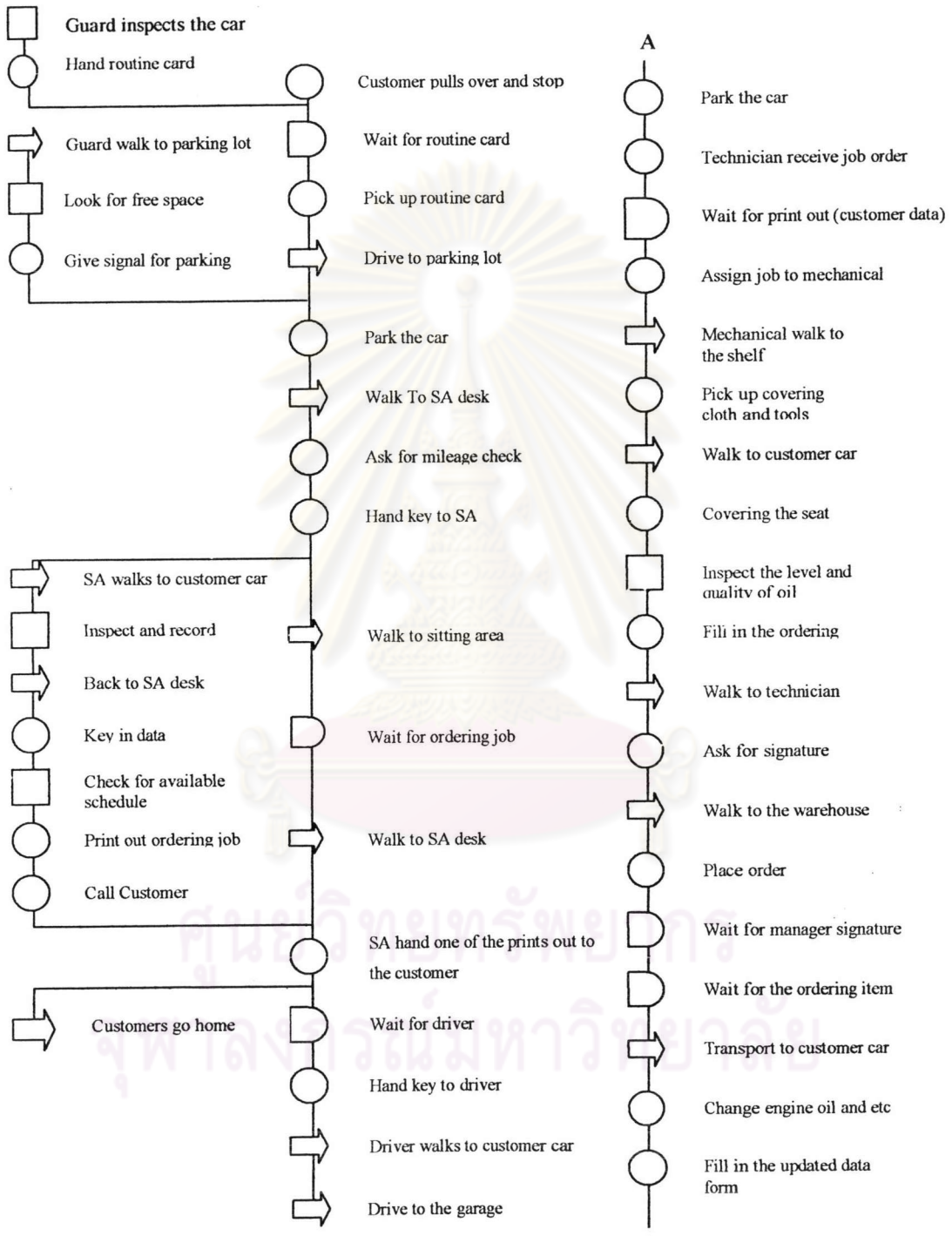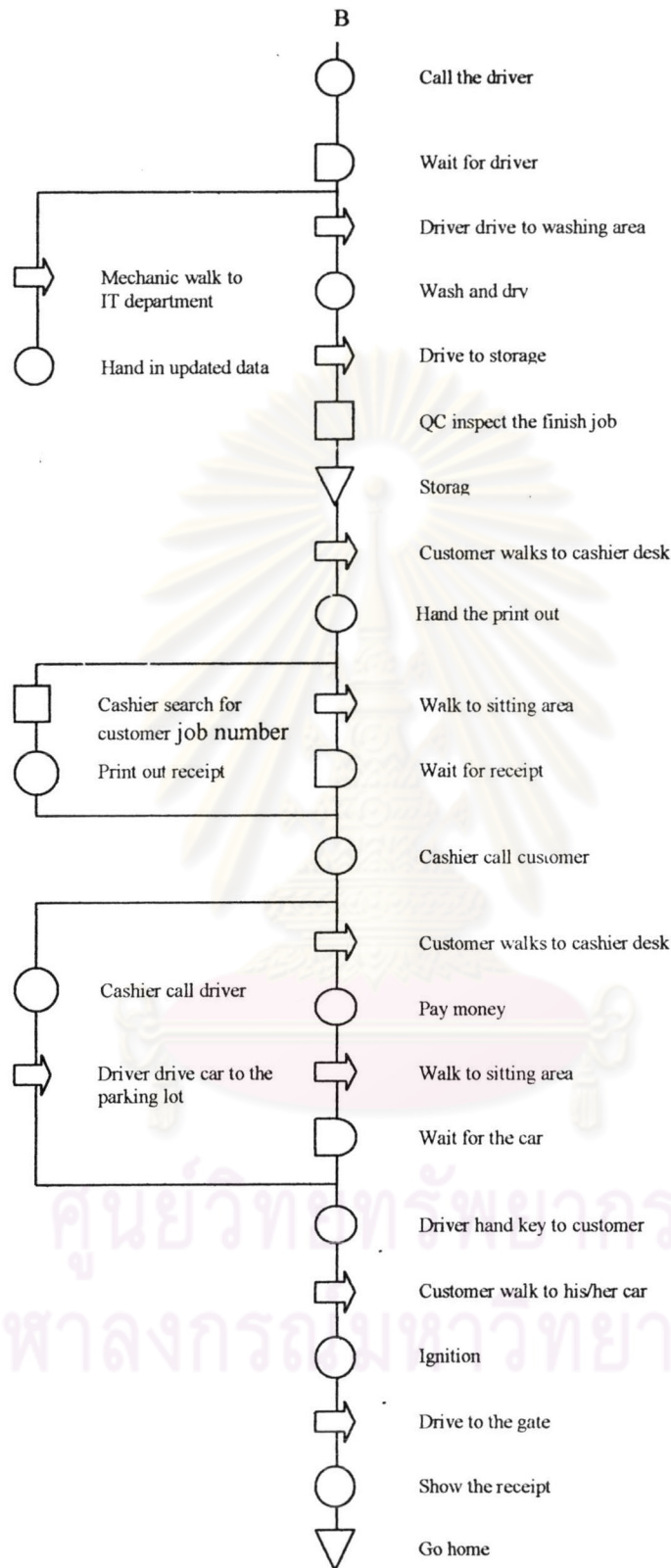

Figure 5-3: Flow Chart for mileage check during June 2004

B

Call the driver

Wait for driver

Driver drive to washing area

Mechanic walk to IT department — Wash and dry

Hand in updated data — Drive to storage

QC inspect the finish job

Storag

Customer walks to cashier desk

Hand the print out

Cashier search for customer job number — Walk to sitting area

Print out receipt — Wait for receipt

Cashier call customer

Customer walks to cashier desk

Cashier call driver — Pay money

Driver drive car to the parking lot — Walk to sitting area

Wait for the car

Driver hand key to customer

Customer walk to his/her car

Ignition

Drive to the gate

Show the receipt

Go home

Figure 5-3: Flow Chart for mileage check during June 2004(continue)

| PRESENT METHOD ☑ | | FLOW PROCESS CHART | | | PAGE 1/1 |

| PROPOSED METHOD ☐ | | | | | |
| ☐ | | | | | |

PRAT NAME: **E 220 cdi**

PROCESS DESCRIPTION: **Mileage check**

DEPARTMENT: **Maintenance unit**

PLANT: **Garage.**

DATE: **JUNE 2004**

SUMMARY		NO.
○ OPERATIONS		13
⇨ TRANSPORTATIONS		16
☐ INSPECTIONS		2
D DELAYS		9
▽ STORAGES		2
TOTAL STEPS		42
DISTANCE TRAVELED (MEAN)		293 m
TOTAL TIME (MEAN)		143 min

Step	Symbol (marked)	DESCRIPTION	Distance	Time
1	Operation	Customer pull over	-	-
2	Delay	Wait for routine card	-	1
3	Transportation	Drive to the parking lot	29.2	-
4	Operation	Park the car	-	3.6
5	Transportation	Walk to SA desk	18.8	-
6	Operation	Ask for mileage check	-	-
7	Transportation	Walk to sitting area	7.4	-
8	Delay	Wait for the receiving order print out	-	13
9	Transportation	Walk back to SA desk	7.4	-
10	Operation	Receive the order print out	-	-
11	Delay	Wait for driver	-	9.2
12	Transportation	Driver walk to customer car	18.8	-
13	Transportation	Drive to the garage	57.8	-
14	Operation	Park the car	-	3.4
15	Delay	Technician wait for customer data print out	-	3
16	Operation	Assign job to mechanical	-	1.6
17	Transportation	Mechanical walk to the shelf	11.8	-
18	Operation	Pick up cover cloth and tool	-	1.6
19	Transportation	Walk to customer car	11.8	-
20	Operation	Cover seat and part that are risk to dirtiness	-	2.6
21	Inspection	Inspect the level and quality of engine oil, break oil, etc	-	9.6
22	Operation	Fill the ordering form	-	3
23	Delay	Wait for technician to sign order form	-	2
24	Transportation	Walk to warehouse	12	-
25	Delay	Wait for manager to sign and wait for ordering item	-	11.6
26	Transportation	Back to customer car	12	-
27	Operation	Change engine oil, brake oil, and etc	-	29.6
28	Operation	Fill in the form for the updated change	-	3.6
29	Delay	Wait for driver	-	4.2
30	Transportation	Driver drive to the washing area	39.6	-
31	Operation	Wash and dry	-	10.8
32	Transportation	Drive to the storage	44.2	-
33	Inspection	QC check the finish job	-	6
34	Storage	Storage	-	-
35	Transportation	Customer walk to cashier desk	-	-
36	Transportation	Walk to sitting area	7.4	-
37	Delay	Wait for receipt	-	5.6
38	Transportation	Walk to cashier desk	7.4	-
39	Operation	Pay money	-	5
40	Transportation	Walk to sitting area	7.4	-
41	Delay	Wait for the car	-	13
42	Storage	Go home	-	-
		Total	293	143

5.5 The Propose Flow Chart for Mileage Check

In order to propose a better flow cart for mileage check, the researcher had used E-C-R-S analysis. E-C-R-S is used in order to eliminate the unnecessary activities, combine two or more activities to reduce certain step, rearrange to make a better flow, and simplify the complicate activities. The main objective of using E-C-R-S is trying to reduce the time used in operation process. The research had then proposed the way to reduce the operation time as follow:

A. *Eliminate* – elimination of unnecessary activities

 ➢ Step 11, 12, 13 and 14 should be terminated since customers can go straight to the garage rather than the parking lot.
 ➢ Step 16 should also be eliminated since the order is assigned directly to the mechanic.
 ➢ Step 23, 24, 25, and 26 had been eliminated since the mechanic no longer needed a signature for the relevant part (engine oil, brake oil, steering oil and etc).
 ➢ Step 29 can be eliminated, instead of waiting for a driver to come; the company can prepare drivers waiting for the finish job.
 ➢ Step 36, 37, and 38 should be terminated because the receipt was print after IT department had updated the changes.
 ➢ Step 40 and 41 had been eliminated since customer car are ready in the parking lot

B. *Combine* – combining activities together to reduce activities, time, etc.

 ➢ Step 1 and 6 had been combined so that the guard can escort the customer directly to the garage
 ➢ Step 5 and 20 had been combined and reason is stated in simplicity below
 ➢ Step 22 and 28 can now be combined since the mechanic had to do the stock themselves

C. *Rearrange* – rearranging activities thus facilitate discrimination

   ➢ Step 13 had been replaced step 3 because the customer is asked to go directly to the garage.

   ➢ Step 7, 8 , 9, and 10 had moved one step up due to the combination of step 1 and 6

   ➢ Step 15 had replaced step 10 due to the elimination of step 11, 12, 13, and 14

   ➢ Step 17, 18, and 19 had moved five step and step 21 had moved 7 step up due to elimination of step 16

   ➢ Step 27 had replaced step 16 since step 23, 24, 25, and 26 had been eliminated

   ➢ the combination of step 22 and step 28 had replaced step 17

   ➢ Step 30, 31, and 32 had moved up11 step and step 34 and 35 had moved up 12 step since step 29 had been terminated

   ➢ Step 33 had replaced step 18, since it is better to let QC inspect the finish job before washing it.

   ➢ Step 39 had replaced step 25, and step 42 had replaced step 26

D. *Simplicity* – reducing the number of operations, reducing or eliminating delays and storage or minimizing transportation (Work In Progress)

   ➢ Step 5 had been simplified to such that the service advisor must be ready to greet the customer. This is made in order to reduce the customer transporting and waiting time and as well as increase the customer satisfaction.

   ➢ Step 18 had been simplify such that the mechanic no longer needed to waste time carrying and covering the car's seat. This is because service advisor can easily take care with it.

   ➢ Step 32 had been simplified by reducing the step in transport customer car to the storage.

	BEFORE	E-C-R-S		AFTER
1	Customer pull over	Combine: step 1 with step 6	1	Customer pull over/ask for mileage check
2	Wait for routine card		2	Wait for routine card
3	Drive to the parking lot	Eliminate: step 3	3	Drive to the garage
4	Park the car		4	Park the car
5	Walk to SA desk	Combine: step 5 with step 20 Simplicity: step 5	5	SA greet customer and covering the seat
6	Ask for mileage check		6	Customer walk to sitting area
7	Walk to sitting area	Rearrange: step 7 to step 6	7	Wait for the order print out
8	Wait for the receiving order print out	Rearrange: step 8 to step 7	8	Walk back to SA desk
9	Walk back to SA desk	Rearrange: step 9 to step 8	9	Receive the order print out
10	Receive the order print out	Rearrange: step 10 to step 9	10	Mechanic wait for the customer data print out
11	Wait for driver	Eliminate: step 11	11	Walk to the shelf
12	Driver walk to customer car	Eliminate: step 12	12	Pick up tools
13	Drive to the garage	Rearrange: step 13 to step 3	13	Transport to customer car
14	Park the car	Eliminate: step 14	14	Inspect the level and quality of engine oil, break oil, etc
15	Technician wait for customer data print out	Simplicity: step 15 Rearrange: step 15 to step 10	15	Pick up engine oil, brake oil, and etc.
16	Assign job to mechanical	Eliminate: step 16	16	Change engine oil, brake, and etc
17	Mechanical walk to the shelf	Rearrange: step 17 to step 11	17	Fill in the form for the updated change
18	Pick up cover cloth and tool	Simplicity: step 18 Rearrange: step 18 to step 12	18	QC check the finish job
19	Walk to customer car	Rearrange: step 19 to step 13	19	Driver drive to the washing area
20	Cover seat and part that are risk to dirtiness		20	Wash and dry
21	Inspect the level and quality of engine oil, break oil, etc	Rearrange: step 21 to step 14	21	Drive to the parking lot
22	Fill the ordering form	Eliminate: step 22	22	Storage

23	Wait for technician to sign order form	Eliminate: step 23	23	Customer walk to cashier desk
24	Walk to warehouse	Eliminate: step 24	24	Cashier search for the receipt
25	Wait for manager to sign and wait for ordering item	Eliminate: step 25	25	Print the receipt
26	Back to customer car	Eliminate: step 26	26	Pay money
27	Change engine oil, brake oil, and etc	Rearrange: step 27 to step 16	27	Go home
28	Fill in the form for the updated change	Rearrange: step 28 to step 17		
29	Wait for driver	Eliminate: step 29		
30	Driver drive to the washing area	Rearrange: step 30 to step 19		
31	Wash and dry	Rearrange: step 31 to step 20		
32	Drive to the storage	Simplicity: step 32 Rearrange: step 32 to step 21		
33	QC check the finish job	Rearrange: step 33 to step 18		
34	Storage	Rearrange: step 34 to step 22		
35	Customer walk to cashier desk	Rearrange: step 35 to step 23		
36	Walk to sitting area	Eliminate: step 36		
37	Wait for receipt	Rearrange: step 37 to step 25		
38	Walk to cashier desk	Eliminate: step 38		
39	Pay money	Rearrange: step 39 to step 26		
40	Walk to sitting area	Eliminate: step 40		
41	Wait for the car	Eliminate: step 41		
42	Go home	Rearrange: step 42 to step 27		

Table 5-3: E-C-R-S Analysis on mileage check flow chart

Since, many changes had been taken place due to the method of E-C-R-S. The major changes are summarizes below:

1. Instead of parking the parking lot, customer drives directly to the garage and park there. This help to reduce the time and distance used by driver in transfer the customer car from parking lot to the garage.

2. Service advisor will be the one who greet the customer after he/she park his/her car. This help improve the level satisfaction and reduce the time and distance of walking back and forth for both service advisor and customer.

3. Mechanic will receive the job order directly from service advisor instead of technician. This can be done with out the help of technician because mileage check process can be done with out the monitoring of technician.

4. Mechanic will no longer need permission in ordering item, because the item they needed is provided on the shelf. But they had to fill the and check the stock form instead.

5. After the job had be check and washed, it will be kept in the parking lot instead of storage. Customer is no longer had to waited for they car after the payment.

6. Cashier will print the receipt in advance after QC had done with his job. So, that customer can pay and has his/her car back right away.

7. The garage layout had been rearranged too. The researcher had switched the place of Service advisor desk with the IT depth. This is to help reduce both distance and time for receiving customer order. Sitting area had been added to provide more room and comfort for the customer. The rest remain unchanged to avoid complexity and to follow the specification of Mother Company. Figure 5-5 shown the improved layout of the garage
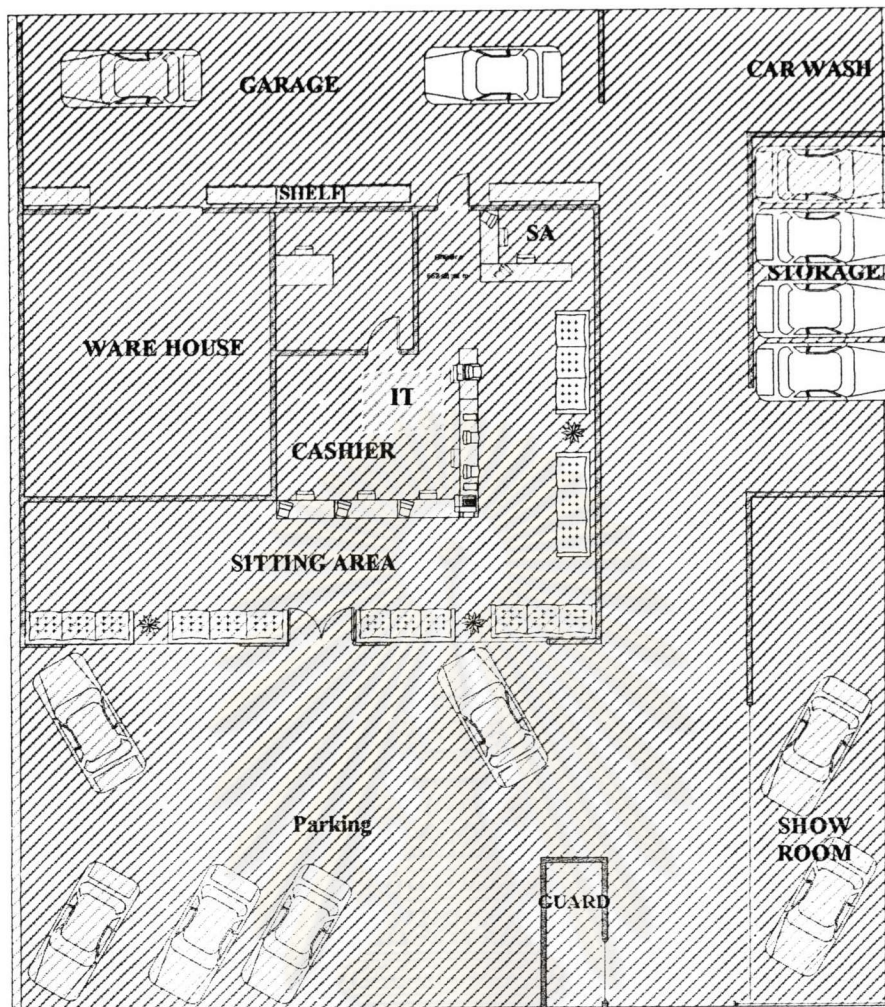
Figure 5-5: The improved layout of the ABC's garage

The propose Flow chart and the propose Process Activity Mapping for mileage check is shown in Figure 5-6 and 5-7 respectively.
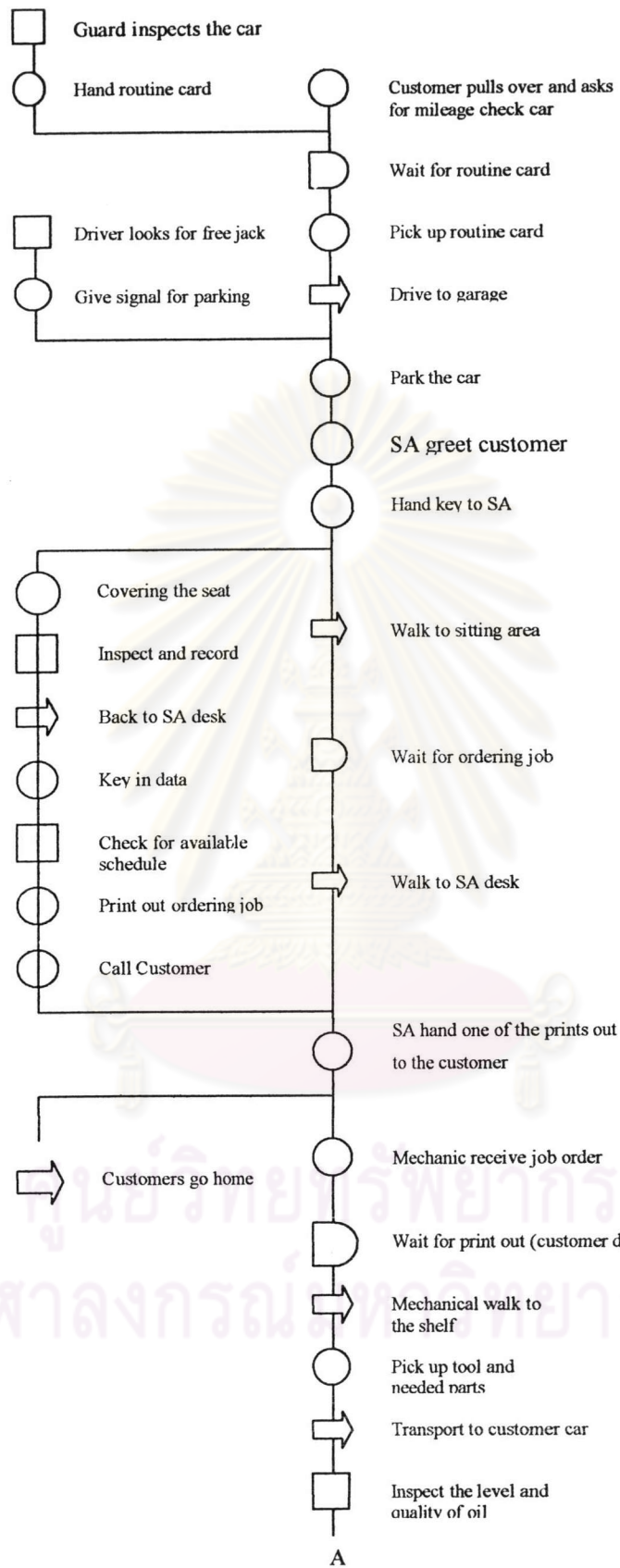
Figure 5-6: The propose flow Chart for mileage check
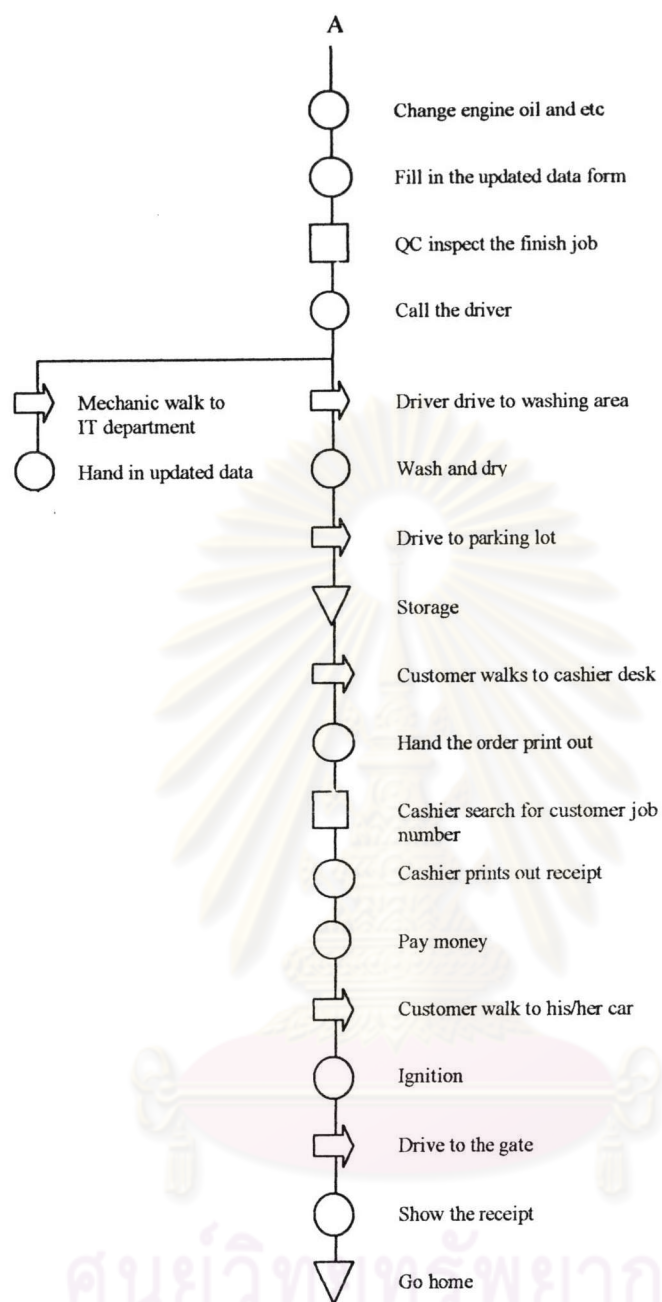
Figure 5-6: The propose flow Chart for mileage check (continue)

PRESENT METHOD ☐	**FLOW PROCESS CHART**		PAGE 1/1

PROPOSED METHOD ☒ ☐		SUMMARY	NO.
PRAT NAME: E 220 cdi.		○ OPERATIONS	10
		⇨ TRANSPORTATIONS	9
PROCESS DESCRIPTION: Mileage check		☐ INSPECTIONS	3
		D DELAYS	3
DEPARTMENT: Maintenance unit		∇ STORAGES	2
PLANT: Garage.		TOTAL STEPS	27
DATE:		DISTANCE TRAVELED (MEAN)	-
		TOTAL TIME (MEAN)	-

Step	Symbol (○ ⇨ ☐ D ∇)	DESCRIPTION
1	● operation	Customer pull over/ask for mileage check
2	D delay	Wait for routine card
3	⇨ transport	Drive to the garage
4	● operation	Park the car
5	● operation	SA greet customer and covering the seat
6	⇨ transport	Customer walk to sitting area
7	D delay	Wait for the order print out
8	⇨ transport	Waik back to SA desk
9	● operation	Receive the order print out
10	D delay	Mechanic wait for the customer data print out
11	⇨ transport	Walk to the shelf
12	● operation	Pick up tools
13	⇨ transport	Transport to customer car
14	☐ inspection	Inspect the level and quality of engine oil, break oii, etc
15	● operation	Pick up engine cil, brake oil, and etc.
16	● operation	Change engine oil, brake, and etc
17	● operation	Fill in the form for the updated change
18	☐ inspection	QC check the finish job
19	⇨ transport	Driver drive to the washing area
20	● operation	Wash and dry
21	⇨ transport	Drive to the parking lot
22	∇ storage	Storage
23	⇨ transport	Customer walk to cashier desk
24	☐ inspection	Cashier search for the receipt
25	● operation	Print the receipt
26	● operation	Pay money
27	∇ storage	Go home

Figure 5-7: The propose Process Activity Mapping

The first thing the customer will do is pull over at the guard and asked for a mileage check service. Then drive directly to the garage and park on the jack. After getting out of the car, customer will be greeted by Service advisor and hand over the key to him. At this point, the customer is require to wait for ordering job print out. After receive the print out customer can either leave or wait for his/her car. Then mechanic will handle the job after receive the customer data print out. Upon inspecting the

level and quality of present oil, mechanic carried the needed oil (engine oil, brake oil, steering oil, battery and etc.) to the front side of the car. The car is then raised by the jack and mechanic does the changes. After the changes had been made, mechanic fills up the form for updated data and also does the inventory checks. Since the propose mileage check had put mechanic in charge of stock handling. Next is QC turn to inspect the finish job. If the work is completely done, the drive will take turn in washing the car. Instead of keeping the car in storage like use too, customer's car will be kept in the parking lot.

With a new propose of mileage check, customer can easily have their car back in a moment. After customer hands the ordering job prints out. Cashier search for customer data and print out the cost of maintenance. Instead of waiting for his/her car, customer can now have their car back right away after the payment, since his/her car is ready in the parking lot.

5.6 Data Collection and Analysis

The researcher was able to collect 5 data per month from the beginning of July 2004 to the end of September 2004. The total numbers of 15 jobs with the E230 cdi model are recorded. The following Table showed the summaries of different data collected each month. The sample and detail data are show in Appendix D-5 to D- 8.

PRESENT METHOD ☐	FLOW PROCESS CHART		PAGE 1/1
PROPOSED METHOD ☑		SUMMARY	NO.
☐		○ OPERATIONS	10
PRAT NAME: Auto		⇨ TRANSPORTATIONS	9
PROCESS DESCRIPTION: Mileage check		☐ INSPECTIONS	3
		D DELAYS	3
DEPARTMENT: Maintenance unit		▽ STORAGES	2
PLANT: Garage.		TOTAL STEPS	27
DATE: JULY 2004		DISTANCE TRAVELED (MEAN)	199 m
		TOTAL TIME (MEAN)	93 min

Step	Symbol	DESCRIPTION	Distance	Time
1	● ⇨ ☐ D ▽	Customer pull over/ask for mileage check	-	-
2	○ ⇨ ☐ ◗ ▽	Wait for routine card	-	1.6
3	○ ➡ ☐ D ▽	Drive to the garage	51.4	-
4	● ⇨ ☐ D ▽	Park the car	-	2.6
5	● ⇨ ☐ D ▽	SA greet customer and covering the seat	-	3
6	○ ➡ ☐ D ▽	Customer walk to sitting area	11.4	-
7	○ ⇨ ☐ ◗ ▽	Wait for the order print out	-	12.8
8	○ ➡ ☐ D ▽	Walk back to SA desk	-	-
9	● ⇨ ☐ D ▽	Receive the order print out	5.2	-
10	○ ⇨ ☐ ◗ ▽	Mechanic wait for the customer data print out	-	3.2
11	○ ➡ ☐ D ▽	Walk to the shelf	19	-
12	● ⇨ ☐ D ▽	Pick up tools	-	3.6
13	○ ➡ ☐ D ▽	Transport to customer car	-	-
14	○ ⇨ ■ D ▽	Inspect the level and quality of engine oil, break oil, etc	-	8.2
15	● ⇨ ☐ D ▽	Pick up engine oil, brake oil, and etc.	-	3.2
16	● ⇨ ☐ D ▽	Change engine oil, brake, and etc	-	28.4
17	● ⇨ ☐ D ▽	Fill in the form for the updated change	-	3.8
18	○ ⇨ ■ D ▽	QC check the finish job	-	5.6
19	○ ➡ ☐ D ▽	Driver drive to the washing area	40	-
20	● ⇨ ☐ D ▽	Wash and dry	-	9.6
21	○ ➡ ☐ D ▽	Drive to the parking lot	60.6	-
22	○ ⇨ ☐ D ▼	Storage	-	-
23	○ ➡ ☐ D ▽	Customer walk to cashier desk	-	-
24	○ ⇨ ■ D ▽	Cashier search for the receipt	-	2
25	● ⇨ ☐ D ▽	Print the receipt	-	3
26	● ⇨ ☐ D ▽	Pay money	-	5.2
27	○ ⇨ ☐ D ▼	Go home	-	-
		Total	199	95.8

Figure 5-8: Data collected during July 2004

FLOW PROCESS CHART

PRESENT METHOD ☐	PROPOSED METHOD ☑

PAGE 1/1

PRAT NAME: Auto

PROCESS DESCRIPTION: Mileage check

DEPARTMENT: Maintenance unit

PLANT: Garage.

DATE: AUGUST 2004

SUMMARY

		NO.
◯	OPERATIONS	10
⇨	TRANSPORTATIONS	9
☐	INSPECTIONS	3
D	DELAYS	3
▽	STORAGES	2
	TOTAL STEPS	27
	DISTANCE TRAVELED (MEAN)	207 m
	TOTAL TIME (MEAN)	96 min

Step	Symbol (filled)	DESCRIPTION	Distance	Time
1	Operation	Customer pull over/ask for mileage check	-	-
2	Delay	Wait for routine card	-	1.8
3	Transportation	Drive to the garage	52.6	-
4	Operation	Park the car	-	3.4
5	Operation	SA greet customer and covering the seat	-	3.2
6	Transportation	Customer walk to sitting area	11.4	-
7	Delay	Wait for the order print out	-	13.2
8	Transportation	Walk back to SA desk	11.4	-
9	Operation	Receive the order print out	-	-
10	Delay	Mechanic wait for the customer data print out	-	3.2
11	Transportation	Walk to the shelf	7	-
12	Operation	Pick up tools	-	3.6
13	Transportation	Transport to customer car	19.8	-
14	Inspection	Inspect the level and quality of engine oil, break oil, etc	-	8.2
15	Operation	Pick up engine oil, brake oil, and etc.	-	3.2
16	Operation	Change engine oil, brake, and etc	-	28.4
17	Operation	Fill in the form for the updated change	-	3.8
18	Inspection	QC check the finish job	-	5.6
19	Transportation	Driver drive to the washing area	43.4	-
20	Operation	Wash and dry	-	9.8
21	Transportation	Drive to the parking lot	61	-
22	Storage	Storage	-	-
23	Transportation	Customer walk to cashier desk	-	-
24	Inspection	Cashier search for the receipt	-	2.6
25	Operation	Print the receipt	-	2.8
26	Operation	Pay money	-	5.2
27	Storage	Go home	-	-
		total	206.6	98

Figure 5-9: Data collected during August 2004

FLOW PROCESS CHART

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PRESENT METHOD ☐
PROPOSED METHOD ☑
☐

PRAT NAME: Auto . .

PROCESS DESCRIPTION: Mileage check

DEPARTMENT: Maintenance unit

PLANT: Garage.

SEPTEMBER 2004

SUMMARY		NO.
O	OPERATIONS	10
⇨	TRANSPORTATIONS	9
☐	INSPECTIONS	3
D	DELAYS	3
▽	STORAGES	2
	TOTAL STEPS	27
	DISTANCE TRAVELED (MEAN)	205 m
	TOTAL TIME (MEAN)	90 min

Step	Symbol	DESCRIPTION	Distance	Time
1	● ⇨ ☐ D ▽	Customer pull over/ask for mileage check	-	-
2	O ⇨ ☐ ◗ ▽	Wait for routine card	-	1.6
3	O ➡ ☐ D ▽	Drive to the garage	53.2	-
4	● ⇨ ☐ D ▽	Park the car	-	2.4
5	● ⇨ ☐ D ▽	SA greet customer and covering the seat	-	2.8
6	O ➡ ☐ D ▽	Customer walk to sitting area	11	-
7	O ⇨ ☐ ◗ ▽	Wait for the order print out	-	11.6
8	O ➡ ☐ D ▽	Walk back to SA desk	11	-
9	● ⇨ ☐ D ▽	Receive the order print out	-	-
10	O ⇨ ☐ ◗ ▽	Mechanic wait for the customer data print out	-	3.4
11	O ➡ ☐ D ▽	Walk to the shelf	5.2	-
12	● ⇨ ☐ D ▽	Pick up tools	-	3.6
13	O ➡ ☐ D ▽	Transport to customer car	19.4	-
14	O ⇨ ■ D ▽	Inspect the level and quality of engine oil, break oil, etc	-	7.4
15	● ⇨ ☐ D ▽	Pick up engine oil, brake oil, and etc.	-	3.2
16	● ⇨ ☐ D ▽	Change engine oil, brake, and etc	-	27.6
17	● ⇨ ☐ D ▽	Fill in the form for the updated change	-	4
18	O ⇨ ■ D ▽	QC check the finish job	-	5.8
19	O ➡ ☐ D ▽	Driver drive to the washing area	42.2	-
20	● ⇨ ☐ D ▽	Wash and dry	-	9.2
21	O ➡ ☐ D ▽	Drive to the parking lot	62.4	-
22	O ⇨ ☐ D ▼	Storage	-	-
23	O ➡ ☐ D ▽	Customer walk to cashier desk	-	-
24	O ⇨ ■ D ▽	Cashier search for the receipt	-	2.2
25	● ⇨ ☐ D ▽	Print the receipt	-	2.6
26	● ⇨ ☐ D ▽	Pay money	-	5.2
27	O ⇨ ☐ D ▼	Go home	-	-
		Total	204.4	92.6

Figure 5-10: Data collected during September 2004

5.7 Result of Implementation

As the result of key area improvement, researcher then calculate and summaries **the** mean rating after the implementation in Figure 5-11.

FLOW PROCESS CHART

PRESENT METHOD ☐
PROPOSED METHOD ☑
☐

PRAT NAME: Auto .

PROCESS DESCRIPTION: Mileage check

DEPARTMENT: Maintenance unit
PLANT: Garage.
DATE: July-September 2004

PAGE 1/1

SUMMARY	NO.
○ OPERATIONS	10
⇨ TRANSPORTATIONS	9
☐ INSPECTIONS	3
D DELAYS	3
▽ STORAGES	2
TOTAL STEPS	27
DISTANCE TRAVELED (MEAN)	205 m
TOTAL TIME (MEAN)	90 min

Step	Symbol	DESCRIPTION	Distance	Time
1	● ⇨ ☐ D ▽	Customer pull over/ask for mileage check	-	-
2	○ ⇨ ☐ ■ ▽	Wait for routine card	-	1.7
3	○ ■ ☐ D ▽	Drive to the garage	52.4	-
4	● ⇨ ☐ D ▽	Park the car	-	2.8
5	● ⇨ ☐ D ▽	SA greet customer and covering the seat	-	3
6	○ ■ ☐ D ▽	Customer walk to sitting area	11.3	-
7	○ ⇨ ☐ ■ ▽	Wait for the order print out	-	12.5
8	○ ■ ☐ D ▽	Walk back to SA desk	11.3	-
9	● ⇨ ☐ D ▽	Receive the order print out	-	-
10	○ ⇨ ☐ ■ ▽	Mechanic wait for the customer data print out	-	3.3
11	○ ■ ☐ D ▽	Walk to the shelf	5.8	-
12	● ⇨ ☐ D ▽	Pick up tools	-	3.6
13	○ ■ ☐ D ▽	Transport to customer car	19.4	-
14	○ ⇨ ■ D ▽	Inspect the level and quality of engine oil, break oil, etc	-	7.9
15	● ⇨ ☐ D ▽	Pick up engine oil, brake oil, and etc.	-	3.2
16	● ⇨ ☐ D ▽	Change engine oil, brake, and etc	-	28.1
17	● ⇨ ☐ D ▽	Fill in the form for the updated change	-	3.9
18	○ ⇨ ■ D ▽	QC check the finish job	-	5.7
19	○ ■ ☐ D ▽	Driver drive to the washing area	41.9	-
20	● ⇨ ☐ D ▽	Wash and dry	-	9.5
21	○ ■ ☐ D ▽	Drive to the parking lot	61.3	-
22	○ ⇨ ☐ D ▼	Storage	-	-
23	○ ■ ☐ D ▽	Customer walk to cashier desk	-	-
24	○ ⇨ ■ D ▽	Cashier search for the receipt	-	2.3
25	● ⇨ ☐ D ▽	Print the receipt	-	2.8
26	● ⇨ ☐ D ▽	Pay money	-	5.2
27	○ ⇨ ☐ D ▼	Go home	-	-
		Total	203.3	95.5

Figure 5-11: The calculated mean rating collected during July 04 – September 04.

The number of steps has reduced from 42 steps to 27 steps, which the improvement is worked out to decrease at 36%. The number of distance needed in operation also has reduced from 293 meters to 203 meters, which the improvement is worked out to decrease at 31%. Moreover, the number of time needed for the operation has greatly reduced from 143 min to 96 min, which the improvement is worked out to decrease at 33%. Figure 5-12 below show the comparison between before and after the key area improvement.
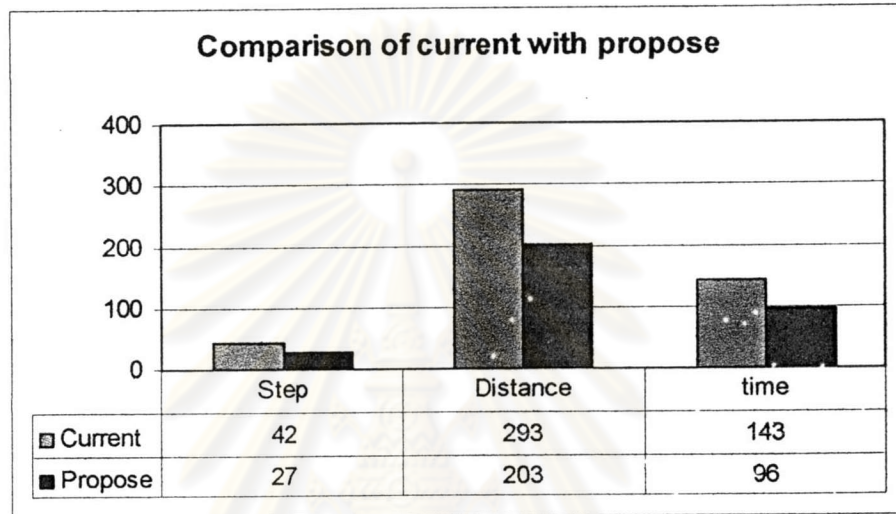
Comparison of current with propose

	Step	Distance	time
Current	42	293	143
Propose	27	203	96

Figure 5-12: Comparison between the current and the improved key area.

Moreover, the trend of both distance traveled and time used for mileage check process are varied in the same direction as below. Both Figures 5-13 and 5-14 showed the 20 different data collected from June 2004(before implementation) till the end of September 2004. These figure show the satisfactory trend for the improvement of both distance and time used in mileage check
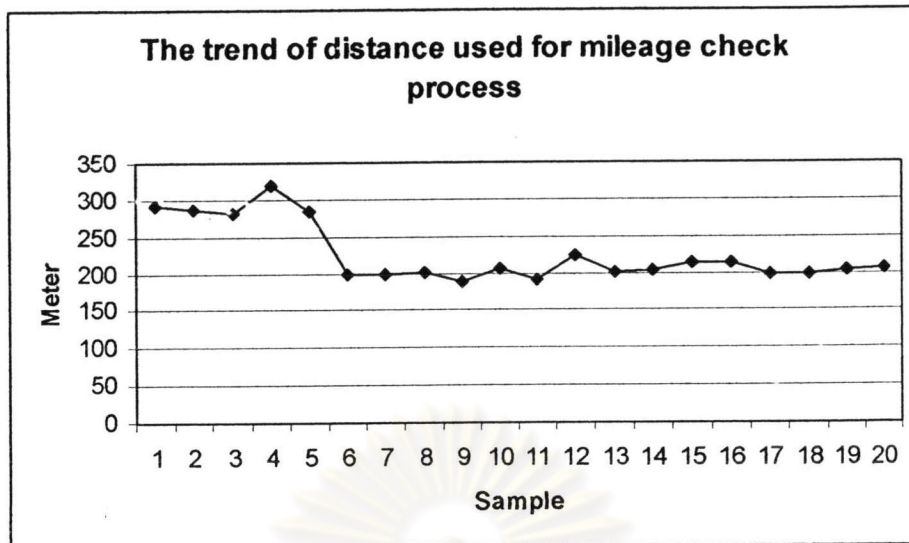
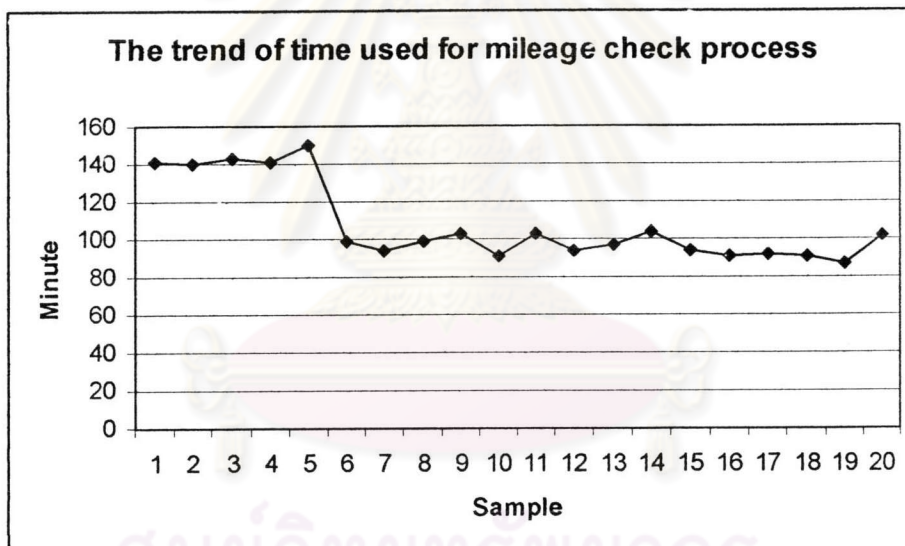**Figure 5-13:** Trend of distance traveled by mileage check

Figure 5-14: Trend of time used by mileage check

Based on the acquiring data, the goal at this phase, which is to improve the quality and performance of the key area, is achieved. However, the trend of time used still varied greatly as show in figure. In order to understand this varied, the research has conducted a Cause and Effect diagram as shown in Figure 5-15.