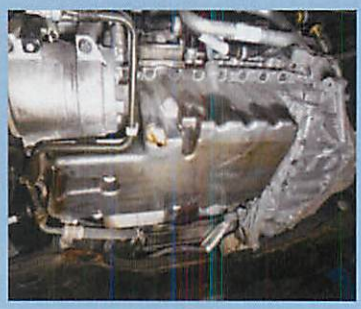
Manual for Underbody Inspection

The name of part	
Engine	

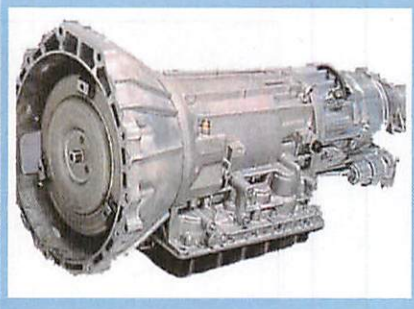
Inspection method and standards for judgment

C. inspection method

D. standard for judging

Check 1	check engines for leaks in the inspection pit	
A	Check for the seal of oil pan	
A	Check for attachment of oil filter	
A	Check for oil drain bolt	
A	Check for joint part of engine / transmission	
B	It is dry	Pass
B	Oil runs	Pass
B	Oil is dripping	Fail (1)
A	Check if the engine starts properly	
B	Starts without difficulty	Pass
B	Some problem in starting	Fail (1)

Manual for Underbody Inspection

The name of part	
Gearbox & differential	

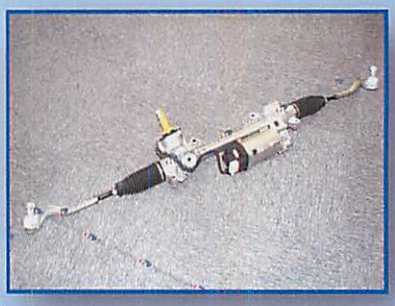
Inspection method and standards for judgment

C. inspection method

D. standard for judging

Check 1 check for oil leaks in the inspection pit		
B	It is dry	Pass
B	Oil runs	Pass
B	Oil is dripping	Fail (1)

Manual for Underbody Inspection

The name of part	
Steering gearbox	

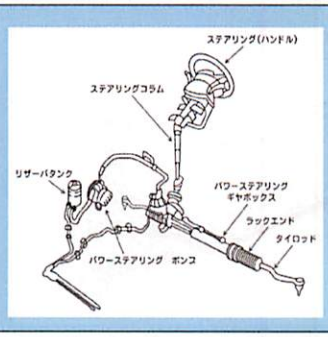
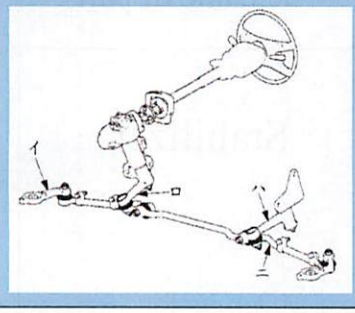
Inspection method and standards for judgment

C. inspection method

D. standard for judging

Check 1 check for oil leaks		
B	It is dry	Pass
B	Oil runs	Pass
B	Oil is dripping	Fail (1)

Manual for Underbody Inspection

The name of part	
Steering	 

Inspection method and standards for judgment

C. inspection method

D. standard for judging

Check 1 check each ball joint for looseness

A	check the joint for looseness by shaking with hands	
B	The joint is solid and rattle-free	Pass
B	there is play of more than 2 mm	Fail (1)

(Tips)

■It is recommended to check ball joints for looseness by turning the handle from side to side because you cannot judge the status only by looking at

Check 2 check each rod and arm for bent state

B	Not bent nor damaged	Pass
B	Bent or damaged	Fail (1)

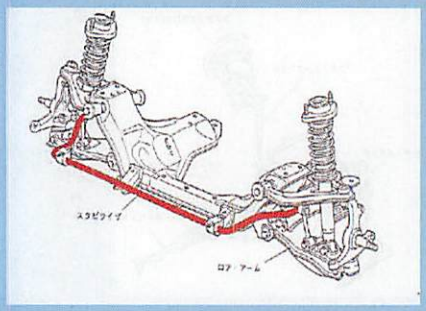
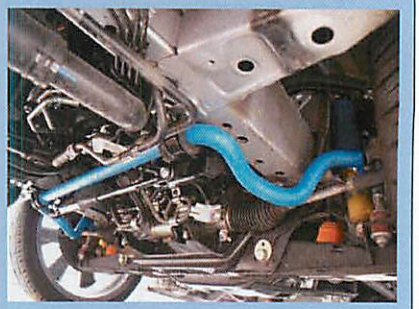
Check 3 check dust boots for damage

B	No damage	Pass
B	A dust boot is torn	Fail (1) →

(Suggestion on change to the name of inspection item)

■It is suggested to cover not only steering ball joint part but the whole steering unit.

Manual for Underbody Inspection

The name of part		
Stabilizer		

Inspection method and standards for judgment

C. inspection method

D. standard for judging

Check 1 check nuts of mount part for looseness

A	Visually check for looseness	
B	Nuts are tightened properly	Pass
	If nuts are not tightened properly, go to the next.	
A	Check for looseness with a hammer tap with a hammer more than half of the nuts	
B	You hear a metallic sound when tapped	Pass
B	You hear a dull sound when tapped	Fail (1)
A	Check all the nuts	
B	Some nuts drop out from the stabilizer	Fail (2)

Check 2 check locking part of bushes for looseness

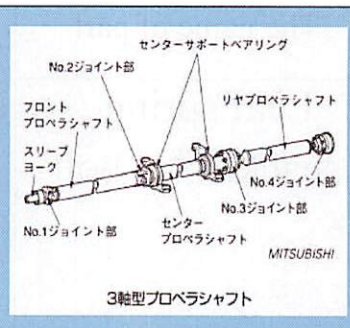
A	Check the locking part for looseness by shaking with hands	
B	The part is solid and rattle-free	Pass
B	There is backlash (play)	Pass
B	There are no bushes	Fail (1)

(Tips)

■Some passenger vehicles are equipped with stabilizer at the rear too

■Some trucks are not equipped with stylizer

Manual for Underbody Inspection

The name of part	
Propeller shaft / joint	 3軸型プロペラシャフト

Inspection method and standards for judgment

C. inspection method

D. standard for judging

Check 1 check joint bolt for looseness

A	Visually check for looseness	
B	Tightened properly	Pass
B	Not tightened properly	
A	Check for looseness with a hammer tap with a hammer more than half of the nuts of bolts of each joint	
B	You hear a metallic sound when tapped	Pass
B	You hear a dull sound when tapped	Fail (1)
A	Check all the bolts	
B	Some bolts drop out from the stabilizer	Fail (2)

Check 2 check joint and center support bearing for looseness

A	Check visually if nuts are loose or not	
B	Nuts are tightened properly	Pass
B	Nuts are not tightened properly	Fail (1)

Check 3 check splines for looseness

A	Check for looseness by shaking with hands	
B	Backlash is less than 5mm	Pass
B	Backlash is more than 6mm	Fail (1)

Check 4 check propeller shaft for bent state

B	Bent	Pass
B	Not bent	Fail (1)

New standard to be considered in the future: standard for the direction of yoke

Manual for Underbody Inspection

The name of part	
Leaf spring / shackle / U bolt	

Inspection method and standards for judgment

C. inspection method

D. standard for judging

Check 1 check leaf spring for damage

B	No damages	Pass
B	Damaged / broken	Fail (2)

Check 2 check U bolt for looseness

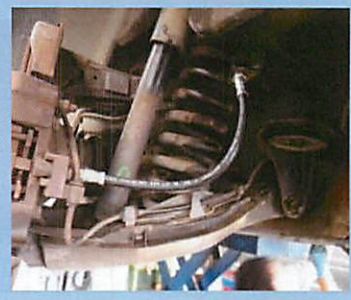
A	Check nuts for looseness with a hammer	
B	Tightened properly	Pass
B	Nuts are loose	Fail (1)

Check 3 check shackle and bush for looseness

A	Check nuts for looseness with a hammer	
B	Tightened properly	Pass
B	Nuts are loose	Fail (1)
A	Check shackle for looseness by shaking with hands	
B	The part is solid and rattle-free	Pass
B	There is backlash	Fail (1)

New standard to be considered in the future : standard for the legal limit on adding leaves for overloading

Manual for Underbody Inspection

The name of part	
Brake pipe / hose	

Inspection method and standards for judgment
C. inspection method
D. standard for judging

Check 1 check brake pipes / hoses for damage

A	Check brake hoses for damage	
B	No cracks or there are no cracks which expose cord layer	Pass
B	Cord layer is exposed due to a crack	Fail (1)
A	Check brake pipes for damage	
B	No pipes are collapsed	Pass
B	A pipe is collapsed	Fail (1)

Check 2 check pipes and hoses for oil leaks

B	No leaks	Pass
B	Oil is leaking	Fail (2)

Check 3 check pipes and hoses for air leaks

A	Get the applicant (vehicle owner) press the brake pedal	
B	No leaks	Pass
B	Air is leaking	Fail (2)

Check 4 check for clips of hoses

B	Fixed properly	Pass
B	Not fixed properly	Fail (1)

New standard to be considered in the future: standard for the amount of liquid in reservoir tanks

Manual for Underbody Inspection

The name of part		
Shock absorber		

Inspection method and standards for judgment

C. inspection method

D. standard for judging

Check 1 check shock absorber for fixed condition

A	Check shock absorber bolts for looseness with a hammer	
B	The part is solid and rattle-free	Pass
B	There are not nuts	Fail (2)
B	There is backlash	Fail (1)
A	Check the shock absorber for looseness by shaking with hands	
B	Only rubber bushes (buffers) are loose, other parts are fixed properly	Fail (1)
B	There are no rubber bushes (buffers)	Fail (1)

Check 2 check shock absorber for oil leaks

B	No leaks	Pass
B	Oil is leaking	Fail (1) →

Check 3 check dust boots for damage

B	No damage	Pass
B	Dust boots are torn or broken	Fail (1) →

Manual for Underbody Inspection

The name of part	
Fuel pipe	

Inspection method and standards for judgment
E. inspection method
F. standard for judging

Check 1 check fuel pipe for fuel leaks

A	Check from engine to fuel tank for leaks	
B	No leaks	Pass
B	Fuel is leaking from fittings	Fail (1)
B	Fuel is leaking from pipe	Fail (2)

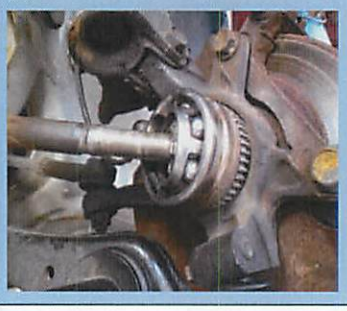
Check 2 check fuel tank for fixed condition

B	The tank is fixed to the body firmly	Pass
B	There is backlash (play)	Fail (1)

Check 3 check for the lid of fuel tank filler neck

B	The lid is closed and there is no leaks	Pass
B	Dust boots are torn or broken	Fail (1)

Manual for Underbody Inspection

The name of part		
Drive Shaft		

Inspection method and standards for judgment

G. inspection method

H. standard for judging

Check 1 check drive shaft for looseness

A	Check the shaft for looseness by shaking with hands	
B	The shaft is solid and rattle-free	Pass
B	There is play of around 2 to 3 mm	Pass
B	There is play of more than 5 mm	Fail (1)

Check 2 check bolts of constant-velocity joint for looseness

A	Check for looseness with a hammer	
B	Bolts are tightened firmly	Pass
B	Bolts are loose	Fail (1)
B	Bolts and nuts are missing	Fail (2)

Check 3 check dust boots for damage

B	No damage	Pass
B	Damaged	Fail (1)

(Tips)

■For vehicles that use cross joint for drive shaft, an inspection similar to inspection for propeller shaft is needed.

Manual for Underbody Inspection

The name of part	
Exhaust pipe / silencer	

Inspection method and standards for judgment

I. inspection method

J. standard for judging

Check 1 check exhaust pipe for exhaust gas leaks

A	Check with the engine running	
B	No gas leaks	Pass
B	Exhaust gas is leaking from fittings	Fail (1)
B	Exhaust gas is leaking from holes due to rust	Fail (2)

Check 2 check if there is silencer

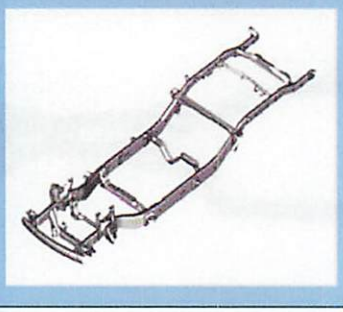
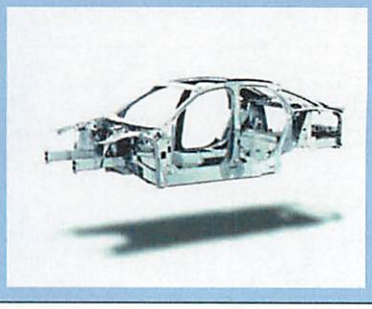
B	Equipped with silencer	Pass
B	Replaced by a sports muffler	Fail (1)
B	Silencer has been taken out	Fail (2)

Check 3 check if there are hangers

B	Exhaust pipe / silencer are fixed properly	Pass
B	Hangers are missing	Fail (1)

New standard to be considered in the future: introduction of rules for proximity exhaust noise

Manual for Underbody Inspection

The name of part	
Frame / body	 

Inspection method and standards for judgment

K. inspection method

L. standard for judging

Check 1 check frame for cracks / damages

A	Visually check for the whole frame	
B	No cracks / damages	Pass
B	There are cracks / damages in side members	Fail (2)
B	There are cracks / damages in cross members	Fail (1)

Check 2 check body for cracks / damages

A	Visually check for the whole body	
B	No cracks / damages	Pass
B	There are cracks / damages	Fail (1)

Check 3 check frame and body for corrosions

A	Visually check for the whole frame and body	
B	No corrosions	Pass
B	The part that are not that important in terms of body strength is corroded severely.	Fail (1)
B	There are corrosions that may have some effect on body strength	Fail (2)

3.2. CHECK LIST FOR VISUAL INSPECTION

The users of the check list are inspectors. Inspectors are required to record the results of inspections on the check sheet each time when they inspect a vehicle. Inspection centers keep the sheets.

MPWT are to check if inspectors use the check list properly. Every quarterly, 30 check sheets are selected randomly from each inspection center and are checked against the data on the system.

MPWT can check more sheets or anytime whenever the need arises. MPWT also can check if inspectors use the check sheet properly by visiting inspection centers whenever the need arises.

Date
Bill Number Vehicle Plate Number

Check list for Appearance Inspection

	pass	fail			
wiper	☐	2 ☐	one or all does not function		
		1 ☐	a gap between the wiper and the glass		
		2 ☐	lens are broken		
windshield	☐	1 ☐	scratch >= 5 cm	1 ☐	crack >= 10 cm
		2 ☐	a lot of cracks >= 10 cm		
seat-belt	☐	1 ☐	One of front seats has no seat-belt	2 ☐	No seat-belt for front seasts
		1 ☐	not fixed to the body or the seat	1 ☐	cannot be buckled
		1 ☐	belt is damaged		
door/	☐	2 ☐	door opens without using doorknob		
door hinge		1 ☐	loose hinge	1 ☐	door opens when locked
driver seat /	☐	1 ☐	one of seats is not fixed	2 ☐	No seats is fixed
front seat		1 ☐	seats > riding capacity	1 ☐	seats < riding capacity
tire	☐	2 ☐	the largest crack > 4 cm	1 ☐	a bulge or some bulges
		1 ☐	the depth < the standard value	1 ☐	worn not uniformly
wheel nut /	☐	1 ☐	a missing bolt for tires with 6 or more bolts		
hub bolt		2 ☐	more than one missing bolts for tires with 6 or more bolts		
		2 ☐	a missing bolt for tires with 5 bolts or less		
		1 ☐	dull sound when tapped		
Side Guard	☐	2 ☐	not set	1 ☐	wrong size
		1 ☐	weak in the joints	1 ☐	wrong color or not coated.
turn signal	☐	1 ☐	one of side signals not blink	2 ☐	both sides not blink
		1 ☐	lens are broken	1 ☐	white in color
		1 ☐	blinks < 60/m or > 120/m		
brake lump	☐	1 ☐	one of side lumps not blink	2 ☐	no lump blinks
		2 ☐	lens are broken	1 ☐	other colors than red
		1 ☐	brake lumps as bright as rear lumps	1 ☐	rear lumps go out

Check list for Underbody Inspection

	pass	fail		
Radiator	☐	1 ☐	clearly leaking	
engine	☐	1 ☐	oil is dripping	1 ☐ some problem in starting
gearbox & differential	☐	1 ☐	oil is dripping	
steering gearbox	☐	1 ☐	oil is dripping	
steering	☐	1 ☐	play > 2 mm	1 ☐ bent or damaged
		1 ☐	a dust boot is torn	
stabilizer	☐	1 ☐	dull sound when tapped	2 ☐ nuts drop out from the stabilizer
		1 ☐	no bushes	
propeller shaft/ joint	☐	1 ☐	dull sound when tapped	2 ☐ bolts drop out from the stabilizer
		1 ☐	backlash > 3mm (joint and center support bearing)	
		1 ☐	backlash > 6mm (splines)	1 ☐ bent (propeller shaft)
leaf spring/ shackle/U bolt	☐	2 ☐	damaged / broken (spring)	1 ☐ loose U bolt nuts
		1 ☐	loose shackle or bush nuts	1 ☐ backlash (shackle / bush)
brake pipe/ hose	☐	1 ☐	cord layer is exposed	1 ☐ collapesed
		2 ☐	oil is leaking	2 ☐ air is leaking
		1 ☐	not fixed properly (clips of hoses)	
shock absorber	☐	2 ☐	no nuts	1 ☐ backlash
		1 ☐	rubber bushes (buffers) are loose	1 ☐ no rubber bushes (buffers)
		1 ☐	oil is leaking	1 ☐ dust boots are torn / broken
fuel pipe	☐	1 ☐	fuel leaking from fittings	2 ☐ fuel leaking from pipe
		1 ☐	backlash (play)	1 ☐ possibility of fuel leaking
drive shaft	☐	1 ☐	play > 5 mm	1 ☐ bolts are loose
		2 ☐	bolts and nuts are missing	1 ☐ damaged (dust boots)
exhaust pipe/ silencer	☐	1 ☐	gas leaking from fittings	2 ☐ gas leaking from holes
		1 ☐	sports muffler	2 ☐ silencer taken out
		1 ☐	hangers are missing	
frame / body	☐	2 ☐	cracks/damages in side	1 ☐ cracks/damages in cross
		1 ☐	cracks/damages (body)	
		1 ☐	corrosions in not important part	2 ☐ corrosions in important part

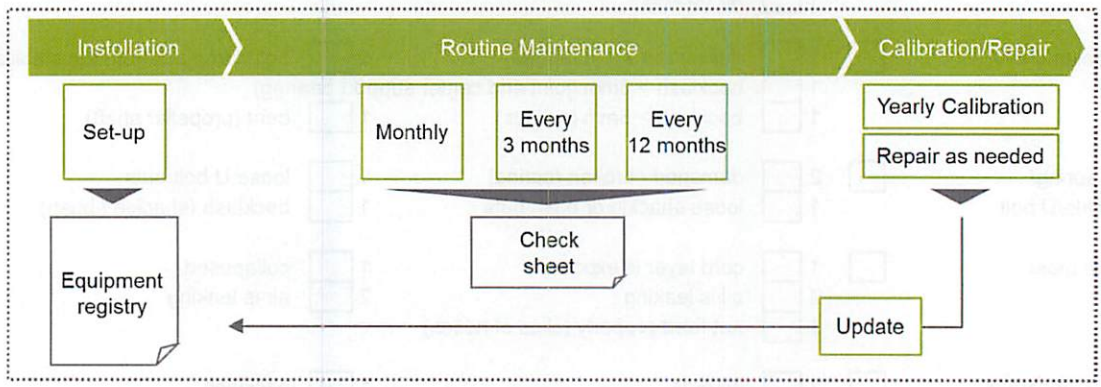
4. MAINTENANCE AND CALIBRATION OF INSPECTION EQUIPMENT

Inspection equipment is required to meet the technical standards, and be maintained to ensure conformity to the standards. This chapter illustrates how the equipment should be managed after its installation. The figure below gives overall procedures.

First, the basic information of equipment is to be registered with the registry (4.1).

Maintenance staff at inspection centers must do routine maintenance of equipment every one, three or twelve months, according to the manual (4.2). After doing maintenance, centers keep a simple log using the check sheets (4.3).

When centers conduct calibration of equipment or repair equipment, centers need to update the registry of the equipment (4.1).



4.1. INSPECTION EQUIPMENT REGISTRY

General Information of Equipment

Name of Equipment	
Manufacturer	
Manufacturing number	
Installation date(*)	
Registration date	

(*)In cases where the equipment was installed already and installation date is not clear, fill in information as much as possible such as the year of installation

Calibration / Repair log

Calibration / Repair log			Person in charge of maintenance	MPWT (for calibration)
Date	Activities	By whom		

4.2. MAINTENANCE AND CALIBRATION MANUAL FOR INSPECTION EQUIPMENT

Side Slip Tester

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
	1. check if the slide plate moves smoothly 2. check if the slide plate returns to the original position when you move the plate	1. Remove the slide plate of the tester and check each part for wear, play, looseness, deformation and rust 2. Perform in-house calibration with a calibration equipment 3. Lubricate moving parts	

Headlight Tester

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
	1. Clean the dirt off the light receiving part 2. check tester rail for horizontal level 3. check wheels for looseness 4. Lubricate wheels	1. perform in-house calibration with a calibration equipment 2. Check the rail for distortion	1. Get calibration equipment checked by manufacturer every three years 2. the accuracy level that the calibration equipment has to meet complies with the standard set by manufacturer

Speedometer Tester

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
	1. check for the zero point 2. Lubricate the wheel bearings 3. check the gearbox for the quantity of oil 4. Lubricate gears 5. check the lift for oil leaks	1. perform in-house calibration with a calibration equipment	1. Get luminous device checked by manufacturer every three years 2. the accuracy level that the inspection equipment has to meet complies with the standard set by manufacturer

Brake Tester

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
	1. check for the zero point 2. Lubricate the wheel bearings 3. check the gearbox for the quantity of oil 4. Lubricate gears 5. check the lift for oil leaks	1. check V belt for tension 2. perform in-house calibration with a calibration equipment 3. perform in-house calibration on weight scale	1. Get the scale checked by manufacturer every three years 2. the accuracy level that the inspection equipment has to meet complies with the standard set by manufacturer

CO・HC Tester

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
1. Perform in-house calibration with zero gas and span gas 2. Clean gas inlet pipe			1. Get tester checked by manufacturer every three years 2. the accuracy level that the tester has to meet complies with the standard set by manufacturer

Diesel Smoke Tester

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
1. Clean gas inlet pipe	1. perform in-house calibration with a standard filter paper	1. perform in-house calibration with a calibration equipment	1. Get tester checked by manufacturer every three years 2. the accuracy level that the tester has to meet complies with the standard set by manufacturer

Opacimeter

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
1. Clean the chamber of detection unit 2. Clean gas inlet pipe		1. perform in-house calibration with a calibration equipment	1. Get the opacimeter checked by manufacturer every five years 2. the accuracy level that the opacimeter has to meet complies with the standard set by manufacturer

Sound Level Meter

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
	1. check for zero point	1. perform in-house calibration with a calibration equipment	1. Get the meter checked by manufacturer every five years 2. the accuracy level that the meter has to meet complies with the standard set by manufacturer

Weight Scale

Monthly Maintenance Checkup	3 Month Maintenance Checkup	12-Month Maintenance Checkup	Maintenance of Calibration Equipment
		1. perform in-house calibration on weight scale	1. Get the scale checked by manufacturer every five years 2. the accuracy level that the scale has to meet complies with the standard set by manufacturer

4.3. CHECKLIST OF INSPECTION EQUIPMENT MAINTENANCE

Equipment	timing	Points to check	1	2	3	4	5	6	7	8	9	10	11	12
Side Slip Tester	3 month	Checking smoothness of side plate												
		Side plate returning to original position												
	12 month	Removing slide plate and checking each part												
		Calibration with calibration equipment												
		Lubricating moving parts												
Headlight tester	3 month	Cleaning dirt off light receiving part												
		Tester rail for horizontal level												
		Wheels for looseness												
		Lubricating wheel												
	12 month	Calibration with calibration equipment												
		Checking rail for distortion												

✓ : Good A : Adjusted T : Tightened R : Replaced C : Cleaned L : Lubricated

Equipment	timing	Points to check	1	2	3	4	5	6	7	8	9	10	11	12
Speedometer Tester	3 month	Checking for zero point												
		Lubricating wheel bearing												
		Gearbox for quantity of oil												
		Lubricating gears												
		Lifting for oil leak												
	12 month	Calibration with calibration equipment												
Brake Tester	3 month	Checking for zero point												
		Lubricating wheel bearings												
		Gearbox for quantity of oil												
		Lubricating gears												
		Lifting for oil leak												

✓ : Good A : Adjusted T : Tightened R : Replaced C : Cleaned L : Lubricated

Equipment	timing	Points to check	1	2	3	4	5	6	7	8	9	10	11	12
Brake Tester	12 month	Checking V belt for tension												
		Calibration with calibration equipment												
		Calibration on weight scale												
CO/HO Tester	Monthly	Calibration with zero gas and span gas												
		Cleaning gas inlet pipe												
Diesel Smoke Tester	Monthly	Cleaning gas inlet pipe												
	3 month	Calibration with standard filter paper												
	12 month	Calibration with calibration equipment												

✓ : Good A : Adjusted T : Tightened R : Replaced C : Cleaned L : Lubricated

5. MONITORING OF INSPECTION CENTERS

Inspection centers are required to follow this guidelines and relevant regulations. When any violation against them is confirmed at an inspection center, penalty points (5.1) are to be added to the center (5.2). That way, violation situations at each center are visualized with the points. Here, the purpose is not to penalize inspection centers that violate the regulations but to clarify and improve the violation situations.

5.1. PENALTY POINTS TABLE

When a violation is confirmed, identify item that apply and decide penalty points to be added according to the table below.

Category	Item	Description	Point
Facilities of centers	non-conforming facilities	Facilities do not follow the requirements (per case)	6
Inspectors	Violation of Appointment of inspectors	The number of inspectors appointed is less than the defined number	15
		False information on the appointment of inspectors	15
		Appointment of inspectors are not submitted	3
Inspection	Inspectors	Inspection is carried out / inspection certificate is issued by someone who are not registered at the center	6
		Inspectors carry out their job beyond the scope of authority	3
	Check list	Inspections are carried out without using the check list (per case)	3
		Inspections are carried out with improper usage of the check list (per case)	1
Maintenance of Equipment	Calibration of inspection equipment	Calibration for a piece of equipment is not conducted.	6
	Maintenance of	Maintenance for a piece of equipment	3

	inspection equipment	is not conducted.	
	Maintenance of calibration equipment	Maintenance for a piece of calibration equipment is not conducted.	3
	Recording	Failed to record of results of maintenance or calibration (per item)	1
		False recording	15

5.2. FORMAT FOR MONITORING VIOLATION

Name of Company:

Name of Inspection Center:

Date	Item	Points	Total	Signature	
				Center	MPWT

Appendix4

IT Roadmap

No. 5-2

Empower MPWT

The IT Roadmap 2019

The Department of Information Technology and Public Relations

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Executive Summary

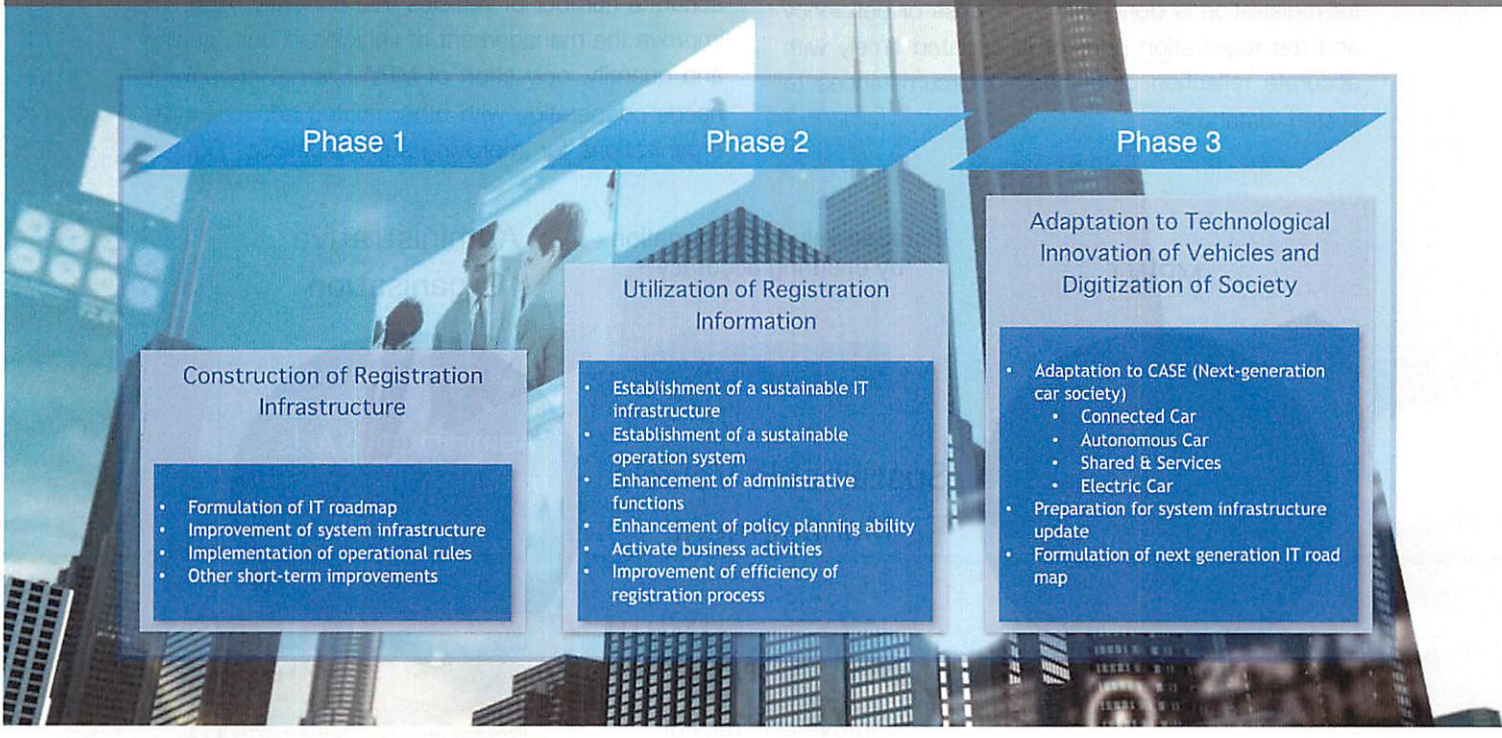
The Department of Information Technology and Public Relations (IT&PR department) of Ministry of Public Works and Transport (MPWT) has achieved numerous reforms since its inception in 2016. In 2017, the department won the best in the public sectors of the IT contest in Cambodia that allows expectation for promising growth and changes keeps continue.

The IT & PR department was established in 2016 and plays an important role of managing all IT systems in the MPWT. Among those IT systems, this report deals with those related to vehicle management. Vehicle management is very important for people's livelihood and it is possible to reduce traffic congestion and improve environmental problems by appropriately performing management.

Currently, the department is focusing on improvement on an IT system for vehicle management. As it is shown in this roadmap, reforms are planned to be implemented in three phases. The first phase begins in 2016, in which building a foundation to properly managing vehicles is an urgent need. The server was reinforced since the processing capacity of the sever is low which affected to efficiency of vehicle management. Moreover, other measures were also implemented, such as formulating operational rules to strengthen the organization.

The second phase is from 2019 with further strengthening of the IT system will be implemented so that information on registered vehicles can be utilized more effectively. By this, we believe that it will enrich every individual and organization in vehicle society.

For the third phase, all updates to adapt to the new car society will be addressed. As various technologies are born one after another in the world with rapid changes, we promise to keep up with the flow of these world's technologies.



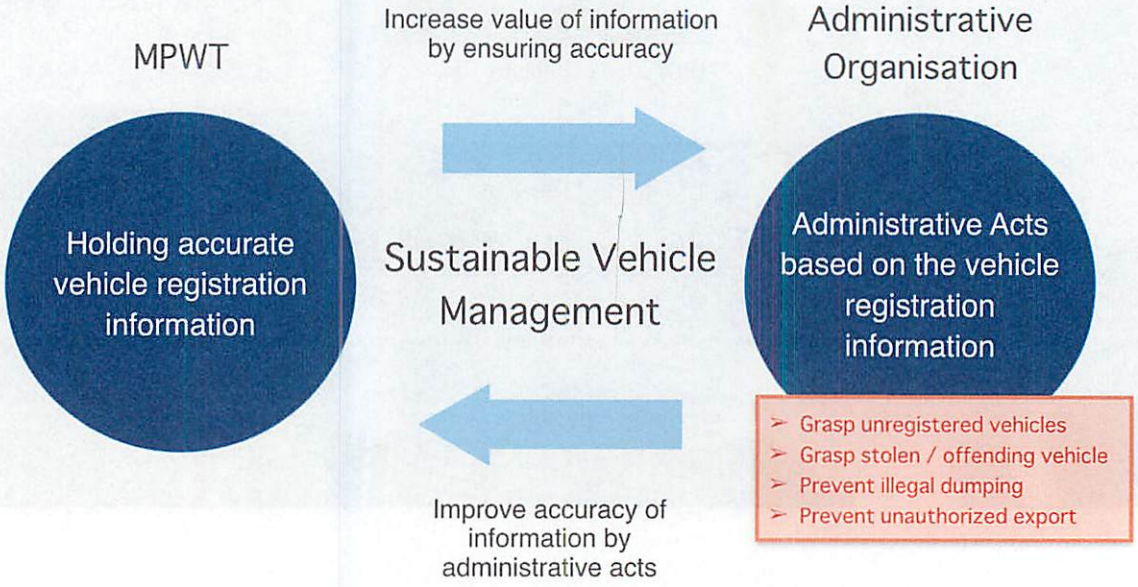
Introduction

Basic Concept

The population increase and economic growth in ASEAN developing countries has led rapid urbanization and motorization, which cause the massive increase in number of vehicle along with social issues, and Cambodia is not an exception. In order to develop sound public accessibility sustainably while preventing the scale of these problems from increasing, it is necessary for administrative organizations to work intimately together.

The below figures shows the basic flow for securing the accuracy of vehicle registration information. Vehicle registration information is based on the premise that necessary formalities have been fulfilled. In other words, it is integral that the application for registration is done without excess or deficiency and the registration content is updated timely with accurate reflection of ownership circumstances to system database.

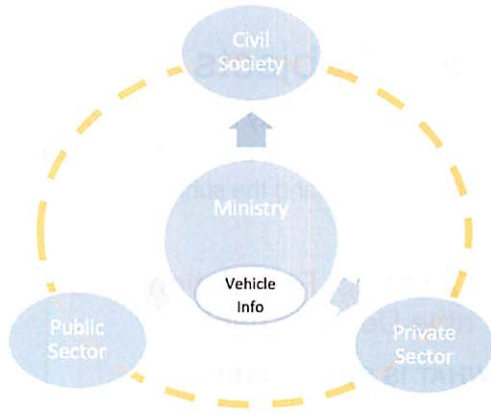
However, in Cambodia, although new registration made by dealers are mostly conducted, there are also cases that application for changes in the name/ location of car owners, or application for disuse of the car are necessary, but those procedures does not exist which makes MPWT hardly estimates the accurate number of vehicles that currently used. To improve the management of vehicles in both quality and quantity, only effort of MPWT is not enough; it needs cooperation with other related administrative organizations for improving such situations. Figures



shows the interrelationship between accuracy of vehicle registration information with the cooperation from other administrative organization: accurate vehicle registration information improves the effectiveness in administrative acts of other administrative organizations. In the other hands, adopting the results of those administrative acts increases the accuracy of vehicle registration. It is required to maintain this cycle in order to establish sustainable vehicle management administration.

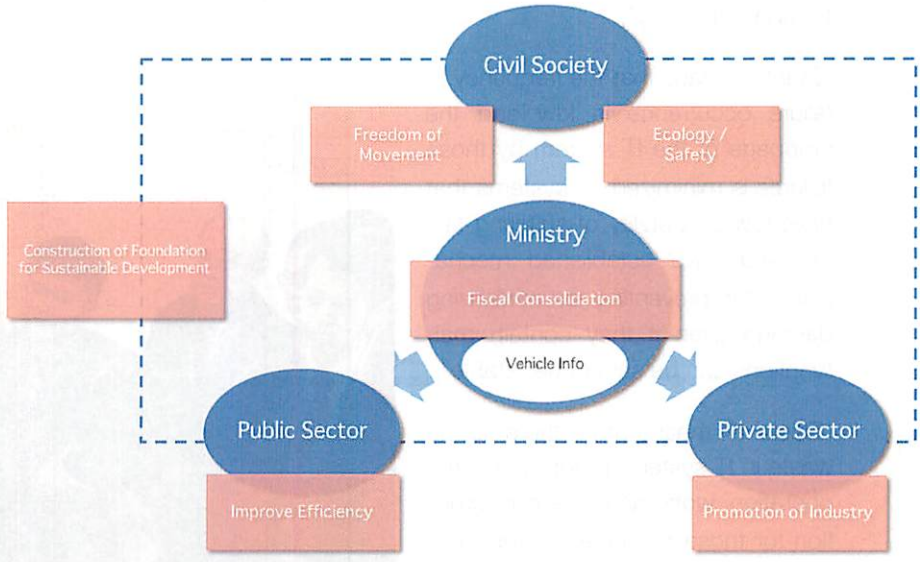
Furthermore, to have these effectiveness of this mechanism be more sustainable, efforts coming from only perspective of public sectors without deep understandings of the citizen are not enough since the citizen is the main subject who performs vehicle registration application. It will be a one-sided impression from the administration that will not lead to an essential improvement. In addition, since nowadays citizen lifestyles and work-styles are diversified, it is difficult to provide adequate administrative services for all needs. In order to cope with such issues, the "collaboration" is required. The collaboration between public sectors and private sectors and the collaboration between public sectors and third sectors will combine the strength of each sector that can be made to eliminate inefficiencies and create a big impact. Many stakeholders, such as car manufacturers, car dealers, insurance companies and agency businesses exist in the process of vehicle registration applications. Create an environment where all stakeholders function organically is substantial in consideration of sustainability. For that reason, it is important to consider comprehensive measures by looking attentively which private sector is the subject of the vehicle registration and which private sector is mostly involved in registration flow as one ecosystem.

As social demands, the figure



required for IT system that handles vehicle registration information (hereinafter referred to as a vehicle registration system) is shown below. The blue circle in the figure indicates major stakeholders in vehicle management administration.

As mentioned above, wide variety of players exist in vehicle registration. In order to abstract their relationships and to show the path to solution, they are classified into 4 groups in this report. "Competent authority" which controls the vehicle registration system in the center of the figure, while the stakeholders is expressed by "public sector", "private sector" and "civil society (third sector)" with arrows expressing their relationship. The red part in the figure describes priority subjects assumed in each stakeholder. It is stated to clarify the issues of each stakeholder and will be mentioned in next section.



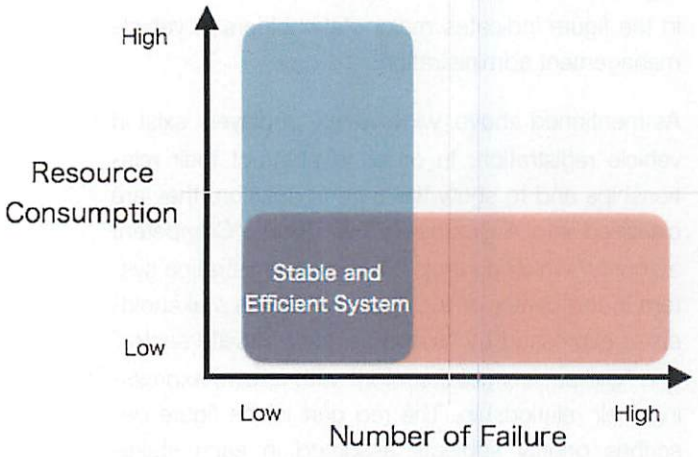
Priority Subjects

In this section, six priority subjects which is momentous and essential to realize sustainable vehicle management administration, will be described. Again, it is important to consider for measures to solve the issues for each stakeholders, and the subjects describes in this section are the one that is needed to work on as priority.

I. Construct Foundation for Sustainable Development

✦ WHAT IS SUSTAINABLE?

The goal of this roadmap is to realize the sustainable development in the Kingdom of Cambodia. The sustainability in the IT system can be measured from two aspects, "stability" and "efficiency".



"Stable" means that the frequency of failure occurrence is low and the stoppage of the IT system by those failures is minimized. IT systems that have low probability of suffering failure and have established mechanisms for preventing or minimizing damage even if they contain malfunctions can be said to be "stable".

"Efficient" means that there is no waste in IT system design and in the operation work and the consumption for those resources is kept to a minimum. A mechanism to cut down operation cost for long-time running IT system is essential. In addition, possibility of mistakes happening in a long-time working process will increase. Therefore, not only "efficiency" but also "stability" is required to maintain the sustainability of IT systems.

✦FIVE SHORT-TERM IMPROVEMENT

Five short-term improvement have already been implemented from 2016. In order to realize sustainable development of Cambodia, policies based on a long-term perspective are necessary, but it takes time to improve from the bottom and for such problems that is currently faced. Hence, after conducting an analysis on the current situation, below five short-term improvements have been chosen to be implemented.

1. Interface Specifications for Information Sharing With Relevant Organizations

To solve the social problems surrounding Cambodia, it is insufficient to only consider counter-

measures within MPWT without cooperation with other ministries and agencies, such as Department of Traffic Police and Public Order, General Department of Identification, General Department of Customs and Excise, General Department of Taxation, as well.

In 2017, the interface specification for information sharing that is needed in Cambodia has proposed by JICA team. The interface specification is made to have concrete discussions with other relative organizations, and it shows the phase, the technical method, and the organization in charge of development. The development of new IT system for information sharing will be implemented based on the agreement of MPWT in December.

2. Security Diagnosis

In December 2016, MPWT officially requested to JICA team for an implementation of a security diagnosis and the requirement was approved. The security diagnosis consists of two types of test, web application test which has made in the early 2018 and platform test, which will be conducted in the late 2018.

3. Operational Rules for Online Application System

The vehicle registration system had been released in 2017. However, inquiries are rushing from nationwide registration offices, and the General Department of Land Transportation (GDLT) has not secured organizational system that is possible to respond them. In addition, in 2017, Department of IT&PR was newly established in MPWT, and they oversee all operations related to IT system within MPWT. However, knowledge of GDLT is indispensable for inquiries concerning vehicle registration and vehicle inspection. Therefore, it is obvious that organizing the appropriate organizational structure according to the actual operation and presenting operational rules for those organizations is necessary. In view of the above, the operational rules had been made.

4. IT Infrastructure Requirements

Study to construct a new system infrastructure is underway in the MPWT. However, the overall budget strategy and the details of necessary equipment have not been considered yet. Since the IT systems under MPWT are very important as a social infrastructure and high non-functional requirements are required, a survey was conducted and summarized as a report.

5. Additional Servers and Middleware

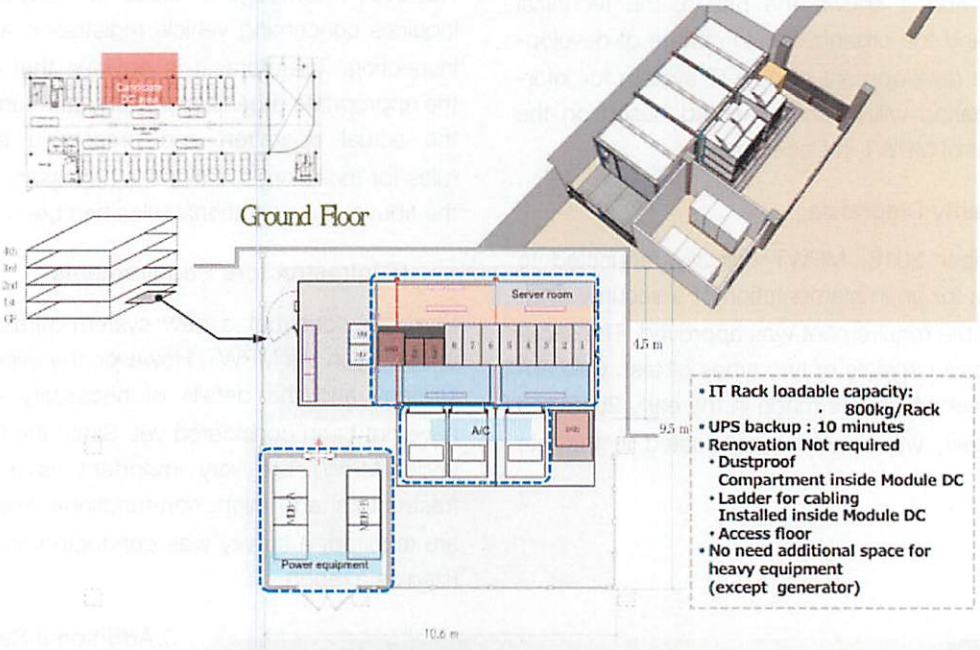
The reform of datacenter is needed from the perspective of long-term improvement. However, the datacenter is urgently needed to deal with the problems that currently faced so the JICA team chose to support introducing equipment. In addition, JICA team is planning to develop the application software for information sharing and will deploy it to the production environment at the same

time with additional servers and middleware.

✦ REALIZATION OF STABLE AND EFFICIENT IT INFRASTRUCTURE

Vehicle registration information handled by the MPWT is extremely important. It will cause extensive damage with profound effect on society when the process of the IT system stops or the data is lost. Therefore, the JICA team reported that a high level reliability (corresponding to Tier 3 defined by TIA 942-A, which is an indicator for data center facilities) is required for the system infrastructure to support the management of vehicle registration.

Based on the confirmation in the field, JICA team proposed adopting a container type data center as the most efficient way to realize reliability equivalent to Tier 3 from among the following multiple methods.

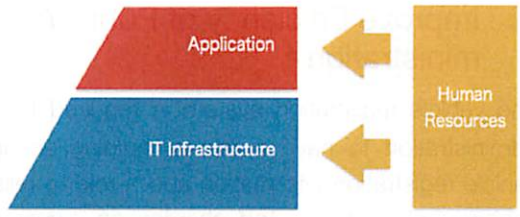


Classification	Implementation Method	Features
On-Premise	Building Type	A leading choice when there are buildings built on the assumption that they are already used as a data center. When there are lots of restriction related to building specifications, the burden of time and expenses also become larger in case the later maintenance happens.
	Container Type	Easy to install and expand with power saving design. There is a need to secure dedicated land and separate foundation work.

Classification	Implementation Method	Features
Cloud	Public Cloud	Easy to introduce and maintain. Foreign services are common, but there are not many cases to use for the management of citizen management and similar information from the viewpoint of national security. Pricing fee charging is mainly used, so it is difficult to control by the annual budget.
	Private Cloud	An option if there is a stable service provider of high quality in the country. At present, the presence of influential services in Cambodia has not been confirmed.

✦ DEVELOPMENT OF HUMAN RESOURCES

After the new IT system released in 2017, General Department of Land Transport (GDLT) receives daily inquiries on problems and problems day after day. Currently, several people in GDLT are dealing with those problems, which often be handled by IT & PR stations and private companies in charge of system development. Regarding the importance of a stable IT infrastructure and applications, it is indispensable to develop human resource of local staffs that can operate and maintain the system by themselves without any support from foreign countries including Japan. After the short-term improvements, there is a plan that Japanese team dispatch engineers from Japan to Cambodia and implement system development together with local staffs with their responsibility for system infrastructure construction and application development. During this skill transfer period, local staffs are expected to acquire practical skills related to system operation management and maintenance based on a systematic education framework such as ITIL framework, which will improve from aspect of organization management to actual problem solving skills as well as application renovation skills. In this skill transfer course, Japanese team will conduct a training in Japan and a briefing session in Cambodia. Below is a conceptual



Education and Training in the Development Phase

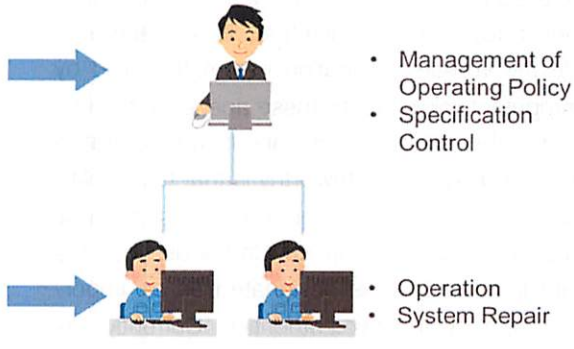
Well-planned training course according to role model

- Establish development objectives based on role model and conduct systematic training for about six months
- Conduct a visit to Japan to learn system operation that is practiced in Japan

Transfer skills of development through actual project

- Place Cambodian engineers in consideration of balance from the application to the infrastructure
- Learn from the development process and master skills that can be built from scratch
- Fully supported by Japanese engineers

Roles in the Maintenance Phase



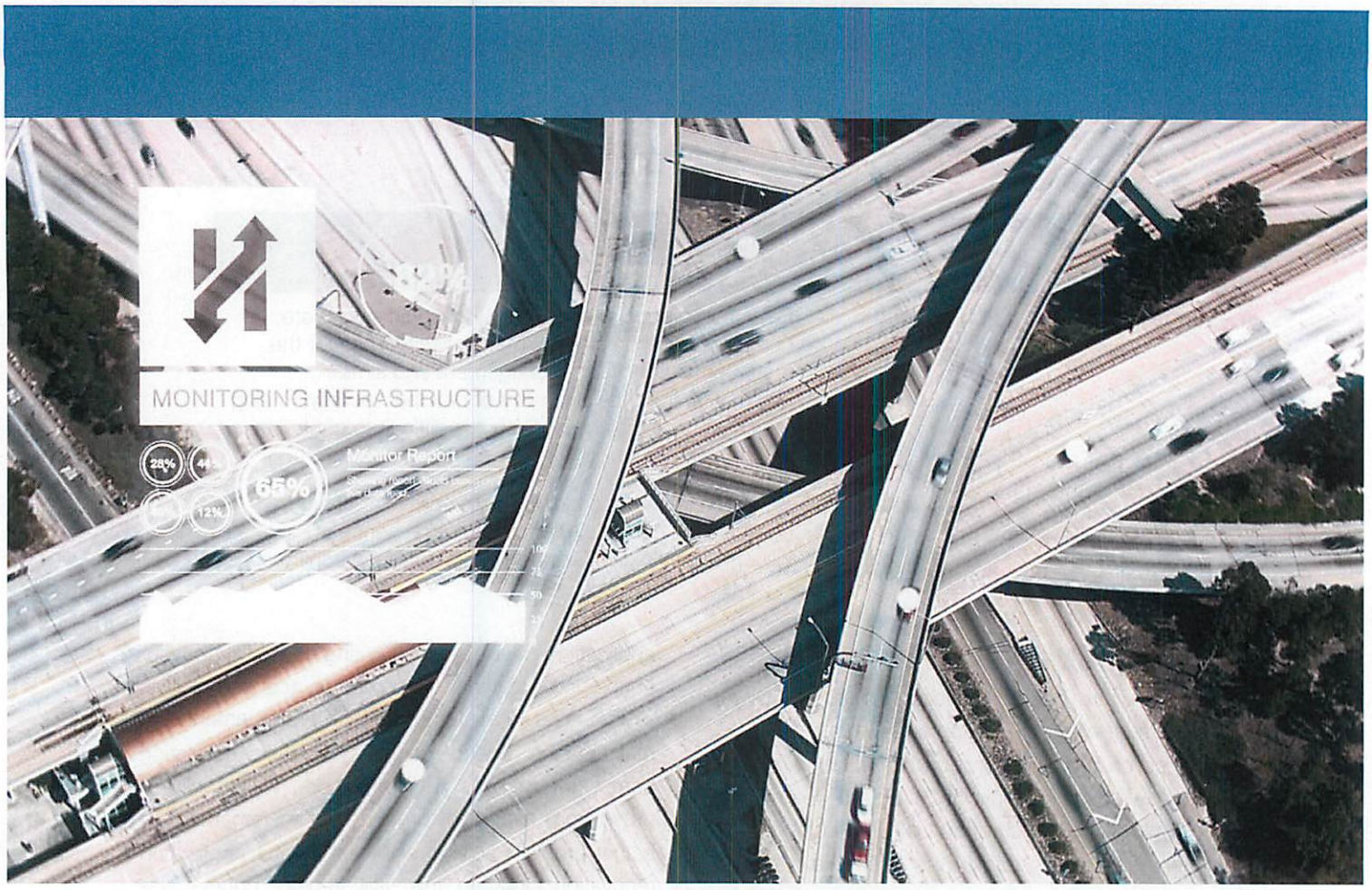


diagram of nurturing IT management human resources.

II. Improve Efficiency of Public Administration

The vehicle registration system is required for the administration to have a role of holding accurate vehicle registration information and a role to reliably impose various taxes and charges on owner and user of the vehicle. As an entity to execute it, the ministry and authority of vehicle registration alone is inadequate, efforts from all administrative organizations related to automobile management administration are indispensable. Therefore, it is effective to provide the vehicle registration information held by the competent ministries to these agencies, thereby enhancing the execution of various administrative measures. Particularly noteworthy is that taxes related to cars are of high importance as financial sources in many countries. In Cambodia too, the automobile-related tax is designated as an important tax item by the tax authorities. Currently, tax authorities manage tax payer by their own roster, but by using vehicle registration information it becomes possible to cover all car owners.

Meanwhile, it is expected that different administrative merits can be obtained by receiving information related to vehicle registration from the other administrative agencies. Registration of the vehicle is carried out according to the contents of the application brought in by applicants, which finds obstacle in detecting if that vehicle has infraction such as stolen vehicle, or incomplete tax payment. Therefore, collating application content with the information of violated vehicles from police, and alerting at the time those vehicles are applied for registration can effectively improves the enforcement of law as well as tax levy.

As described above, the vehicle registration system not only plays a role to ensure that the owner and user of vehicle perform obligations, it also helps government efficiently realize a wide variety of administrative efforts to solve social problems. Despite the fact that vehicle registration information is one of the most basic administrative infrastructure for the nation, Cambodia does not currently have a mechanism for effectively utilizing them. Looking at exam-

ples of other countries, as the automobile society gets more sophisticated, interest in keywords such as safety and environment has increased that requires effective solutions for issues in such those fields. In developed countries, traffic accidents have been seriously investigated since the 1960s. Moreover, since 1980 the International Road Traffic and Accident Database (IRTAD) was established to manage vehicle safety information of major countries. In the United States, the Fatality Analysis Reporting System (FARS) has been in operation since 1975 with about 40,000 surveys are conducted annually, covering the case of a passenger dying within 30 days. In this survey, experts called FARS analysts use various data in all state governments to record over 200 items and transmit them to the central computer of the National Highway Traffic Safety Administration (NHTSA). As a result, many ways of utilization of these data becomes available. In Cambodia, it is also necessary to have a mechanism to cross-search and utilize various kinds of information.

III. Promote Industries

The need of using vehicle registration information does not only exist in administration but also in industry and civil society. Currently, there is no official way to retrieve the vehicle registration information in Cambodia that misses a potential chance of creation different kinds of business. Giving types of registration data that can be flexibly editable to private sectors; new market opportunity can be born by utilizing those data. In Cambodia, new registration is the mostly conducted procedure, which is mainly carried out by the dealers instead of vehicle owner. However, it reveals that the dealers are facing up to a pressure of low productivity in their operation in registration. For example, dealers often have to input the same data for two kinds of system, one is for their own sales data management system, and one is for government's application screens for registration. Furthermore, the systems is unable to process multiple application tasks at once; it is necessary to process each application individually. Therefore, it is essential for the establishment of a sustainable automobile management administration to make the task of the private sectors more efficient. Providing API service for registration procedures and statistic data to private sectors with a fee charge, is a beneficial means to improve income for system operation and maintenance. This kind of incentive has also been widely applied in many countries.

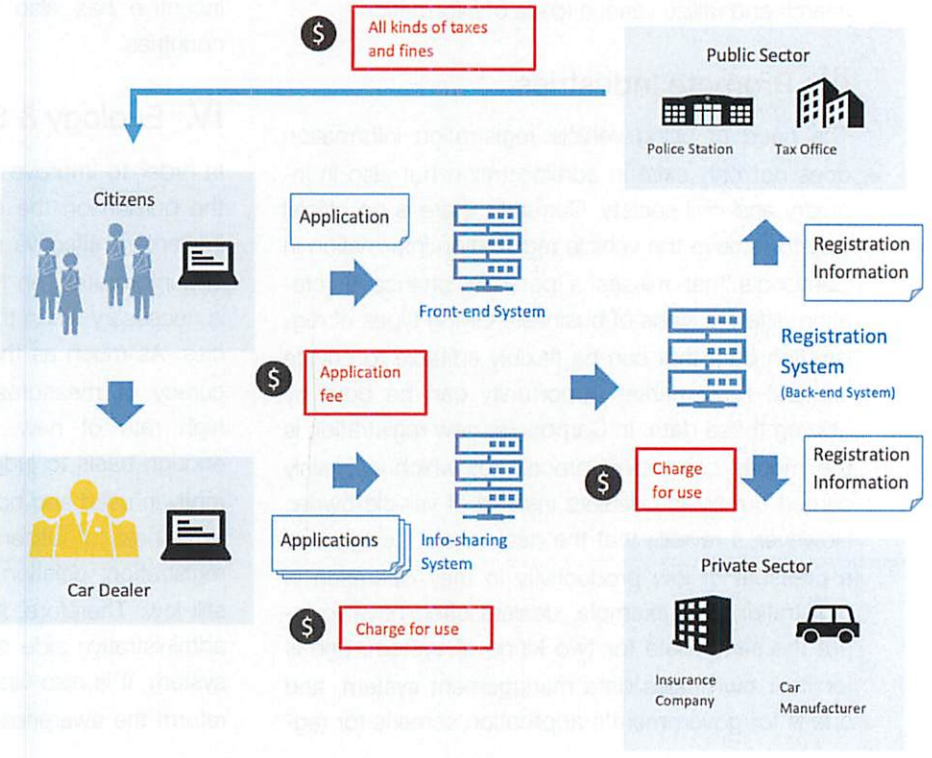
IV. Ecology & Safety

In order to improve the safety of traffic and reduce the burden on the environment, it is necessary to implement effective measures in the administration. The information on the vehicles actually being used is necessary when the administration examines policies. As much as the data is accumulated, the accuracy of measures improves. Anyway, just only high rate of new registration does not provide enough basis to judge how many vehicles are currently in used and how reliable that data is since the awareness of citizen to carry out such as transfer registration, deletion registration in change case is still low. Therefore, in addition to the efforts of the administrative side such as improvement of the IT system, it is also vital to notify the applicant and to reform the awareness of the citizen. In order to en-

courage more active participation of citizens, it is necessary to start from improving transparency of administrative agencies, which means to promote "visualization" of administrative organs through open data and data visualization and to enable objective observation of the situation of society from the data. In addition, because of such information disclosure, it becomes possible for citizens to participate directly in policy planning, to express their own ideas and to touch others' opinions. In doing so, understanding of vehicle registration will be promoted, and it will be expected that policies closely followed by citizens will be developed.

V. Fiscal Consolidation

In order to realize sustainable vehicle management administration, it is important to secure financial resources for operation. Two types of approaches are conceivable as means for securing financial resources. One is to strengthen the collection of taxes and penalties. Such collection is carried out by MoEF and MOI, so by offering vehicle registration information to these ministries, it can be expected to realize more powerful collection using these information. Another approach is to collect fee for using the vehicle registration information and the IT system of vehicle registration after increasing the value and importance of it. As described in the section above, vehicle information is worth the revitalization of the industry. Therefore, by



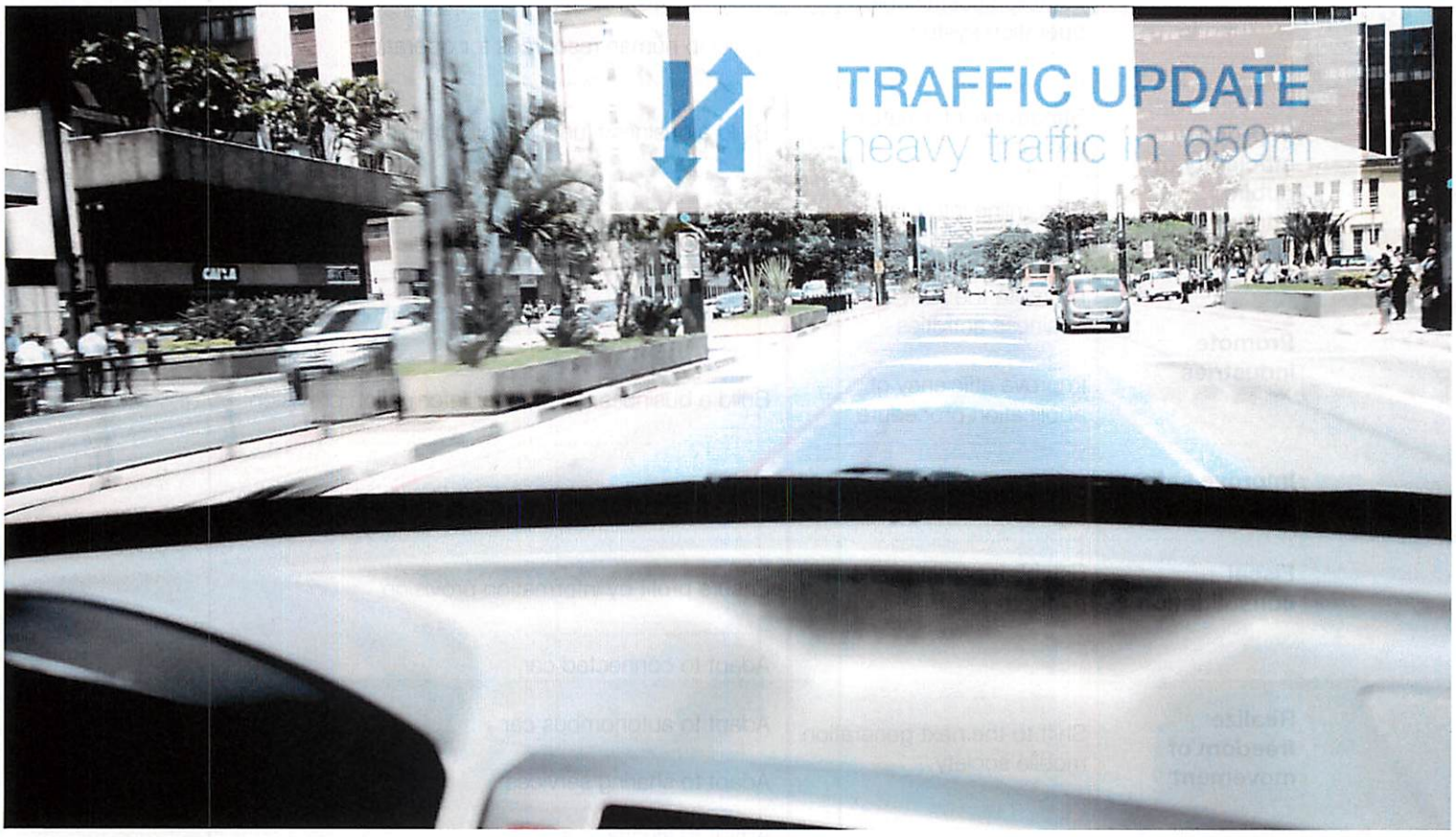
providing a mechanism for using such information, it is possible to collect continuous usage fees.

VI. Freedom of Movement

Recently, the development of automobile technology including CASE has been remarkable. The word CASE is a coined word proposed by Dieter Zetsche from Daimler AG at the Paris Motor Show in 2016. It consists of four initials "Connected" "Autonomous" "Shared / Service" "Electric". From his words, it seems that he is willing to change from "a company that manufactures and sells cars" to "a company that provides services as a means of moving a car."

Changes in these technologies come abruptly like the smart phone in the past few years. People are required to respond to new concepts, but on the other hand, it is a chance to secure new traveling means for those who have not possessed cars. With these technologies, people who have stayed in one place may be able to move wherever they want which allows new trends to be welcomed.

Since society today sometimes radically changes what was thought to be commonsense, so to respond to such a large change, the conventional legal system is inadequate. Global trends like CASE will definitely come to Cambodia. Therefore, it is necessary to investigate new trends and redesign the system accordingly.



Specific Improvement Plan

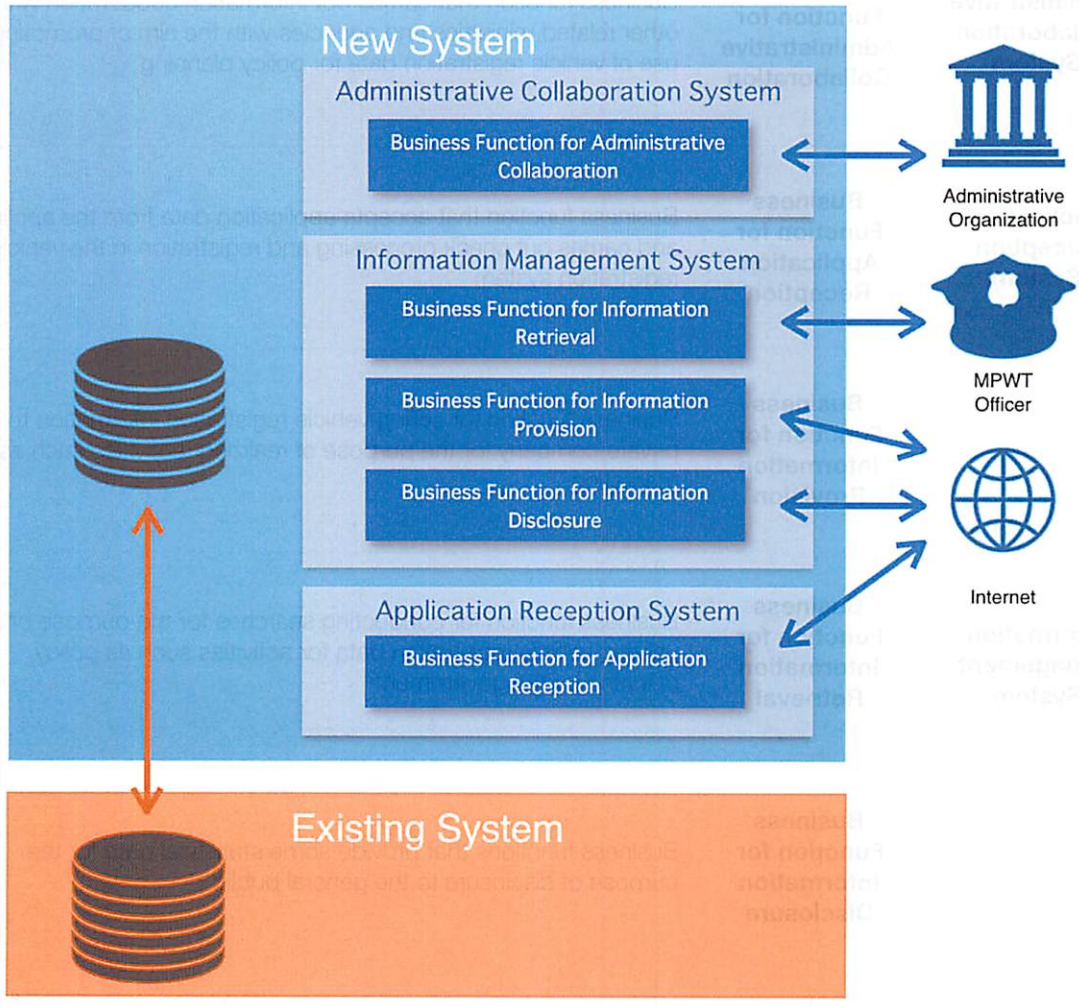
Tasks to be Addressed

The table below lists the priority subjects, goals, and activities needed to achieve sustainable vehicle management administration. Priority subjects and goals are a summary of what was said in the previous chapter. And we defined the activities needed to achieve each goal. In order to realize some activities, it is necessary to build a new IT system, which will be described in the next section. These activities are not expected to execute in parallel, but are expected to carry out according to a road map to be described later.

Priority Subjects	Goals	Activites
Construct foundation for sustainable development	Normalize vehicle registration information	Improve administrative system of vehicle registration
		Cleanse database of vehicle registration
	Realize stable IT infrastructure	Introduce container type data center
	Establish sustainable operation system	Develop operational rules
		Develop human resources for operation
Improve efficiency of public administration	Streamline information exchange	Build a business function for administrative collaboration
	Streamline information utilization	Build a business function for information retrieval
Promote industries	Promote the activation of business activities	Build a business function for application reception
	Improve efficiency of application procedure	Build a business function for information provision
Improve safety and ecology	Promote public participation	Build a business function for information disclosure
Fiscal consolidation	Establish earnings securing method	Ensure profit by information provision
Realize freedom of movement	Shift to the next generation mobile society	Adapt to connected car
		Adapt to autonomous car
		Adapt to sharing services
		Adapt to electric car

Perspective of IT System

The outline of the IT system including the business functions described in the previous section is shown below. Since a vehicle registration system is already exists in Cambodia, there is a possibility that it will have a big influence on existing process when adding new functions to it. The influence on availability and maintainability by adding functions are also concerned as well. Therefore, a new system should be constructed separately from the existing system. The new system is divided into three subsystems according to characteristics with several business functions could be exist in one subsystem.



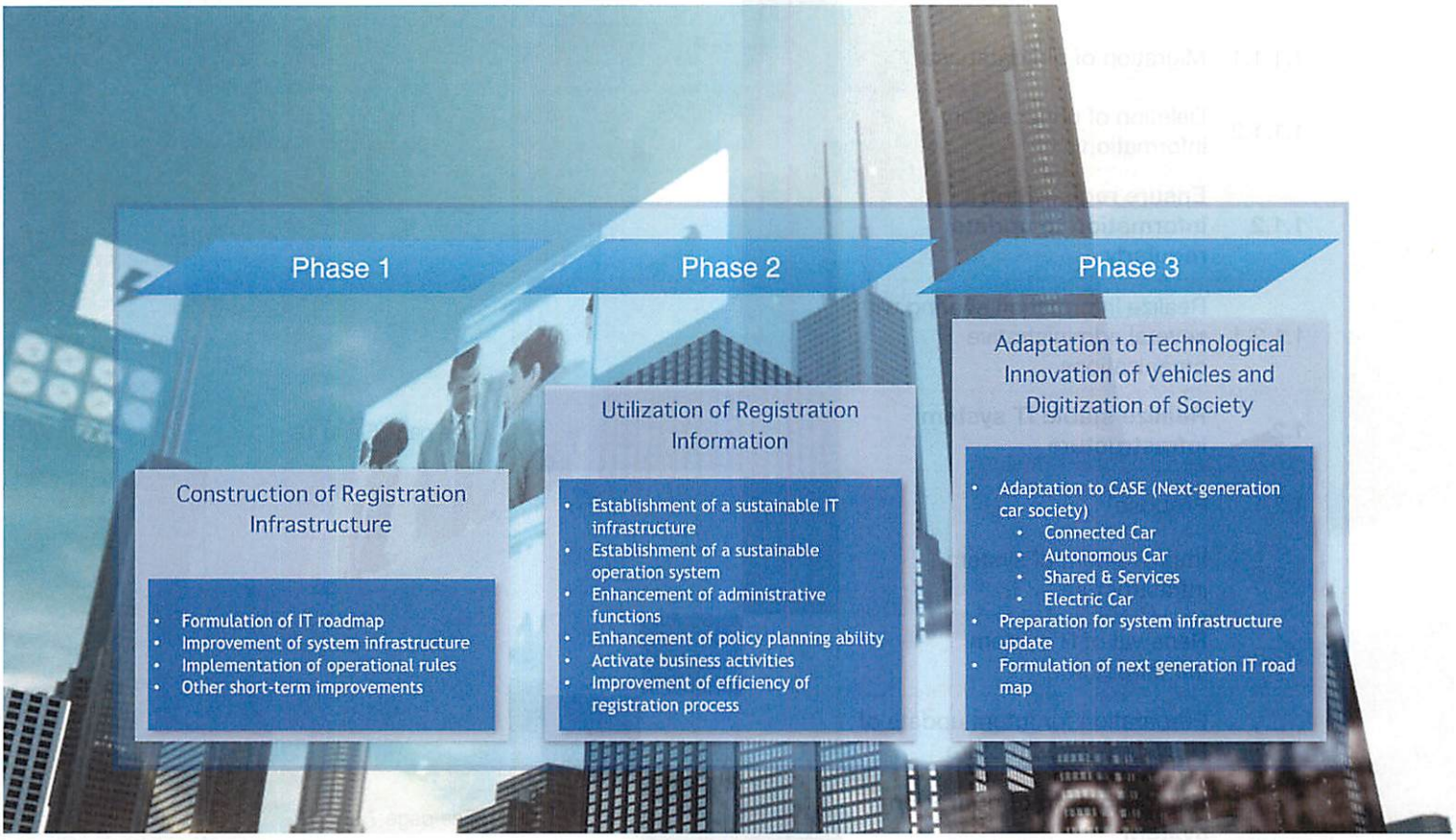
System Functions

The outline of the business function described above is shown below. In order to realize these business functions, it is necessary to reorganize information and redefine business specifications in subsequent projects.

Sub-Systems	Business Functions	Contents
Administrative Collaboration System	**Business Function for Administrative Collaboration**	Business function that carries out information cooperation with other related ministries and agencies with the aim of promoting the use of vehicle registration data for policy planning
Application Reception System	**Business Function for Application Reception**	Business function that accepts application data from the applicant and carries out check processing and registration in the vehicle registration system
Information Management System	**Business Function for Information Provision**	Business function for selling vehicle registration information to private company for the purpose of realizing activities such as marketing
	Business Function for Information Retrieval	Business function for conducting searches for the purpose of utilizing vehicle registration data for activities such as policy planning by the government
	Business Function for Information Disclosure	Business functions that provide some statistical data for the purpose of disclosure to the general public

The Road Map

Based on the above matters, this section gives a road map showing the schedule of activities that is considered better to be executed in Cambodia for the realization of sustainable vehicle management administration. Japan and Cambodia will continue to cooperate in the tasks described in this roadmap in the future and will continue detailed examination.



The schedule described below does not necessarily proceed as described, but is created based on the concept of each phase illustrated above. Phase 1 mainly describes the tasks that have been carried out so far, and phase 2 describes the tasks that are necessary to make effective use of vehicle information. Phase 3 refers to the future prospects and is highly abstract. Since the technology and society surrounding automobiles are fast, it is required to brush up the roadmap according to the situation after Phase 3.

	Activities	Phase 1	Phase 2	Phase 3
		2016-19	2020-23	2024-
1	**Construction of Foundation for Sustainable Development**			

See page 4

	Activities	Phase 1 2016-19	Phase 2 2020-23	Phase 3 2024-	
1.1	**Normalization of vehicle registration information**				See page 12
1.1.1	**Cleansing of current database**				
1.1.1.1	Migration of old database				
1.1.1.2	Deletion of unnecessary information				
1.1.2	**Ensure registration information to update regularly**				
1.1.2.1	Realize information sharing with several administrative organizations				
1.2	**Realize stable IT system infrastructure**				See page 6 and 12
1.2.1	Propose				
1.2.2	Improvement of system infrastructure				
1.2.3	Renewal of IT system infrastructure				
1.2.4	Preparation for future update of IT system infrastructure				
1.3	**Establishment of operation system**				See page 7 and 12
1.3.1	Propose				
1.3.2	Development of human resources for IT system operation				
1.4	**Proceed five short-term strategies**				See page 4
1.4.1	Set the interface specification for information sharing with relevant organizations				See page 4
1.4.2	Execute security diagnosis				See page 5

Activities		Phase 1 2016-19	Phase 2 2020-23	Phase 3 2024-	
1.4.3	Set the operational rules for online application system				See page 5
1.4.4	Define IT infrastructure requirements				See page 5
1.4.5	Introduce additional servers and middleware				See page 5
2	**Streamlining the administration**				See page 8
2.1	**Enhancement of administrative functions**				See page 12
2.1.1	Proposal for construction of structure for administrative collaboration				
2.1.2	**Business function for administrative collaboration**				See page 14
2.1.2.1	Propose				
2.1.2.2	Develop				
2.1.2.3	Operate				
2.2	**Enhancement of policy planning ability**				See page 12
2.2.1	**Business function for information retrieval**				See page 14
2.2.1.1	Propose				
2.2.1.2	Develop				
2.2.1.3	Operate				
2.3	**Enhance ability of monitoring of the administration**				

Activities		Phase 1	Phase 2	Phase 3	
		2016-19	2020-23	2024-	
2.3.1	**Authorized system for passenger/freight forwarder**				An IT system to manage a permission for passenger service company or delivery company
2.3.1.1	Propose				
2.3.1.2	Deploy				
3	**Revitalization of industry**				See page 9
3.1	**Activate business activities**				See page 12
3.1.1	**Business function for information provision**				See page 14
3.1.1.1	Propose				
3.1.1.2	Develop				
3.1.1.3	Operate				
3.2	**Improve efficiency of registration process**				See page 12
3.2.1	**Business function for application reception**				See page 14
3.2.1.1	Propose				
3.2.1.2	Develop				
3.2.1.3	Operate				
3.2.2	**Authorized system for number plate related business**				An IT system to manage a permission for company related to manufacture or delivery number plate
3.2.2.1	Propose				
3.2.2.2	Deploy				
4	**Safety and Ecology**				See page 9
4.1	**Promotion of public participation**				See page 12
4.1.1	**Business function for information disclosure**				See page 14

Activities		Phase 1	Phase 2	Phase 3	
		2016-19	2020-23	2024-	
4.1.1.1	Propose				
4.1.1.2	Develop				
4.1.1.3	Operate				
4.2	**Authorized system for compulsory automobile liability insurance**				A function or an IT system to manage information of compulsory automobile liability insurance of registered vehicle
4.2.1	Propose				
4.2.2	Deploy				
4.3	**Function for notifying timing of vehicle inspection**				A function to send a notification when the expiration date of vehicle inspection is approaching
4.3.1	Propose				
4.3.2	Deploy				
5	**Fiscal consolidation**				See page 10
5.1	**Establishment of earnings securing method**				See page 12
5.1.1	Propose				
5.1.2	Deploy				
6	**Realize freedom of movement**				See page 11
6.1	**Authorized system for parking space of car owner**				A function or an IT system to manage information of parking space of vehicle owner to avoid parking without permission
6.1.1	Propose				
6.1.2	Deploy				
6.2	**Collaboration with parking lot**				A mechanism for managing and displaying information of parking lot availability to relieve congestion in urban areas

Activities		Phase 1	Phase 2	Phase 3	
		2016-19	2020-23	2024-	
6.2.1	Propose				
6.2.2	Deploy				
6.3	**Road-pricing**				The practice of charging motorists to use busy roads at certain times, especially to relieve congestion in urban areas
6.3.1	Propose				
6.3.2	Deploy				
6.3	**Adapt to CASE (Next-generation vehicle society)**				The practice to adopt to CASE (CASE consist of four initials "connected", "autonomous", "shared / service", and "electric")
6.3.1	Propose				
6.3.2	Deploy				

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Appendix5

IT Operating Manual

PREFACE

MPWT Vehicle Registration System

History of revision

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1. TARGETS OF MANAGEMENT

1.1. PROBLEM MANAGEMENT DEFINITION

The goal of Problem Management is to minimize both the number and severity of incidents and problems during maintenance period. It should aim to reduce the adverse impact of incidents and problems that are caused by errors in the system's infrastructure, and to prevent recurrence of incidents related to these errors.

1. We should address problems in priority order, paying attention to the resolution of problems that can cause serious disruption.
2. The degree of management and planning required is greater than that needed for incident control, where the objective is restoration of normal service as quickly as possible.
3. The function of Problem Management is to ensure that incident information is documented in such a way that it is readily available to all technical support staff.

Problem Management has **reactive** and **proactive** aspects:

- Reactive: Problem solving when one or more incidents occur
- Proactive: Identifying and solving problems and known errors before incidents occur in the first place.

Problem Management includes:

- Problem control, which includes advice on the best workaround available for that problem.
- Error control.

1.1.1. DIFFERENCES BETWEEN INCIDENT MANAGEMENT AND PROBLEM MANAGEMENT

1. The aim of incident management is to restore the service to the customer as quickly as possible, often through a workaround, rather than through trying to find a permanent solution.
2. Problem management differs from incident management in that its main goal is the detection of the underlying causes of an incident and the best resolution and prevention.
3. In many situations, the goals of problem management can be in direct conflict with the goals of incident management.
4. Deciding which approach to take requires careful consideration. A sensible approach would be to restore the service as quickly as possible (incident management), but ensuring that all details are recorded. This will enable problem management to continue once a workaround had been implemented.
5. Discipline is required, as the idea that the incident is fixed is likely to prevail. However, the incident may well appear again if the resolution to the problem is not found.

1.1.2. INCIDENT AND PROBLEM

An incident is where an error occurs: something doesn't work the way it is expected.

This is often referred to as: **(a fault, error, it doesn't work, a problem)**. But the term used with is 'incident'.

A problem can be:

1. The occurrence of the same incident many times
2. An incident that affects many users
3. The result of network diagnostics revealing that some systems are not operating in the expected way.

Therefore, a problem can exist without having immediate impact on the user, whereas incidents are usually more visible and the impact on the user is more immediate.

1.2. WHO USES PROBLEM MANAGEMENT?

This is where the technician calls upon all their problem-solving skills and analysis techniques to decide how to approach the problem, how much time to allocate and what to do if the problem cannot be resolved.

If you get the same incident occurring repeatedly, you should implement the Problem Management process.

We need to keep records of how well the IT systems are functioning, what is failing and how long IT systems are unavailable. The information you will gain from problem management should enable you to report to the PMs on the technical problems that create incidents and problems. To provide PMs with an effective approach to its technical support, you should always implement problem management alongside incident management.

1.3. WHY USE PROBLEM MANAGEMENT?

The benefits of taking a formal approach to problem management include the following.

1. There is a standard way to approach every problem – this saves time.
2. The number of incidents will reduce.
3. The solutions will be permanent. There will be a gradual reduction in the number and impact of problems and known errors, as those that are resolved will stay resolved.
4. You learn from your mistakes. The process provides the historical data from which to identify trends, and the means of minimizing failures and reducing the impact of failures.
5. You will obtain a better first-time fix rate of incidents because you will have a knowledge database available to the service desk and technicians when a call is first logged.

1.4. HOW PROBLEM MANAGEMENT WORKS

Problem management works by using analysis techniques to identify the cause of the problem. Incident management is not usually concerned with the cause, only the cure. Problem management therefore takes longer and should be done once you have dealt with the urgent stage of the incident: for example, removing a faulty computer and replacing it with a working computer. This takes the urgency away and leaves the faulty computer ready for diagnostics.

Problem management can take time. It is important to set a time limit on how much time should be spent on the problem – or the cost of resolution can become expensive.

To achieve the goal, problem management aims to:

1. Identify the root cause
2. Initiate actions to improve and correct the situation.

1.5. What is the Cost Required for Problem Management?

1. Initially it costs someone's time and effort to look at problems and document an approach to resolving them in the future.
2. The technician should be able to put time aside each week to look at problems. This time should be protected.

As a proactive process, problem management:

1. Will save time, as fewer incidents are logged
2. Will save budget, as the technician's salary is not used on resolving the same incident many times
3. Will increase the availability of equipment if frequency of failure decrease
4. Will increase the confidence of the users, both teaching staff and the systems become more reliable.

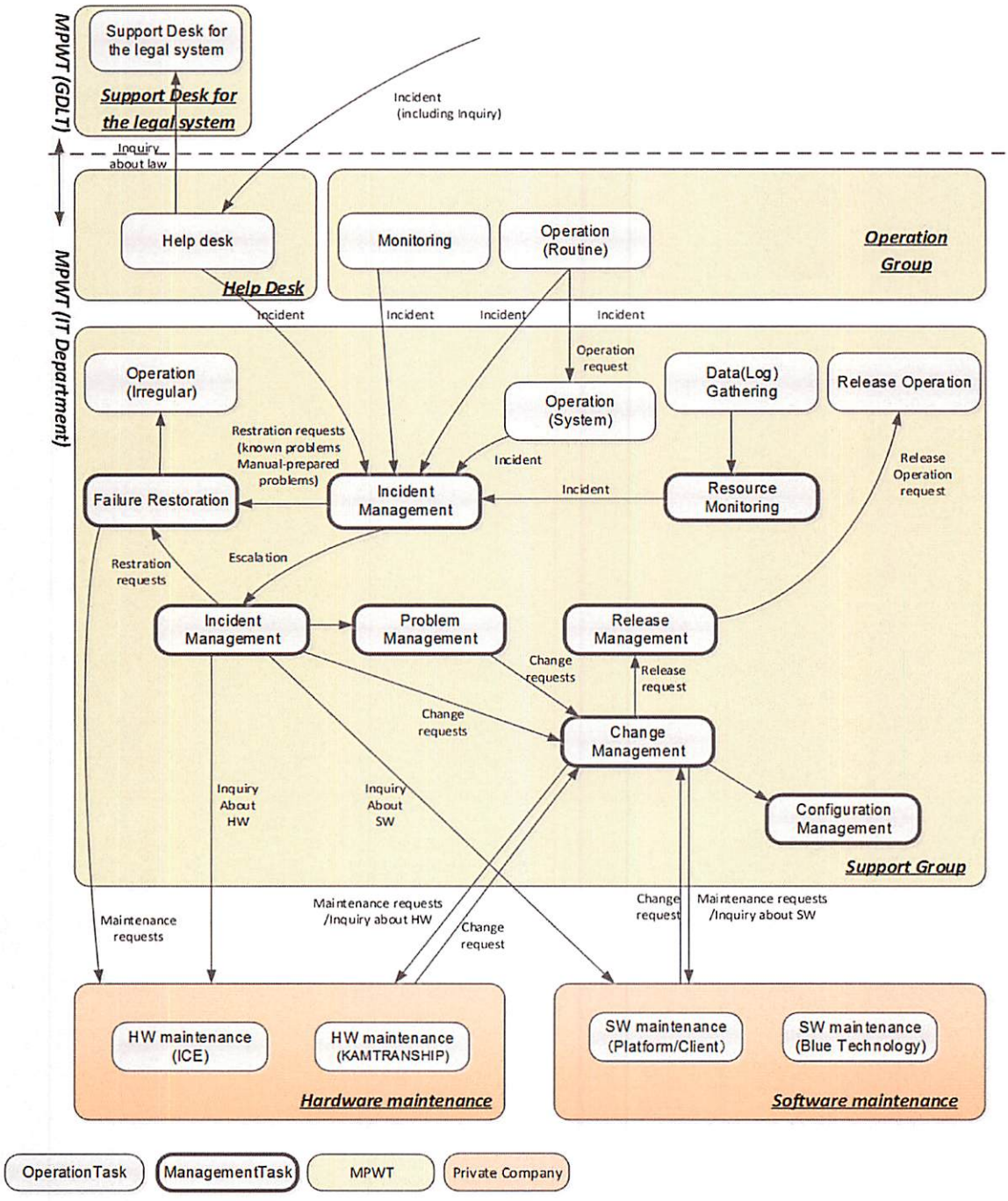
2. Tools Used in Management

- Beware of overloading yourself with tools that you cannot use easily.
- Beware of thinking that you can solve all problems if you have the right tool.
- Beware of making all problems a mathematical problem and inventing models and diagrams to explain your theory.
- Remember that there is a cost associated with the time spent on problem solving, so use problem solving for expensive problems.

Root cause analysis

- This is the process of finding the real cause of a problem and dealing with it rather than simply continuing to deal with the symptoms.
- It seeks to identify the reason for the failure by asking lots of questions and determining whether changing an event early on in the chain of events could have prevented the failure.

Relationship diagram for System Operation



INCIDENT MANAGEMENT GUIDELINE

MPWT Vehicle Registration System

History of revision

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3. Structure of Incident Management 2

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5. Tools Used in Incident Management 4

6. Procedures of Incident Management 5

1. PURPOSES

To control the solution of all indecencies (to the IT Infrastructure or any aspect of IT services) that occurs during maintenance phase.

- To restore a normal service operation as quickly as possible.
- To minimize the impact on business operations.
- To manage all occurred incident.

2. BASIC POLICIES

- Record all incident.
- Solve recurrent incident quickly by using former records of incident.
- Obtain the approval of PM to the way to restore.
- Make clear these below
- Deadline to be solved
- Impact on the service
- Status of consideration of the way to restore.
- Result of the way to restore.
- Solved or Unsolved
- All unsolved incidences must be reviewed regularly.

3. STRUCTURE OF INCIDENT MANAGEMENT

Roles related to incident management are shown below.

TABLE 1 ROLES IN INCIDENT MANAGEMENT

No.	Role	Description
1	Project Manager (PM)	(1) Review and make decision about cause, incident type, solution, assignment, deadline for each incident. (2) Before responding, confirm the solution performing result of each team.
2	Incident management: PIC	(1) Receive incident request. (2) Perform initial analysis for incident. If this incident need failure restoration: + Assign HW/SW maintenance to create instruction (3) In case it is the already known incident, respond and close the incident. (4) In case it is the un-known incident, set up meeting to analyze and give solutions for this incident. Can ask PIC of [HW/SW maintenance] to join this meeting. (5) Report the solution to PM. In case it is approved by PM, assign each team to perform the solution. In case it is not approved by PM, return to step (2). (6) Receive the solution performing results from each team. Setup meeting with PM to review that results. In case it is approved by PM, respond and close this incident. In case it is not approved by PM, instruct corresponding team to re-perform the solution. (7) For managing, announce [Problem management] team about closed incident. (8) Perform daily checking for un-closed incident
3	HW/SW maintenance: PIC	(1) Take part in analyzing and taking solution for incident as required. (2) Be responsible to solve incident by performing the approved solution and keeps its deadline. (3) Report about the solution performing results.

4. MEETINGS OF INCIDENT MANAGEMENT

The meetings for incident management are shown below.

TABLE 2 MEETINGS FOR INCIDENT MANAGEMENT

No.	Meeting	Description	Participants	Timing
1	Incident Analysis Meeting	(1) Analyze the causal incident (2) Decide the solution and the deadline to resolve the incident. (3) Decide the team who has responsibility to perform solution of this incident.	- Incident PIC - HW/SW maintenance (as needed)	Time when incident occurred and PIC had initial analysis and found that this is the first time occurred incident.
2	Official Solution Approval Meeting	(1) Report to PM about solution of this incident. (2) Get approval of PM	- PM - Incident PIC	After the time when PIC has decided solution for this incident.
3	Progress Meeting	(1) Review and evaluate all incidences that have "IN PROGRESS" status. (2) Act in case there is any incident can't be resolved in deadline.	- PM - Incident PIC	Daily

5. TOOLS USED IN INCIDENT MANAGEMENT

The tools for Incident management are shown below.

TABLE 3 TOOLS FOR INCIDENT MANAGEMENT

No.	Form	Content	Timing	Created by
1	Incident Management Flow	Flow of incident management	-	-
2	Incident Sheet	- Incident occur date - Incident description - Referent documents (if any) - Solved by - Reality cause - Solution - Status - Solved date plan - Solved date actual	- Incident occurs - After analysis of incident -After failure restoration -After getting approval from PM	- Help Desk / Operation Group - HW/SW maintenance -Incident PIC

6. PROCEDURES OF INCIDENT MANAGEMENT

The procedure for Incident management is described below:

（1） When incident occur, help desk or operation group write down the description into the incident sheet, and report it to Incident Management PIC.

（2） Incident Management PIC will do initial analysis to know this incident have occurred or not. If this is the already happened incident (known incident), Incident Management PIC report to PM and closes incident.

Otherwise go to step (3).

（3） Assign HW/SW maintenance to create instruction.

（4） Incident Management PIC conducts Incident Analysis Meeting to analyze the incident type, assignment and set deadline for this incident.

（5） Incident Management PIC conducts Official Solution Approval Meeting with PM to analyze the incident type, assignment and set deadline for this incident.

If needed, Incident Management PIC can involve [HW/SW maintenance: PIC] who relates to incident.

（6） If incident need system repair, Incident Management PIC do steps as below:

① Escalate this incident to HW/SW Maintenance.

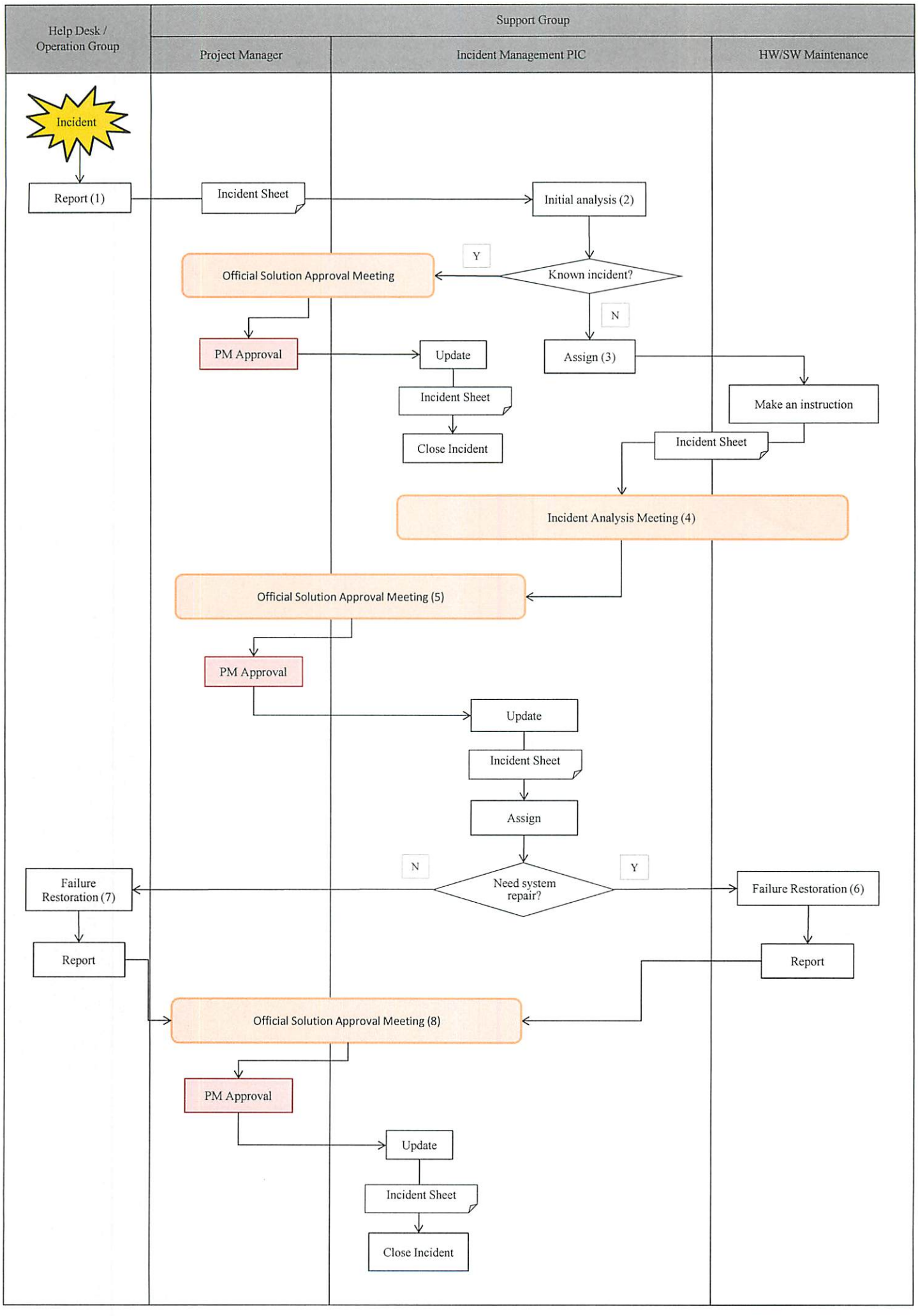
② HW/SW Maintenance team repair the system. Note that the system repair needs to be based on Change Management.

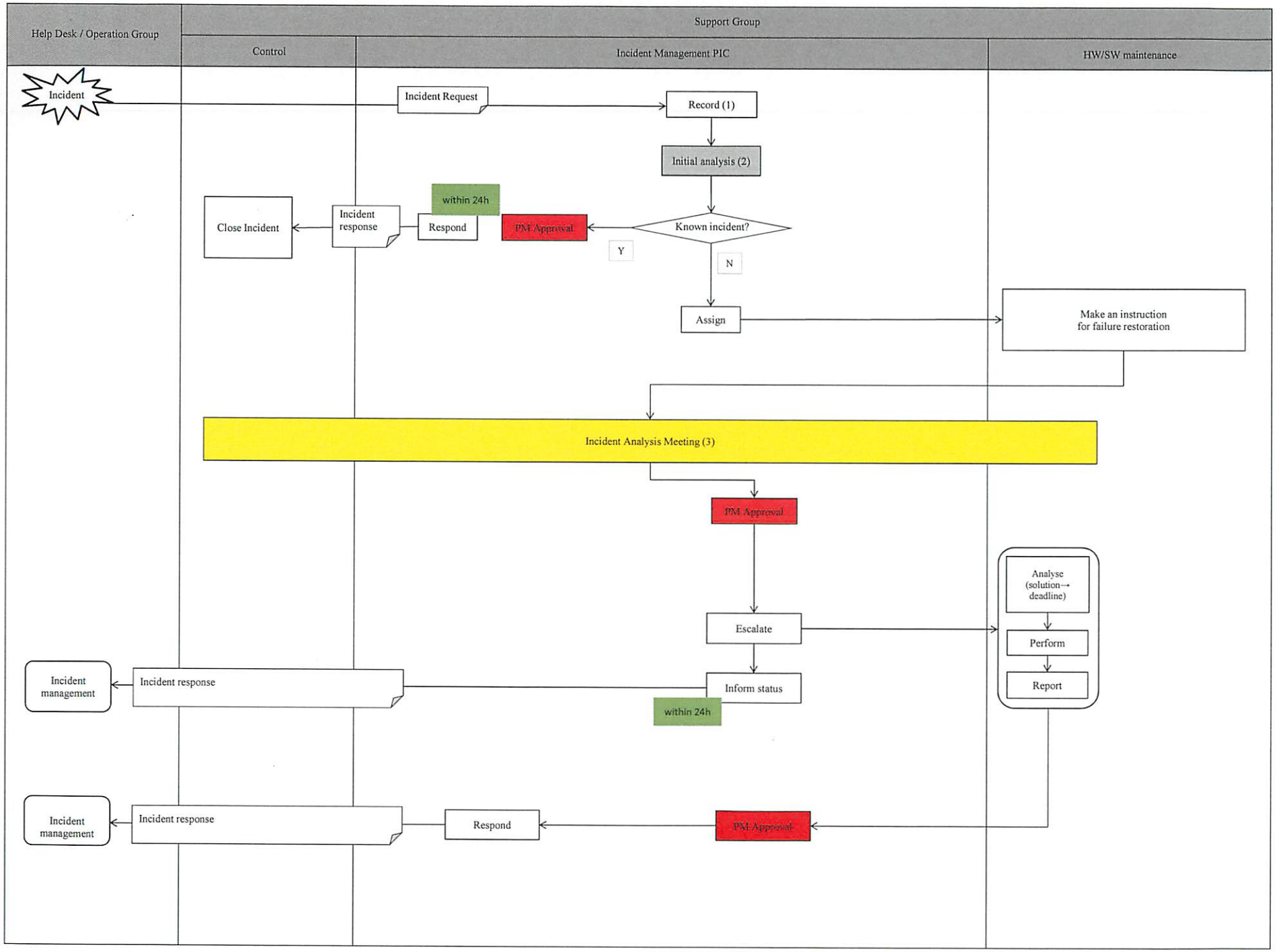
（7） If incident does not need system repair, Incident Management PIC do steps as below:

① Escalate this incident to Help Desk or Operation Group.

② Help Desk or Operation Group conduct the failure restoration based on the instruction.

（8） To close this incident, PM and Incident Management PIC analyze to confirm whether this is root cause of system or not. If yes, this incident will be escalated to Problem management. If no, this incident is closed.


Help Desk / Operation Group
Support Group
Project Manager
Incident Management PIC
HW/SW Maintenance
Incident
Report (1)
Incident Sheet
Initial analysis (2)
Known incident?
Y
N
Official Solution Approval Meeting
PM Approval
Update
Incident Sheet
Close Incident
Assign (3)
Make an instruction
Incident Sheet
Incident Analysis Meeting (4)
Official Solution Approval Meeting (5)
PM Approval
Update
Incident Sheet
Assign
Need system repair?
N
Y
Failure Restoration (7)
Report
Failure Restoration (6)
Report
Official Solution Approval Meeting (8)
PM Approval
Update
Incident Sheet
Close Incident


Help Desk / Operation Group
Support Group
Control
Incident Management PIC
HW/SW maintenance
Incident
Incident Request
Record (1)
Initial analysis (2)
Known incident?
Y
N
PM Approval
Respond
within 24h
Incident response
Close Incident
Assign
Make an instruction for failure restoration
Incident Analysis Meeting (3)
PM Approval
Escalate
Analyse (solution→ deadline)
Perform
Report
Inform status
within 24h
Incident response
Incident management
Incident response
Incident management
Respond
PM Approval

Incident diagnostics sheet

Equipment Unique ID	Name of person	Date & Time of Incident / Request
Establish current status		
What was expected to happen?		
What did happen? Can the incident be recreated?		
When did it last work? Has it EVER worked?		
What has been changed recently?		
Write down any error messages displayed.		
Can you or anyone else perform the same task on other equipment?		
Which area is the likely cause?		
From the answers above is the problem likely to be hardware, software, network, user guide, other (details please).		

Actions to take

Hardware Check the knowledge base and fact sheets	
Which area of hardware is affected?	
Which part requires replacing	
Which spare equipment is available?	
Install spare or order replacement or other, please detail.	

Software Check the knowledge base and fact sheets	
Which application or operating system is in error?	
Result of checking the error message through tools, the internet).	
Does software require reinstallation or a patch? Please give reasons.	
Results of reinstallation or patch applied.	

Network Check the knowledge base and fact sheets	
Does the network error affect one or many computers?	
Can the area affected be identified or isolated using diagnostics?	

Which replacement equipment can be installed?	
Actions to take.	
Results of actions taken.	
User Guide Check the knowledge base and fact sheets	
Which user guide is in error, does a user guide exist?	
Can the error be corrected with training or documentation?	
Actions to take.	
Results of actions taken.	
Other Check the knowledge base and fact sheets	
What was the cause of the incident?	
What actions have been taken?	
Which further actions are required?	

Incident outcome	
Has the incident been resolved?	[ ] Yes [ ] No
What was the final outcome?	
Date and resolver's name.	
Has the incident sheet and call log been updated?	Has the user been informed?
[ ] Yes [ ] No	[ ] Yes [ ] No

PROBLEM MANAGEMENT GUIDELINES

MPWT Vehicle Registration System

History of revision

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1. Purposes 1

2. Basic Policies 1

3. Structure of Problem Management 2

4. Meetings of Problem Management 3

5. Tools Used in Problem Management 4

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1. PURPOSES

The aim of this section is to introduce the Problem Management Methodology and to help you implement the process of problem management during maintenance period.

- To eliminate recurring incidents proactively.
- To minimize the impact of incidents that cannot be prevented.

2. BASIC POLICIES

The objectives and requirement of this section as the following:

- Understand the difference between incidents and problems
- Understand that a quick fix is not enough to resolve a problem permanently
- Decide whether you need to implement problem control
- Understand how to implement the Problem Management process
- Understand how to achieve workarounds and solutions (solved or unsolved)
- Decide which Problem Management reports to Project Management Committee and how to produce them.

3. STRUCTURE OF PROBLEM MANAGEMENT

Roles related to problem management are shown below.

TABLE 1 ROLES IN PROBLEM MANAGEMENT

No.	Role	Description
1	Project Manager (PM)	Manager authorized for the problem management of the whole Project. Management and instruction shall be made by PM or other personnel appointed by PM.
2	Problem Management: PIC	Report the problem related to development in the meetings or other settings, and lead the review/implementation of countermeasures.

4. MEETINGS OF PROBLEM MANAGEMENT

The meetings for problem management are shown below.

TABLE 2 MEETINGS FOR PROBLEM MANAGEMENT

No.	Meeting	Description	Participants	Timing
1	Action Meeting	Authorized for management of problem which may affect the whole Project. Policies and deadlines of the countermeasures shall be determined.	- PM - Problem Management PIC	Time when problem occurred.
2	Progress Meeting	Review of the problem related to the whole project, and assessment of countermeasures being taken.	- PM - Problem Management PIC	Daily

5. TOOLS USED IN PROBLEM MANAGEMENT

The tools for Problem Management are shown below.

TABLE 3 TOOLS FOR PROBLEM MANAGEMENT

No.	Form	Content	Timing	Created by
1	Problem Management Flow	Flow of problem management	-	-
2	Problem Sheet	• Problem No. • Summary • Detail • Progress report and result • Priority • Deadline • Status	-	Problem Management PIC

6. PROCEDURES OF PROBLEM MANAGEMENT

(1) Record problem

The problem will be recorded by support group when a problem record was raised by Incident management group or by proactive monitoring operation of Problem management itself. Information below should be recorded by a problem record.

(2) Review and analysis the impact of the problem

The person in charge will review and analysis the impact of the problem to the system. If he can resolve the problem without any further investigation, he can fill the investigation's result into problem record then close the problem as closed status.

(3) Investigate and diagnose problem

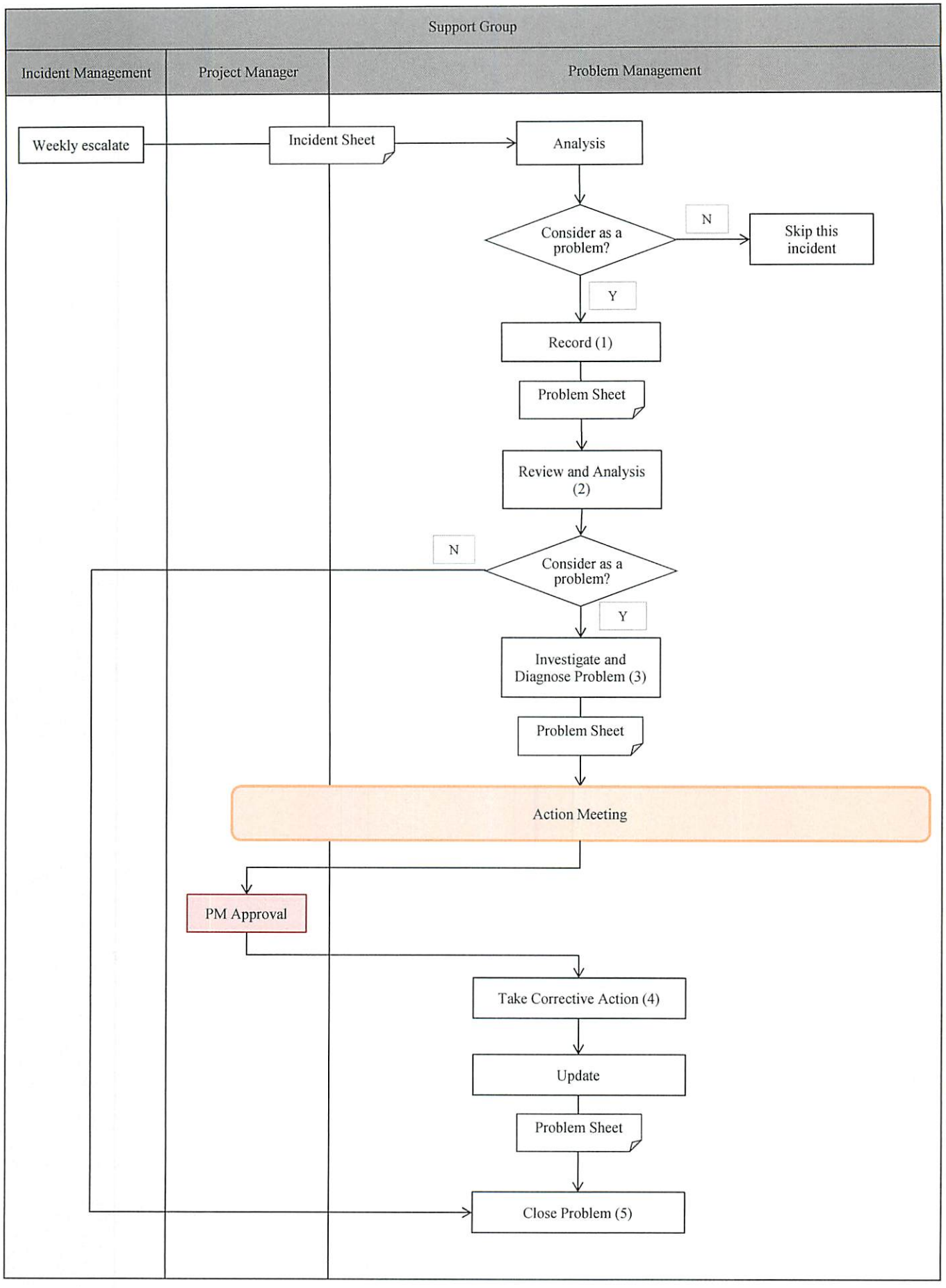
In the case person in charge need to do further investigation, the investigation and diagnose the problem will be done until the root cause is identified. The person in charge has responsibility to the PM then PM will make a decision to accept the root cause of the problem or not.

(4) Take corrective action

When a known error is recorded, the PM will decide corrective action to take after that. The person in charge has responsibility to do the corrective action and report to the PM. The decision can raise a change request to send to Change management group depends on the situation.

(5) Close problem

Project manager will hold the meeting to close the problem when resolution is successfully.


Support Group
Incident Management
Project Manager
Problem Management
Weekly escalate
Incident Sheet
Analysis
Consider as a problem?
N
Skip this incident
Y
Record (1)
Problem Sheet
Review and Analysis (2)
N
Consider as a problem?
Y
Investigate and Diagnose Problem (3)
Problem Sheet
Action Meeting
PM Approval
Take Corrective Action (4)
Update
Problem Sheet
Close Problem (5)

No	Problem No.	Summary	Detail	Progress report and Result	Issuer	PIC	Creation date	Priority	Deadline (Target date)	Status	Finish date	Note
1	PRB-00001											
2	PRB-00002											
3	PRB-00003											
4	PRB-00004											
5	PRB-00005											
6	PRB-00006											
7	PRB-00007											
8	PRB-00008											
9	PRB-00009											
10	PRB-00010											
11	PRB-00011											
12	PRB-00012											

Problem diagnostics sheet

Equipment Unique ID	Name of person	Date & Time of Problem / Request
Establish current status		
What was expected to happen?		
What did happen? Can the Problem be recreated?		
When did it last work? Has it EVER worked?		
What has been changed recently?		
Write down any error messages displayed.		
Can you or anyone else perform the same task on other equipment?		
Which area is the likely cause?		
From the answers above is the problem likely to be hardware, software, network, user guide, other (details please).		

Actions to take

Hardware Check the knowledge base and fact sheets	
Which area of hardware is affected?	
Which part requires replacing	
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Install spare or order replacement or other, please detail.	

Software Check the knowledge base and fact sheets	
Which application or operating system is in error?	
Result of checking the error message through tools, the internet).	
Does software require reinstallation or a patch? Please give reasons.	
Results of reinstallation or patch applied.	

Network Check the knowledge base and fact sheets	
Does the network error affect one or many computers?	

Can the area affected be identified or isolated using diagnostics?	
Which replacement equipment can be installed?	
Actions to take.	
Results of actions taken.	
User Guide Check the knowledge base and fact sheets	
Which user guide is in error, does a user guide exist?	
Can the error be corrected with training or documentation?	
Actions to take.	
Results of actions taken.	
Other Check the knowledge base and fact sheets	
What was the cause of the Problem?	
What actions have been taken?	
Which further actions are required?	

Problem outcome	
Has the Problem been resolved?	[ ] Yes [ ] No
What was the final outcome?	
Date and resolver's name.	
Has the Problem sheet and call log been updated?	Has the user been informed?
[ ] Yes [ ] No	[ ] Yes [ ] No