POLITECNICO
DI TORINO

Information Systems Project

01PDWOV

Analysis of the Trenitalia ticketing system

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1 The organization: Trenitalia

Trenitalia SpA is a company with a unique stakeholder under the direction and coordination of Ferrovie dello Stato Italiane SpA; it has as its object the exercise of medium and long-distance passenger transport, metropolitan and regional rail transport and freight rail transport.

1.1 Mission

The missions that Trenitalia has in its objectives are explained in the annual financial report.

At the basis of its mission, Trenitalia sets, as essential conditions, the safety of service, the quality, the health of its workers, the environmental protection and considers the centrality of the relationship with customers the way to achieve a stable competitive advantage and create value for the shareholder.

1.2 Size

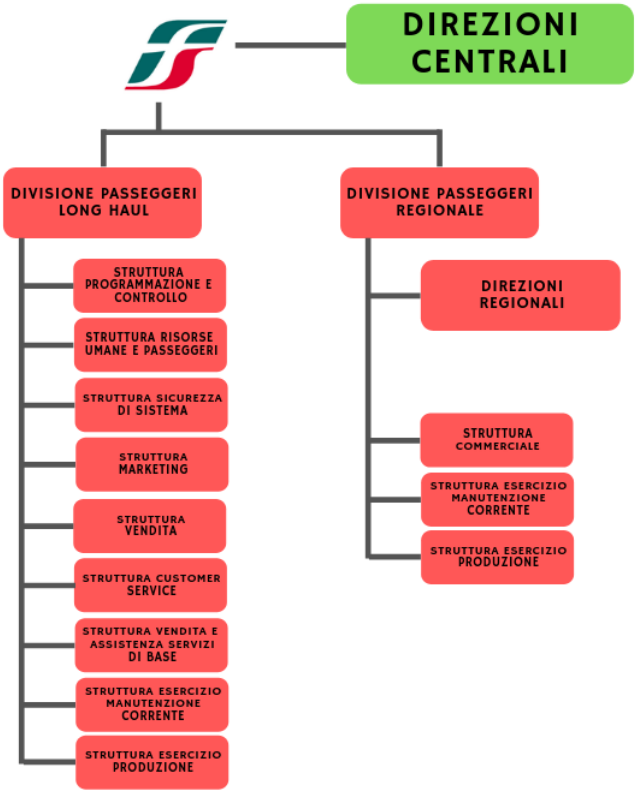
Employees The personnel working for the company in 2017 was of 27 639, a number higher than the previous year (27 421).

Railway fleet The last available value was of 9 339 trains for people (including electric trains, diesel trains, carriages).

1.3 Structure and Organization

The Trenitalia organizational model has a structure of hybrid type since it is at the same time functional (some business units are unique and not focused on the service to be offered) and divisional (because some others business units are repeated in each division) and in addition for Divisione Passeggeri Regionale the business units are replicated also per region.

Trenitalia organizational chart



More in detail **Direzioni Centrali** has several departments:

- **Direction:** President/CEO;
- **Chief Operating Officer:**
  - Sistemi Informativi;
  - Acquisti;
  - Pianificazione Industriale;
  - Logistica Industriale.
- **Chief Financial Officer:**
  - Amministrazione, Finanza e Controllo;
  - Risorse Umane e Organizzazione;
  - Strategie, Pianificazione, Regolamentazione e Sostenibilità.
- **Chief Risk Officer:**
  - Affari legali e societari;
  - Relazioni Istituzionali;
  - Protezione aziendale.
- Audit;
- Controllate estere.

The two main Divisions are differentiated on the basis of the type of passengers:

- the **Divisione Passeggeri Long Haul** carries mainly people on medium and long distances. The trains offered are the **Servizio Universale** trains which are completely financed by the Ministry of Infrastructures and Transport with their specific prices and the "**Market**" trains (like Frecciarossa, Frecciargento and Frecciabianca) which are dispatched according to clients demand;
- on the contrary, the **Divisione Passeggeri Regionale** has 20 Directions (for the regions which have submitted a contract for the railway service) and less substructures which are in part similar to the ones of the previous Division.

1.4 Critical Success Factors

CSF Name	Description	Type	Level
Customer Satisfaction	Ensure high level customer care, provide good services to improve customer satisfaction.	Competitive	Corporation
Safety Service	Provide safety service according to international norms for railways transportation (European Standards), reduce possible accidents and impacts.	Environmental	Function
Production Cost	As every customer cares about cost for the service, it's needed to develop an efficient and waste-free supply chain to minimize costs and be competitive with other companies.	Business domain	Function

1.5 Business Model Canvas

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Customer Relationships</th><th>Customer Segments</th></tr>
<tr><td rowspan="3">Rete Ferroviaria Italiana
Travel Agencies

Train suppliers

Italian Regions

Ministry of Infrastructure and Transportation</td><td>Provide medium-long transport
Provide regional transport
Manage security on trains

Provide ticketing systems
Manage trains and maintenance</td><td rowspan="3">Provide quality transportation
Assurance of environmental protection</td><td>Fidelity programs

Assistance in the stations
Assistance for passengers with mobility problems
Self service

Refunds and client reports</td><td rowspan="3">Citizens</td></tr>
<tr><td>Key Resources</td><td>Channels</td></tr>
<tr><td>Physical: stations, vehicles, platforms, networks
Human: workers
Financial: funds, stock options</td><td>Stations

Tickets Office
Web</td></tr>
<tr><th colspan="3">Cost Structure</th><th colspan="2">Revenue Stream</th></tr>
<tr><td colspan="3">Facilities cost
Personnel cost
Maintenance cost</td><td colspan="2">Revenue for ticket selling
Revenue from Ministry
Revenue from Region's contracts</td></tr>
</table>

1.6 Important processes (Divisione Long Haul)

- Control & Programming
- Customer Care Management
- Human Resources Management
- Personnel Training
- Security Management
- Marketing & Sales Management
- Traffic & Delays Management
- Public Information Management
- Basic Assistance Management
- Train Production
- Train Maintenance

2 Focus on the IT area

PICO is the digital **Integrated Commercial Platform** that combines the best industry practices and the advanced analytics capabilities to offer an agile solution for travellers. It supports the entire sales process, covering all channels and spanning across multiple front-end systems. PICO is an asset owned by Trenitalia and has been developed in partnership with IBM.

2.1 The infrastructure

PICO has a common service infrastructure that is connected to many and heterogeneous systems.

- **PICO Channels**: are the channels used to sell tickets and to get in touch with clients (we still find the traditional ones like the ticket office in the station or the travel agency but also the new ones, including personnel devices used both to issue and check tickets).

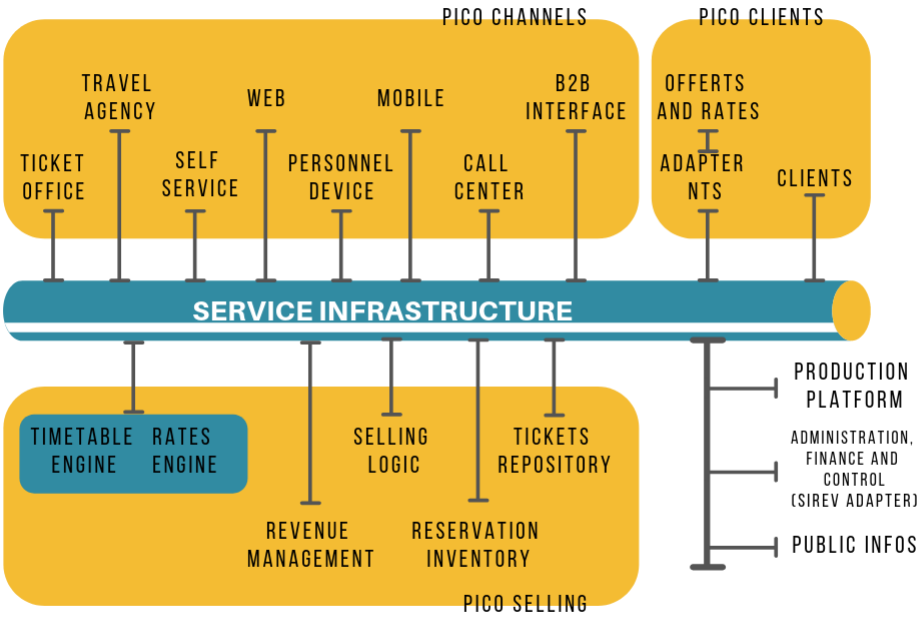


Figure 1: Trenitalia PICO service infrastructure.

- **PICO Selling**: contains all the systems useful to manage ticket selling; the research done by the clients on the different platforms is operated by the timetables and rates engines (which work also with the offers and rates system). This area has also an adapter which enables the system to do money transactions but also a repository of sold tickets and an inventory of tickets to sell. Last part is the revenue management.
- **PICO Clients**: is very relevant in this analysis because it contains both the offers and rates system which works thanks to an adapter but especially the client system which contains all data about clients and interacts with the revenue management and the ticket repository.

Moreover the service infrastructure talks with other systems and infrastructures which are reported here:

- **Production Platform**: is used for many purposes but especially for train management when they are under maintenance.
- **SIREV**: centralized reporting, monitoring and accounting platform that checks the daily situation revenues for each sales channel.
- **Public Infos**: keeps track of train performance by recording arrival and departure times in each station. Informations are displayed in the stations, are available on the different apps (both the mobile ones and the web portal "Viaggia Treno") and are used to emit refunds in case of delay.

2.2 IT area

IT area according to the company structure is organized as staff function ("Sistemi Informativi" Department is part of Direzioni Centrali) because it's a service to line function.

3 Process: ticket refund

The refund of a ticket is a process that happens in the company only in presence of a delay at the arrival.

In compliance with the **European Regulation** No. 1371/2007, in case of delay at the final destination, customers are entitled to receive a payment refund, bonus or cash (only at the ticket offices), equal to:

- **25%** of the ticket price for a delay between 60 and 119 minutes;
- **50%** of the ticket price for a delay of at least 120 minutes.

The compensation for delay is calculated with respect to the total price and to the arrival time of the entire travel solution.

These conditions are valid only for "Le Frecce"[1] and "Intercity" trains while different conditions and request modes are available for Divisione Passeggeri Regionale.

The process starts after the travel only in case the passenger wants to request the ticket refund. The request could be done within a year with many different channels. The refund request is then checked and only if it is valid a bonus[2] is provided to the customer.

In the AS IS situation is analysed the current process for travel refund before the introduction of a software logic to automatically check, emit and forward the digital bonus.

The TO BE situation would be devoted to the analysis of the digitalized process the would be carried totally by the Information System.

Finally, a comparison between the two situations is provided in order to evaluate pros and cons.

3.1 AS IS

At the current time, as already discussed in the previous introduction, the ticket refund can be requested by the customer in case of a delay. This means that the first actor that starts the process in the Trenitalia company is the client.

The client can ask for a refund in four different ways:

- **at the ticket office**, interacting with Trenitalia personnel which checks the availability through an Information System (PICO);
- **at the Call Center**, doing a procedure similar to the one just described;
- **with a Web Form**, available in the Trenitalia web site, which is checked then by Assistance personnel;
- **in the Personal Area** of the Trenitalia web site, by clicking on the button present in each purchased travel.

In three cases the evaluation for the refund emission is done by the PICO system but the client must always start the process. Moreover in the third solution an employee should manually check the request and answer with an email to the customer.

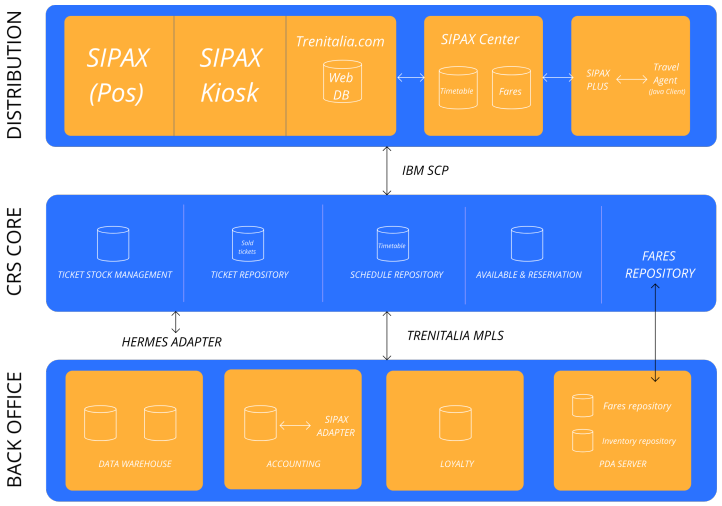
The evaluation is done by looking at the PNR (Passenger Name Record) which is a unique code that identifies the ticket and the travel and the public informations available for the train related to the travel. By crossing these informations is possible to get the delay in the station shown in the ticket.

3.1.1 Technological model/view

The model is divided in three areas/systems:

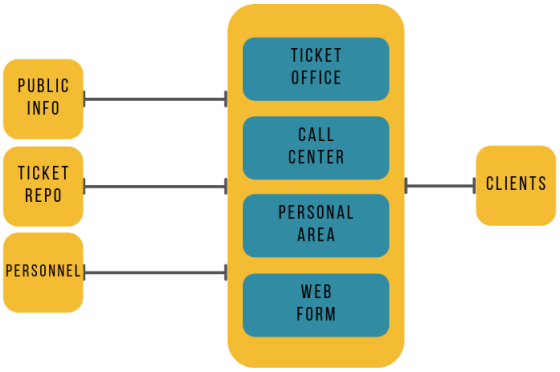
- **Distribution**: this area of the model contains all the interfaces for the customer purchase (SIPAX Pos, both for Web and ticket offices; SIPAX Kiosk, for self services; SIPAX PLUS, for Travel Agencies) and the **SIPAX Center** which is in charge of controlling the different channels.
- **CRS (Computer Reservation System) Core**: contains all the repositories and databases for tickets, fares, seats and trains. It can be interfaced with other European services for ticket selling through the Hermes Adapter.
- **Back Office**: contains the data warehouses, the databases related to accounting and loyalty.

[1] In particular for these kind of trains Trenitalia gives a refund also in case of a delay between 30 and 59 minutes.
[2] Digital money or voucher to use for a following purchase.



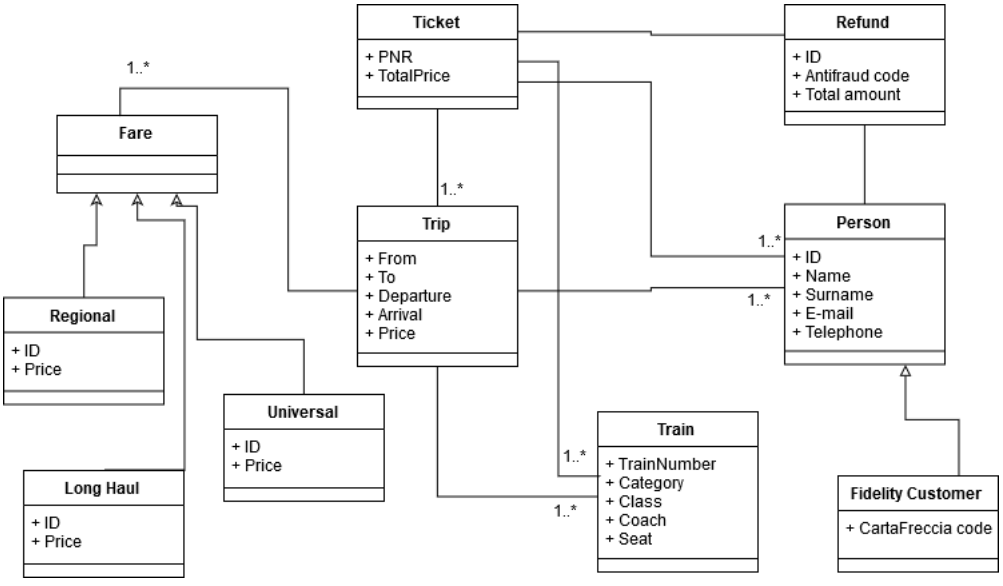
Information flow between Distribution and CRS is guaranteed by the IBM SCP, a protocol for secure transmissions, and between CRS and Back Office through the Trenitalia MPLS that allows also the communication with other systems in the PICO architecture.

3.1.2 Organizational view

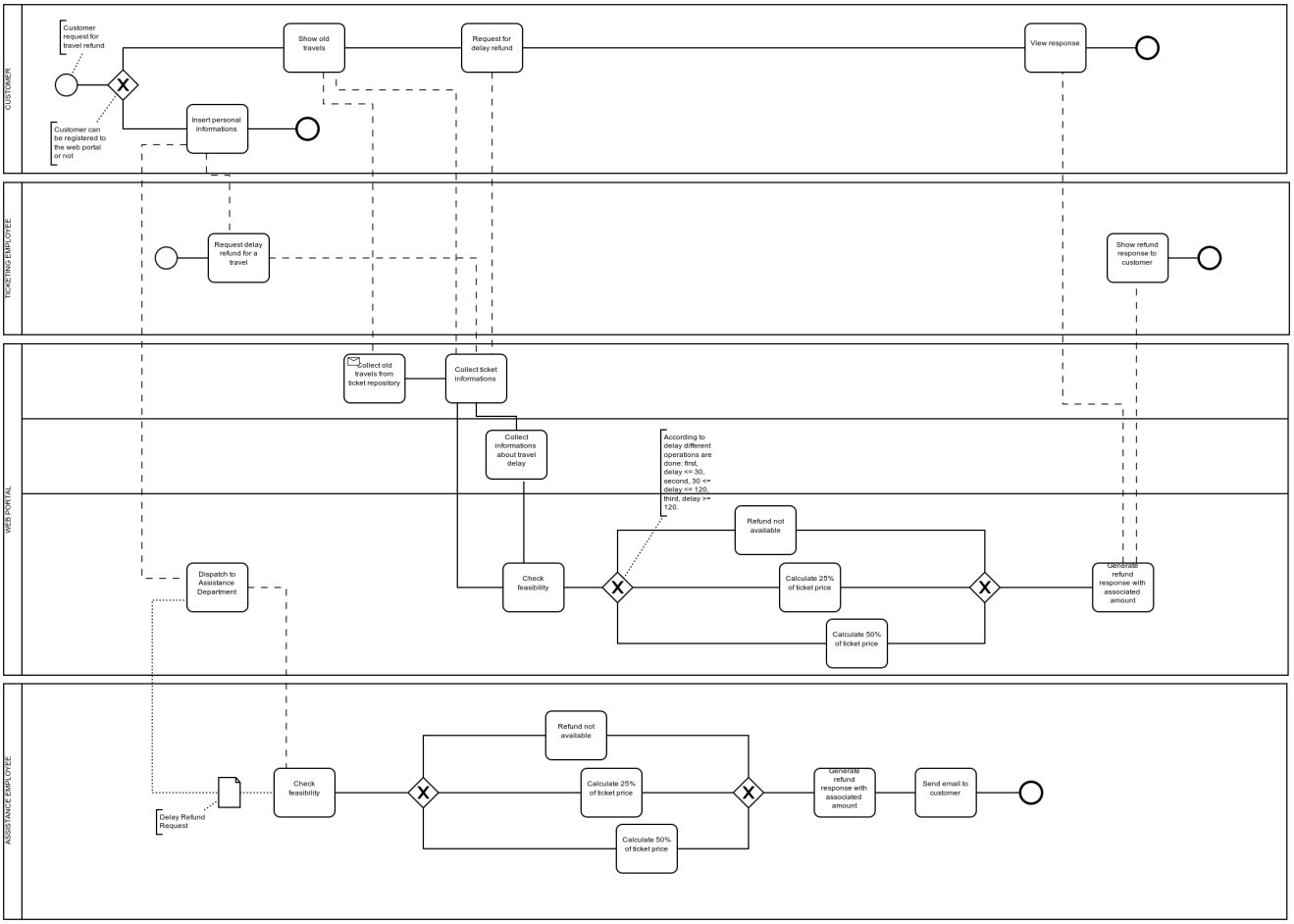


3.1.3 Functional view

UML



Process (BPMN)



3.2 TO BE

In the new situation we would like to introduce a new **software** which takes care of all the refund process, being the first actor instead of the customer asking for it and in particular, after the completion of a travel, it will check if there have been a delay greater than 30 minutes.

If true, the software will automatically collect all the tickets related to that travel (by looking at the ticket repository) and will calculate the corresponding refund based on the ticket price paid.

The software will provide also an email or sms notification to the customer in order to let him or her receive a voucher to be used or to do further purchases or to be translated in money in one of the self-service machines.

In fact we have provided all the refund vouchers with a QR code that can be scanned in the self services available in all the stations to get back the corresponding amount of money.

3.2.1 Technological model/view

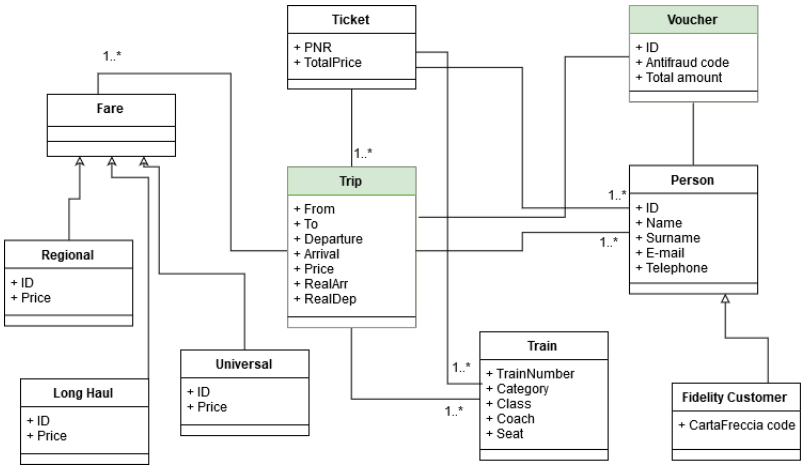
The technological view is similar to the one presented in the AS IS situation, the differences is mainly the refund software, in the new interaction created with self-service machines to get the money back and the QR code system.

3.2.2 Organizational view

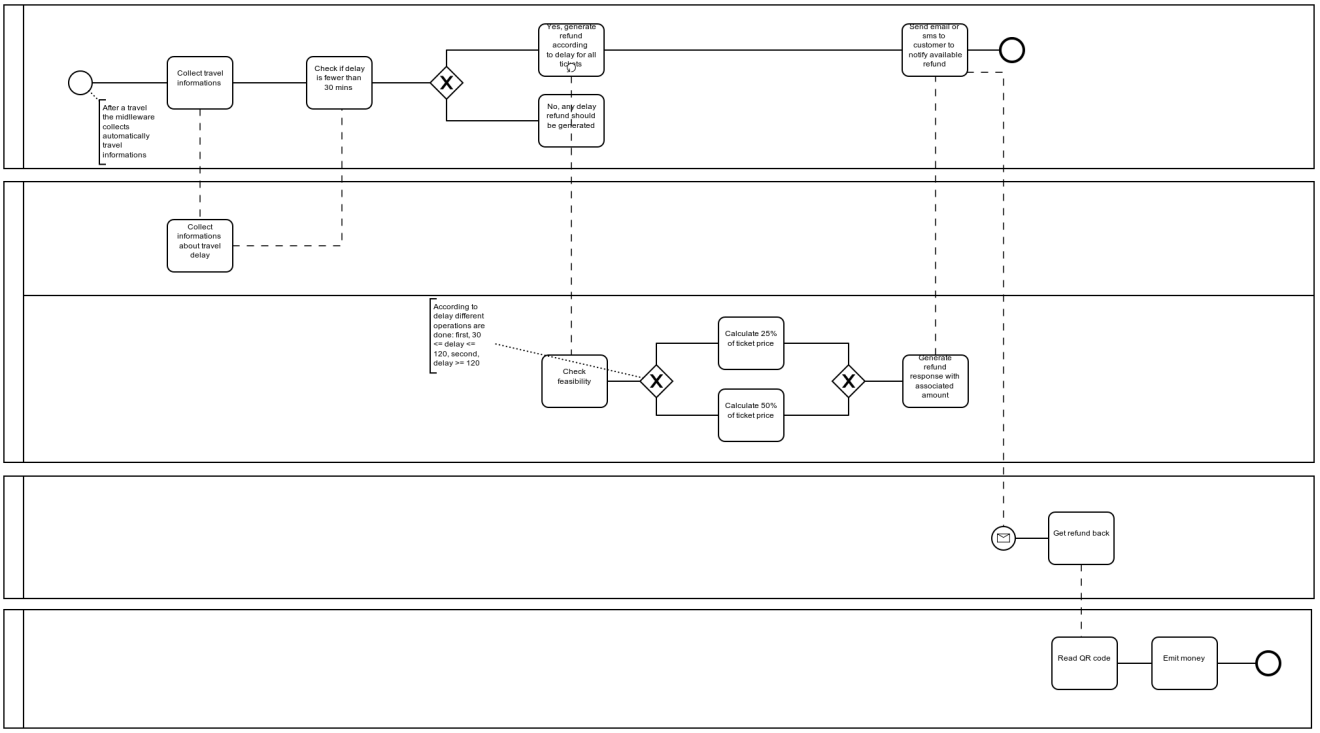
For Trenitalia, employees at the ticket office and managers. Customers continue to be part of the organizational view.

3.2.3 Functional view

UML



Process (BPMN)



4 Evaluation

4.1 KPI

CSF	KPI Category	KPI Name	KPI Description	Unit of Measure
	General	N_I	# of received requests	
		N_O	# of provided refunds	
		HR	# of employees for the process	
		NH	Tools, software, documentation	
Production Cost	Efficiency	U_C	(effort/N_I) where effort=(effort_employees * hour cost) + effort of customers + cost of infrastructure	Euro
Production Cost, Customer satisfaction	Service	L_1	Time between the completion of the trip and the moment in which the client asks for the refund	Time
Production Cost, Customer satisfaction		L_2	Time between the request and the time the customer has the refund	Time
Customer satisfaction	Quality	C	Percentage of errors during the process	%
Customer satisfaction		R	Deliver time of a request	Time

4.2 Comparison

KPI	AS IS	TO BE
N_I		Greater number because the process starts automatically at the end of the trip
N_O		Equal, no relevant changes
HR, NT		HR decreases, NT increases with the new application
U_C	Lot of effort for employees, different channels are presents that need different treatments. Lot of effort for customers that need to contact Trenitalia to request the refund. Paper is still present.	New costs for the IT infrastructure but reduced costs for paper (no paper used), effort of employees that are present only to give back money at ticket offices.
L_1	Minimum 24 hours later, maximum 1 year.	Zero because the system automatically generates the refund after the completion of the trip.
L_2	Ticket office, call center, web form: maximum 30 days. Web application: immediate.	Immediate as in the previous case.
C, R		Reduced due to automation, less informations are introduced by customers.

4.3 IT support

New IT functions regard principally the interaction between the different databases where are stored the sold tickets and the repository of the public information where are contained travel infos.

Once the train has arrived to the final destination of the trip, should collect all the tickets associated to that travel and compute for each final destination of the tickets (also the intermediate ones) the possible delay and establish the refund.

At the end an sms or email notification should be generated.

As the software is developed at the current time by IBM, to increase the compatibility and reduce the amount of errors in the first times, the development could be assigned to IBM.

Thanks to this solution the IT model won't change because only a software component should be added but the entire framework remains unchanged.

Actually by developing the software externally we will introduce transition and decision costs that should be part of the final estimation.

4.4 Cost

4.4.1 Total Cost of Ownership

Phase	Cost
Construction (C)	Cost to acquire the IT infrastructure: in this case only related to the definition of requirements (no need of changes on the infrastructure).
Development (D)	Cost for deployment of the software and training of employees (small cost because interaction with employees is very reduced).
Operation Maintenance (OM)	Cost for software and infrastructure updates which are related to other IT updates already defined in the company.
Dismissal (DS)	Cost for uninstallation and data porting to new IT infrastructure.

TCO is computed as: $TCO = C + D + (5 * OM)$.

4.4.2 ROI

	Year 1	Year 2	Year 3	Year 4	Year 5
Cost	C + D				
Cost	OM	OM	OM	OM	OM
Savings	S	S	S	S	S

S is computed as: $S = U\_C_{AS\_IS} - U\_C_{TO\_BE} > 0$. In fact the U_C in the TO BE model, even if there are new costs related to the software, is reduced because there is less need of employees effort and less infrastructure costs.

5 Conclusions

The possibility to introduce this new software introduces many advantages:

- Reduced time for customers to receive a refund in case of delay;
- Increased customer satisfaction;
- Unique way to receive a refund (via sms or email, which are necessary to emit a ticket);
- No need to request it;
- Few personnel requested to manage the process.

The disadvantages are instead:

- All the refunds should be emitted;
- Cost for software developing.

In the end, probably the introduction of this new way to emit refunds will increase the customer satisfaction which should be in any case fundamental for the company, the cost also to follow the entire procedure will decrease because less effort is needed and IT costs are now present instead of costs for the previous infrastructure.