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Information Systems 01PDWOV

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

Medical visit or test.

In Italy the main way to obtain medical care is through the national health system (NHS). Every citizen, or resident in Italy, is recorded by the NHS, is identified by the fiscal code, and must select a general practitioner. Medical care through the NHS is, under some conditions (like age, income, type of illness or type of prescription), free of charge.
The general practitioner provides basic care and prescriptions for drugs. We focus here on the process to obtain other types of care that the general practitioner cannot deliver (such as specialist visits, lab exams, surgery, treatments, etc).
Emergency care follows other processes, and we will not consider them.

AS IS process
The citizen visits her general practitioner, who decides that some other treatment or visit is needed. Then she produces an 'impegnativa' or request for a treatment (RFT) from the NHS. The RFT is digital, is identified by a unique number, is attached to the citizen, and specifies a certain treatment. The RFT has two months validity. The RFT is recorded in the information system of the NHS. Also the treatment is coded and uniquely identified. From the economic point of view the treatment has a nominal cost that will be paid by the NHS to the entity that will deliver the treatment. The treatment has also a cost for the citizen – the cost depends on age, income of the citizen and other parameters, and in the best case this cost for the citizen is zero.

Next the citizen has to find an entity (private or public practice or hospital or lab) that can deliver the treatment. The citizen contacts the entity, provides both his fiscal code and RFT number, and (possibly) agrees on a date and time when the treatment will be delivered. No treatment can be delivered without a valid RFT.

At the agreed date and time the citizen reaches the entity and starts the acceptance. An office clerk checks the RFT and issues an invoice (as said before, the cost for the citizen may be zero in some cases). The citizen must then pay the invoice (either at a bank or local ATM). With the evidence of the invoice paid the citizen comes back at the same office. The office now schedules precisely the treatment (for instance sends the citizen to a specific room and doctor or room and machine).

Next step is the delivery of the treatment. The doctor in charge performs the treatment and finally produces a report.
The citizen (in the same day, or later, in function of the treatment), must come back at the acceptance office and collects the paper report.

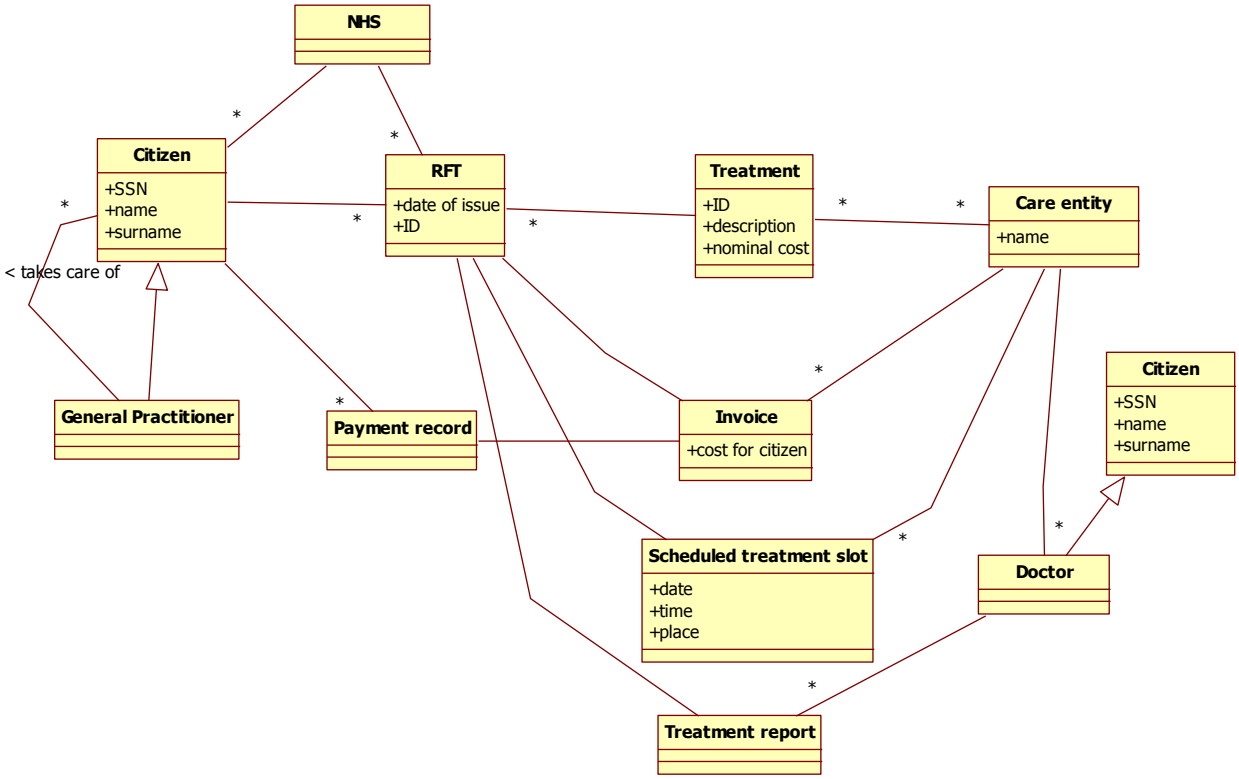
TO BE process.
Propose a new process, more convenient for the citizen

In the following model the AS IS situation.

1 Organizational model: list roles or organizational units involved (AS IS)

Patient/citizen, general practitioner, NHS, care provider (entity), payment system, care provider (doctor), care provider (acceptance)

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

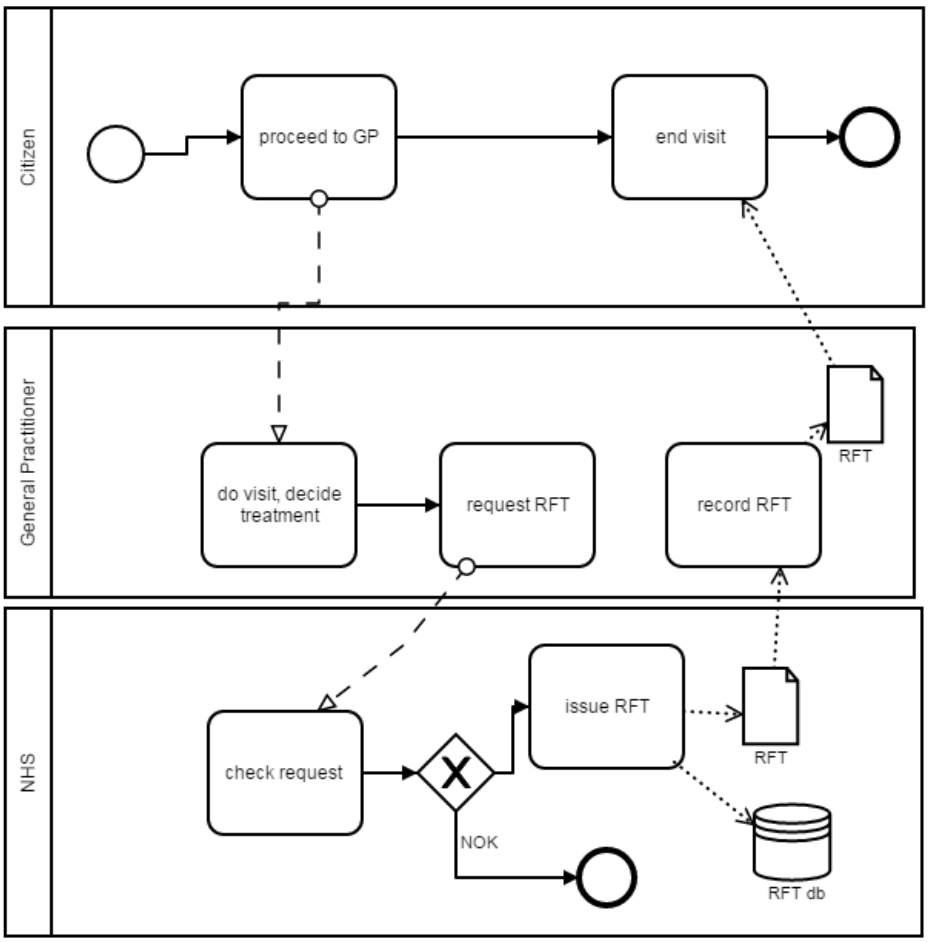


There are 4 sub-processes separated in time

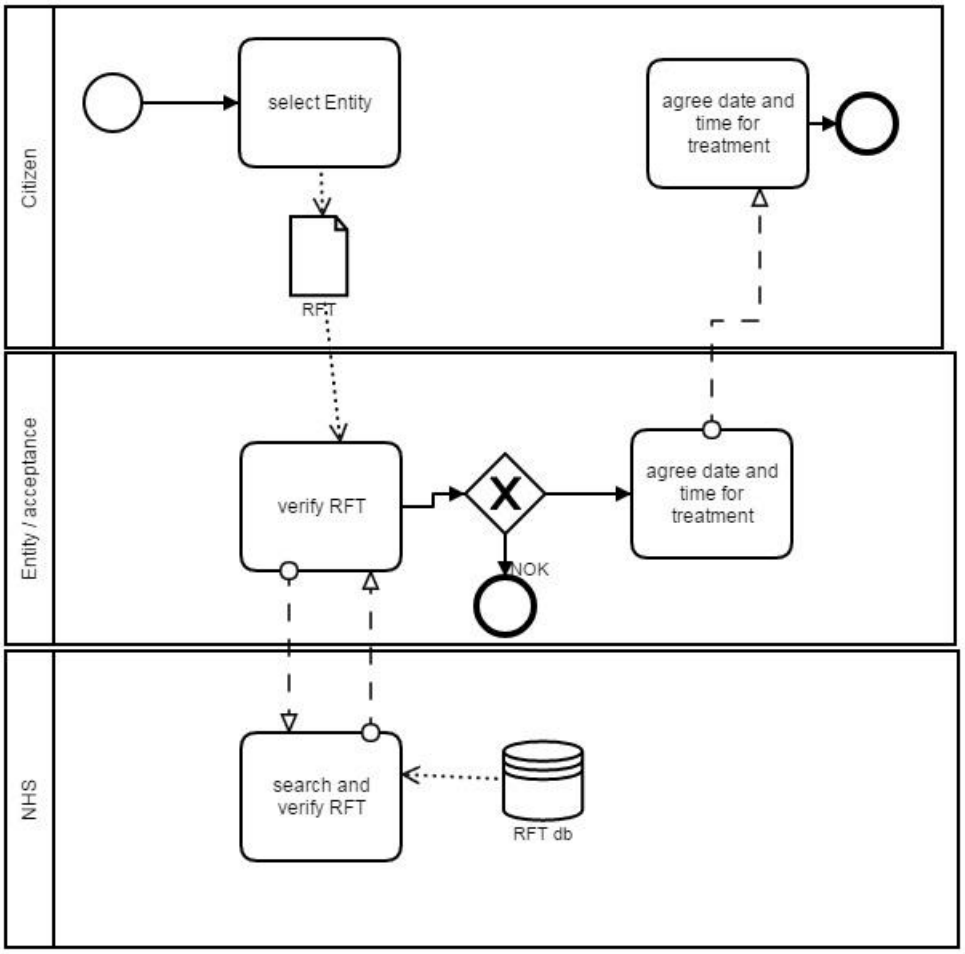
- Visit by general practitioner (GP)
- Schedule of treatment with entity
- Acceptance at entity, payment, delivery of treatment
- Delivery of report (sometimes can be produced immediately, sometimes -ex lab analysis- can be delivered only after some time)

Remark that the RFT is a sort of a travel ticket, identified by a PNR. It is issued and managed by the NHS (is not issued by GP, the GP asks to NHS for an RFT). Similarly, Entity checks the RFT by querying the NHS.

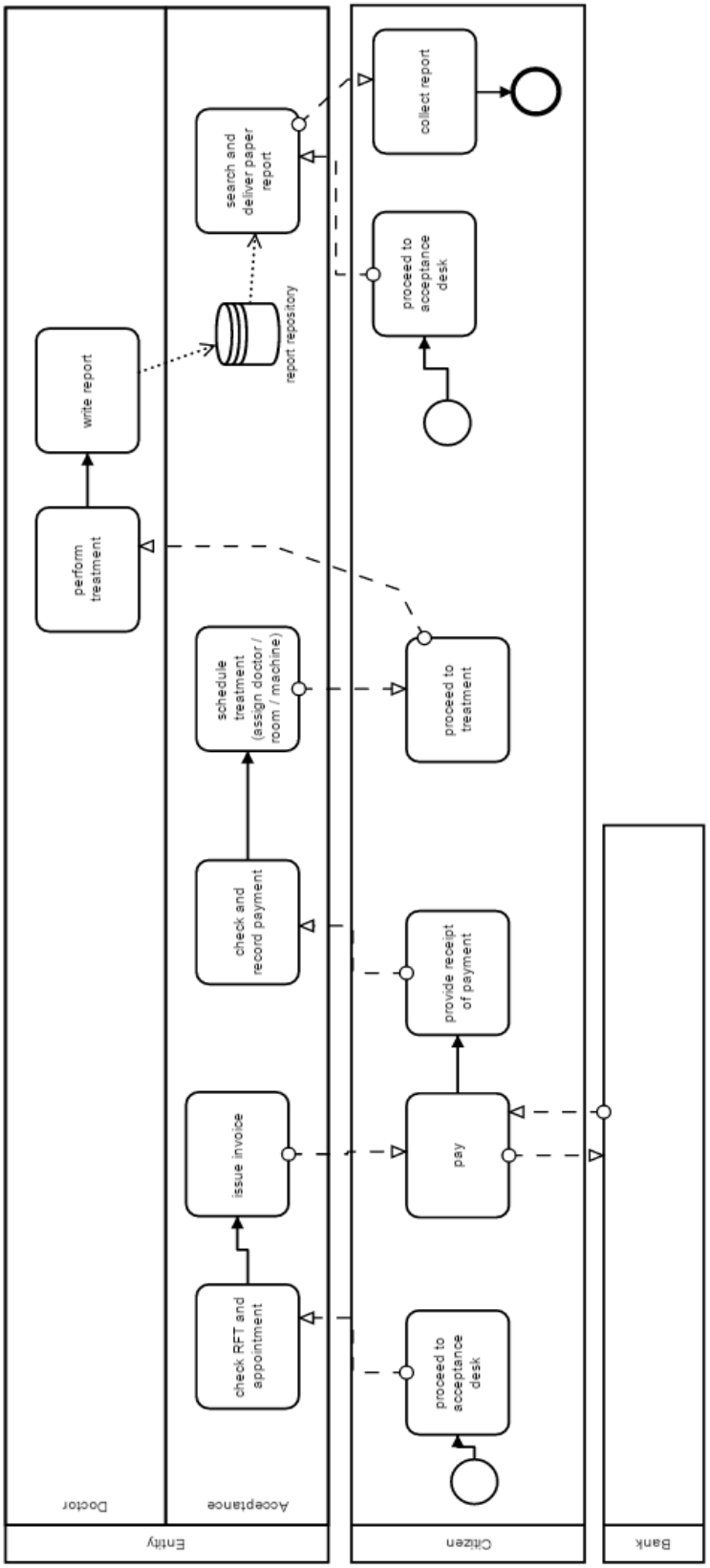
Visit by GP



Schedule treatment



Acceptance and deliver



report

In the following model the TO BE situation.

3-a IT Model / Technological model: describe the hardware architecture of the system (TO BE)

NHS server (list of citizens, RFT, agreed entities, agreed treatment types)
Entity server
General practioner server
Client / citizen
Client / general practitioner
Client / entity employee

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

Treatment can be delivered only if attached RFT is valid (RFT.issue date + 2 months >= scheduled treament slot.date)

4 Functional model: Design and model (using BPMN) the process (TO BE) (NO CLASS DIAGRAM required)

Out of the 4 subprocesses

- The visit by the GP cannot be improved much (no change, see AS IS)
- Schedule of treatment, could be done online or via call center (instead of physically). The AS IS already assumes this (so no change)
- The acceptance at the entity could be done online, with online payment of invoice and final precise scheduling of treatment also online
- The report could be delivered digitally. Email is not the best way to do it. A repository at GP is not optimal (citizen can change GP). Repository at Entity is not optimal (citizen uses a variety of entities, possibly a different one per RFT). Best option would be, the NHS assigns to each citizen a repository for all his/her medical documents. Repository accessible by the citizen, her GP, and all authorized entities (eg ER in case of need, or other entities when needed)

With these improvements the only physical interaction would be citizen – doctor in the entity, for the factual delivery of the treatment.

I suppose that the citizen selects one entity for the treatment. Another option is, NHS proposes a number of entities and treatment slots to the citizen. However the aggregation of all availability of treatments by all entities (both private and public) is a complicated problem (there are hundreds of entities just in one region, both public and private, each possibly with a different IS) that I leave outside of scope (if interested see CUP and SOVRACUP services).

5 Define the KPIs, considering these high level business goals (or CSF), CSF1 increase citizen satisfaction, CSF2 reduce the cost of the process. In the table below show the correspondence CSF – KPI

CSF name	KPI Category (General, cost ..)	KPI Name	KPI Description	Unit of measure
	General	N_rft	Number of RFT per year (per GP, per entity,)	
CSF2	Efficiency	UC_gp	Unit cost of one visit by GP, with issue of one or more RFT. Considers only administrative time (no medical visit time)	euro
CSF1	Service	LT_gp	Lead time for one visit (from 'do visit' to 'end visit')	time
CSF2	Efficiency	UC_schedule	Unit cost for scheduling treatment at a certain entity (effort of personnel at entity)	euro
CSF1	Service	LT_schedule	Lead time for one schedule (from 'verify RFT to 'agree date and time')	time
CSF2	Efficiency	UC_acceptance	Unit cost for acceptance of one RFT / treatment at a certain entity (effort of personnel at entity)	euro
CSF1	Service	LT_acceptance	Lead time for one acceptance (from)	time
CSF2	Efficiency	UC_report	Unit cost for delivery of one report at a certain entity (effort of personnel at entity) (no effort of doctor to write report)	euro
CSF1	Service	LT_report	Lead time for one delivery (from)	Time
CSF1, CSF2	Quality	E_report	Errors related to report / N_rft (errors: lost reports, reports to wrong citizen)	%

The process considered is inter organizational – at least 3 organizations are involved (GP, Entity, NHS), and consequently 3 cost centers, and 3 points of view.
It is essential to focus on KPI per subprocess, since in each sub process there is usually a dominant organization (ex GP for GP visit, Entity per schedule, acceptance, report).
Out of the 4 sub processes identified, 2 do not change (visit at GP, schedule treatment at entity). So we focus on KPIS for the two that actually change.

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

KPI	AS IS	TO BE
N_RFT		No change
UC_gp, LT_GP		No change. Issue of RFT is already digital
UC_schedule, LT_schedule		No change. Assuming this process is already done via call center or web site of entity
UC_acceptance	Done face to face personnel - patient	Done via app / web site. Effort of personnel greatly reduced
LT_acceptance		Should be reduced
UC_report	Done face to face personnel - patient	Done via web site / repository. Effort of personnel close to zero
LT_report		Should be greatly reduced

Define the TCO to shift to the TO BE situation
(applies to two systems, repository of reports per each document developed by NHS, IT support for acceptance developed by Entity)

Phase	**Cost**
Construction	Define requirements for new IT application, develop or acquire it
Deployment	Deployment of new IT application, training of employees
Operation	Electricity, conditioning
Maintenance	Fix of defects, development of new or enhanced functions
Dismissal	Port of data to new system

TCO = C+D + 5OM
$TCO_{per\ year}$ = TCO/5 (assuming 5 years depreciation period and 10 years usage)

7 Considering a 5 years period, define costs and savings (ROI analysis) by adopting the TO BE situation

Year/ cost or saving	Year 1	Year2	Year3	Year4	Year5
Cost	C, D				
cost	O, M	O, M	O, M	O, M	O, M
saving	S				

S = N_RFT (per entity) *(UC_report after – UC_report before)

9 Considering the KPIs and the ROI, is the TO BE situation better? (answer Yes or No): yes

Why?

CSF1 improves, because many LTs decrease (especially LT_report and LT_acceptance)
CSF2 also improves, again because UC_report decrease, and also probably UC_acceptance

10 A small manufacturing company selects these options for their IS. Every employee has a laptop connected to a wifi network. No server is installed on premise, data space is purchased on the cloud, and an ERP / CRM product is used as a service. Frame this case in terms of the outsourcing dimensions.

There are different levels to be considered
--laptop, wifi : infrastructure, not clear from text if rental or acquisition, on site
--data space: infrastructure, not unique, offsite
--erp/crm: application, (probably) not unique, offsite

11 Describe the concept of 'economy of scope' and provide an example

Share fixed costs on a larger variety of products (vs economy of scale, share fixed cost by increasing the production of same product)

12 What is the difference between a 'time and material' or 'fixed price' transaction? What are pros and cons of each one?

Time and material: price defined *after* delivery, in function of material and time spent. Con: seller does not know price, seller can try to inflate time and material; Pro, adaptable to changes in requirements
Fixed: price defined *upfront* vs a description of requirements. Pro, buyer knows price. Con: seller can try to reduce quality, no flexibility to change requirements, ambiguity on requirements

13 A small manufacturing company has a factory, a warehouse, an administration office, a sales office in Turin covering Italy, a sales office in Madrid covering Spain and Portugal. What kind of organizational structure is this?

Geo (sales), functional (manufacturing, admin)

14 Describe what is the role of the 'service desk' in ITIL

See slides