

Matricola\_\_\_\_\_

Surname\_\_\_\_\_

Name:\_\_\_\_\_

## Information Systems 01PDWOV

17 February 2020

Books, notes are not allowed. Write only on these sheets.

### *Traffic light maintenance*

A city administration owns and maintains traffic lights to regulate traffic. An office of the city administration is in charge of monitoring all related activities, while the actual installation and maintenance of traffic lights is outsourced to an external company EXT. Malfunctions in traffic lights imply safety hazards and must be fixed as soon as possible.

#### AS IS process

The office of the city administration operates a hot line. Citizens or employees of the administration (and particularly the city police) can call the hot line, active 8-20 during working days, to signal a malfunction. The employee that receives the call opens a ticket about the malfunction, writing the address of the traffic light, and the type of malfunction. Tickets are recorded on a dedicated sheet of paper. Next the employee calls by phone EXT and repeats the description of the malfunction. EXT checks the malfunction, repairs it, calls back the city office to notify the result of the repair. The employee of the city administration searches the ticket (i.e. the piece of paper describing it) and writes the result of the maintenance activity (ex defect fixed, defect not found).

At the end of the year EXT invoices the city administration for the maintenance activities, mentioning the number of tickets addressed, and the hours worked per ticket. The administration should verify that the number of tickets invoiced by EXT corresponds to the tickets recorded, but in practice this check is unfeasible due to the excessive paperwork needed to do it.

#### TO BE process.

Tickets become digital. The city administration maintains a database of tickets and traffic lights. Each ticket is identified and characterized. In particular it is linked to a traffic light. Each traffic light has an ID and a geolocalization. A citizen (or a city police officer) opens a ticket using a dedicated web page. When a new ticket is opened EXT is notified and takes charge of the ticket. When the ticket is managed and closed EXT accesses the web page and writes the result of the maintenance activity, adding the cost (in terms of material used and hours worked). When the ticket is closed the administration is notified and the city police may decide to check the traffic light. In case this is done the ticket is enriched with the result of the inspection of the city police.

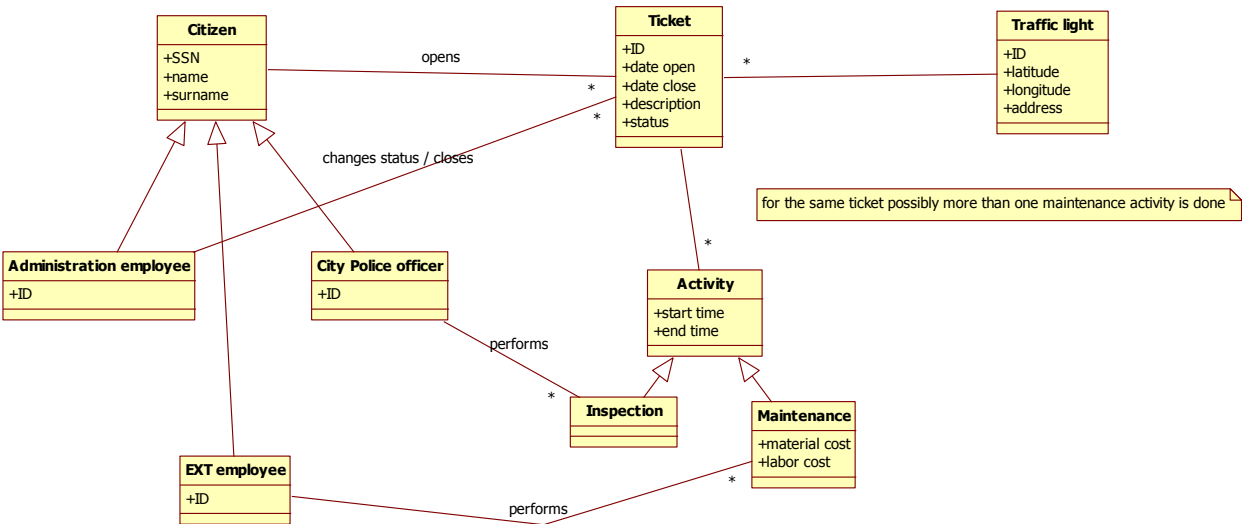
At any time the administration can monitor maintenance activities (frequency, cost), defectivity (traffic lights with more / less malfunctions), and how many closed tickets are verified by the city police.

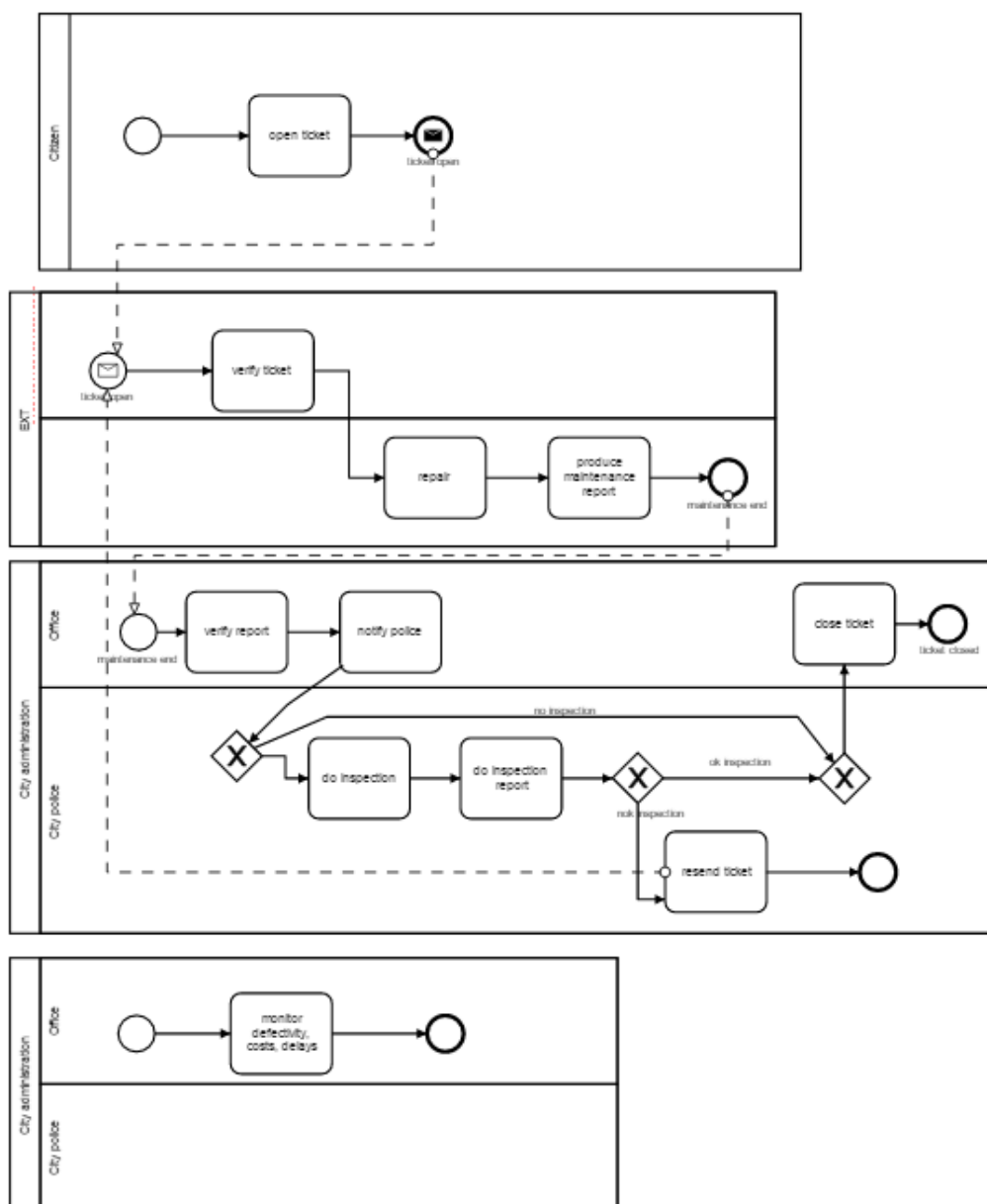
In the following model the TO BE situation.

#### 1 Organizational model: list roles or organizational units involved

City: administration, city police  
Citizen  
EXT

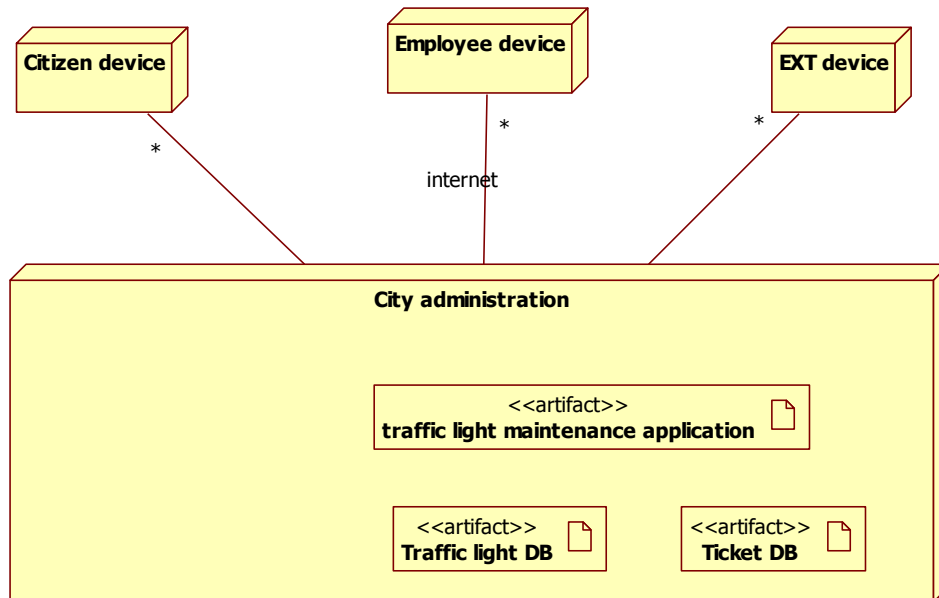
2 Functional model: Design and model (using BPMN + UML class diagram) the TO BE process





3-a IT Model / Technological model: describe the hardware architecture of the system  
(use **UML deployment diagram**)

Client (citizen or policeman, employee, EXT), server



3-b Business rule: define (in English, or formally) at least one business rule for the process

Only one ticket at a time, per one traffic light, can be opened

$\#closed\ tickets \geq \#open\ tickets$

At least 1/10 of tickets should be inspected by the police

5 Define the KPIs, considering these high level business goals (or CSF), CSF1 increase citizen safety, CSF2 reduce the cost of maintenance for the administration.

If needed, define also indicators that are not KPIs.

This case involves citizens, and two organizations – do not forget to consider their specific points of view.

CSF name	KPI Category (General, cost ..)	KPI Name	KPI Description	Unit of measure
	General	N_To	Number of tickets open per year	
	General	N_Tc	Number of tickets closed per year	
		N_I	Number of inspections by police	
CSF1 (citizen)	Service	LT	Lead time from opening of ticket (event ticket open) to closing (i.e. traffic light repaired) (event ticket closed)	Time
CSF2 (administration)	Efficiency	UC	Unit cost for a ticket = effort by city administration (effort for paperwork by office + effort by police for inspection) + C	Euro
		C	cost paid to EXT for the ticket	
CSF1 (EXT)	Service	LT_EXT	Lead time from ticket received by EXT (event ticket open) to maintenance completed by EXT (traffic light repaired) (event maintenance end)	Time
CSF2 (EXT)	Efficiency	UC_EXT	Unit cost for a ticket by EXT (effort + materials)  Remark that EXT charges to the administration C, that is NOT UC_EXT, (normally $C > UC\_EXT$ otherwise EXT loses money)	
CSF1 citizen	Quality	Lost tickets	$N\_Tc / N\_To * 100$ Should be 100, if less than one tickets could have been lost	%
CSF1 citizen		Inspection rate	$N\_I / N\_Tc * 100$ Should be as high as possible (max = 100), otherwise EXT's work is not controlled	%
CSF2 (administration)		Reopened tickets	#tickets reopened / $N\_Tc$ % 100 A ticket is reopened if inspection by police keeps finding a defect Should be as low as possible	%

6 Compare the previous and the current situation, using the KPIs defined above

KPI	AS IS	TO BE
N_To		No change, or possibly increase since web site is 24/7
N_Tc		No change
N_I		No change (anyway changes are don't depend on IT infrastructure)
LT		No change, or may be slightly reduced (faster communication with EXT)
UC		May be reduced for reduction in employee effort by city administration
C		No change (anyway changes are don't depend on IT infrastructure)
LT_EXT		No change, or may be slightly reduced (faster communication with EXT)
UC_EXT		No change (anyway changes are don't depend on IT infrastructure)
Lost tickets		This value could not be practically computed in AS IS
Inspection rate		This value could not be practically computed in AS IS
Reopened tickets		This value could not be practically computed in AS IS

- 7 Considering the city administration and the infrastructure they have to build, define the software functions needed, starting from the BPMN activities you have identified in question 2

Activity in BPMN	Software function(s) needed
Manage tickets	Create ticket, edit ticket (attach traffic light, change status), verify if ticket already exist for traffic light, notify EXT, notify police
Manage reports / inspections	Search ticket (by open time, by location, by traffic light, by status), create maintenance report, edit maintenance report, create inspection report, edit inspection report, attach report to ticket
Monitor	Analyze tickets per period, per status, compute average / max / min LT end to end, compute tickets with inspections, compute reopen tickets, match tickets and invoices..

- 8 Considering the comparison in point 6, summarize pros and cons for the 3 actors in the TO BE situation

	PROS	CONS
Citizens	24h /7 availability of service to signal failures	Need to be familiar with using web
Administration	Monitor of EXT (open and close tickets, close tickets vs invoices, LT of maintenance) feasible Lower effort by employees in office	IT infrastructure to be set up and maintained
EXT	Easier communication about tickets with city administration	More control by city administration



9 Consider the case of exercise 1. Frame the TO Be situation in terms of the outsourcing dimensions. Assume that the IT infrastructure (database of tickets, web site) is developed by company Z, all machines to run the application are owned and maintained by the city administration

	object	unicity	location
IT infrastructure - insourced	infrastructure	shared	On site
Application to manage tickets - outsourced	application	unique	On site

10 Consider again the case of exercise 1. Now assume that the IT infrastructure is developed and maintained by company EXT (the company in charge of traffic light maintenance). The city administration accesses the ticket management application 'as a service' offered by EXT. What are pros and cons of this configuration?

	Pros	Cons
City administration		Data is controlled by EXT, that could modify it at its advantage (ex introduce fake failures, shorten lead time of interventions)
EXT		

11 In ITIL the service operation process must handle incidents, problems and events. Which is the difference between incident, problem, event?

See slides

12 Considering the case of exercise 1, propose a few SLAs that the city administration could use to monitor the outsourcing relationship with EXT.

In fact SLAs can be these kpis defined in ex 5: LT, C, reopened tickets

13 Describe the multi sided business model, and provide an example of it