



# **POLITECNICO**

## **MILANO 1863**

### PowerEnJoy Integration Test Plan Document

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## Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
1.1	Purpose and scope . . . . .	3
1.2	Definitions, Acronyms, Abbreviations . . . . .	3
1.3	Reference Documents . . . . .	3
<b>2</b>	<b>Project size, cost and effort estimation</b>	<b>3</b>
2.1	Size estimation: function points . . . . .	3
2.1.1	Internal Logic Files (ILFs) . . . . .	4
2.1.2	External Logic Files (ELFs) . . . . .	4
2.1.3	External Inputs (EIs) . . . . .	4
2.1.4	External Inquiries (EQs) . . . . .	5
2.1.5	External Outputs (EOs) . . . . .	5
2.1.6	Overall estimation . . . . .	5
2.2	Cost and effort estimation: COCOMO II . . . . .	6
2.2.1	Scale Drivers . . . . .	6
2.2.2	Cost Drivers . . . . .	7
2.2.3	Effort equation . . . . .	14
2.2.4	Schedule estimation . . . . .	14
<b>3</b>	<b>Schedule</b>	<b>14</b>
3.1	Global . . . . .	16
3.2	RASD . . . . .	18
3.3	DD . . . . .	20
3.4	IT . . . . .	22
3.5	PP . . . . .	24
3.6	First release . . . . .	26
3.7	Second release . . . . .	28
3.8	Third release . . . . .	30
<b>4</b>	<b>Risk management</b>	<b>31</b>
4.1	Business risks . . . . .	31
4.2	Project risks . . . . .	32
4.3	Technical risks . . . . .	33
<b>5</b>	<b>Effort Spent</b>	<b>34</b>

## 1 Introduction

### 1.1 Purpose and scope

### 1.2 Definitions, Acronyms, Abbreviations

### 1.3 Reference Documents

## 2 Project size, cost and effort estimation

### 2.1 Size estimation: function points

For Internal Logic Files and External Logic Files

	Data Elements		
<i>Record Elements</i>	<i>1-19</i>	<i>20-50</i>	<i>51+</i>
1	Low	Low	Avg
2-5	Low	Avg	High
6+	Avg	High	High

For External Output and External Inquiry

	Data Elements		
<i>File Types</i>	<i>1-5</i>	<i>6-19</i>	<i>20+</i>
0-1	Low	Low	Avg
2-3	Low	Avg	High
4+	Avg	High	High

For External Input

	Data Elements		
<i>File Types</i>	<i>1-4</i>	<i>5-15</i>	<i>16+</i>
0-1	Low	Low	Avg
2-3	Low	Avg	High
4+	Avg	High	High

UFP Complexity Weights

	Complexity Weight		
<i>Function Type</i>	<i>Low</i>	<i>Average</i>	<i>High</i>
Internal Logic Files	7	10	15
External Logic Files	5	7	10
External Inputs	3	4	6
External Outputs	4	5	7
External Inquiries	3	4	6

### 2.1.1 Internal Logic Files (ILFs)

ILF	Complexity	FPS
Login data	Low	7
Passenger data	Low	7
Taxi drivers	Low	7
Zones	Low	7
Queues	Average	10
Reservations and requests	Low	7
API permissions	Average	10
Total		55

### 2.1.2 External Logic Files (ELFs)

ELF	Complexity	FPS
ETA computation	Low	10
Reverse geocoding	Low	10
Map data retrieval	Low	10
Total		30

### 2.1.3 External Inputs (EIs)

EI	Complexity	FPS
Login/Logout	Low	2x3
Password retrieval	Average	4
Change settings	Average	4
Request or reserve a taxi	High	2x4
Delete a reservation	Low	3
Register a new passenger account	Average	4
View reservation history	Low	3
Insert, delete and update zones	High	3x6
Insert, delete and update taxi drivers	High	3x6
Request service statistics	High	6
Grant and revoke app privileges	Average	2x4
Grant and revoke plugin privileges	Average	2x4
Accept, refuse and end ride	High	3x6
Set taxi availability	Average	4
Total		112

#### 2.1.4 External Inquiries (EQs)

EQ	Complexity	FPs
Retrieve taxi position in queue	Low	3
Retrieve passenger reservation history	Low	3
Retrieve list of taxi drivers	Low	3
Retrieve list of zones	Low	3
Retrieve list of passengers	Low	3
Retrieve list of approved applications	Low	3
Retrieve list of approved plugins	Low	3
Total		21

#### 2.1.5 External Outputs (EOs)

EO	Complexity	FPs
Taxi request assignment notification	Low	4
Request accepted notification	Low	4
Request dropped notification	Low	4
Zone changed notification	Low	4
Position in the queue changed notification	Low	4
Total		20

#### 2.1.6 Overall estimation

The following table summarizes the results of our estimation activity:

Function Type	Value
Internal Logic Files	55
External Logic Files	30
External Inputs	112
External Inquiries	21
External Outputs	20
Total	238

$$\text{SLOC} = 238 * 46 = 10948$$

and an upper bound of

$$\text{SLOC} = 238 * 67 = 15946$$

## 2.2 Cost and effort estimation: COCOMO II

### 2.2.1 Scale Drivers

In order to evaluate the values of the scale drivers, we refer to the following official COCOMO II table:

Scale Factor values,  $SF_j$ , for COCOMO II Models

Scale Factors	Very Low	Low	Nominal	High	Very High	Extra High
PREC	thoroughly unprecedented	largely unprecedented	somewhat unprecedented	generally familiar	largely familiar	thoroughly familiar
$SF_j$	6.20	4.96	3.72	2.48	1.24	0.00
FLEX	rigorous	occasional relaxation	some relaxation	general conformity	some conformity	general goals
$SF_j$	5.07	4.05	3.04	2.03	1.01	0.00
RESL	little (20%)	some (40%)	often (60%)	generally (75%)	mostly (90%)	full (100%)
$SF_j$	7.07	5.65	4.24	2.83	1.41	0.00
TEAM	very difficult interactions	some difficult interactions	basically cooperative interactions	largely cooperative	highly cooperative	seamless interactions
$SF_j$	5.48	4.38	3.29	2.19	1.10	0.00
PMAT	Level 1 Lower	Level 1 Upper	Level 2	Level 3	Level 4	Level 5
$SF_j$	7.80	6.24	4.68	3.12	1.56	0.00

The results of our evaluation is the following:

Scale Driver	Factor	Value
Precedentedness (PREC)	Low	4.96
Development flexibility (FLEX)	Low	4.05
Risk resolution (RESL)	Very high	1.41
Team cohesion (TEAM)	Very high	1.10
Process maturity (PMAT)	Level 3	3.12
Total		14.64

### 2.2.2 Cost Drivers

- Required Software Reliability:

Since the system represents the only way to get taxis in the city, a malfunctioning could lead to important financial losses. For this reason, the RELY cost driver is set to high.

RELY Cost Drivers						
RELY De- scriptors	slightly inconve- nience	easily re- coverable losses	moderate recov- erable losses	high finan- cial loss	risk to hu- man life	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multi- pliers	0.82	0.92	1.00	1.10	1.26	n/a

- Database size:

This measure considers the effective size of our database. We don't have the ultimate answer, but our estimation given the tables and fields we have is to reach a 3GB database. Since it is distributed over 10.000-15.000 SLOC, the ratio D/P (measured as testing DB bytes/program SLOC) is between 209 and 314, resulting in the DATA cost driver being high.

DATA Cost Drivers						
DATA Descriptors		$\frac{D}{P} < 10$	$10 \leq \frac{D}{P} \leq 100$	$100 \leq \frac{D}{P} \leq 1000$	$\frac{D}{P} > 1000$	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multi- pliers	n/a	0.90	1.00	1.14	1.28	n/a

- Product complexity:

Set to very high according to the COCOMO II rating scale.

CPLX Cost Driver						
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multi- pliers	0.73	0.87	1.00	1.17	1.34	1.74

- Required reusability:

In our case, the reusability requirements are limited in scope to the project itself, so the RUSE cost driver is set to nominal.

RUSE Cost Driver						
RUSE De- scriptors		None	Across project	Across program	Across product line	Across multiple product lines
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multi- pliers	n/a	0.95	1.00	1.07	1.15	1.24

- Documentation match to life-cycle needs:

This parameter describes the relationship between the documentation and the application requirements. In our case, every need of the product life-cycle is already foreseen in the documentation, so the DOCU cost driver is set to nominal.

DOCU Cost Driver						
DOCU De- scriptors	Many life- cycle needs uncovered	Some life- cycle needs uncovered	Right- sized to life-cycle needs	Excessive for life- cycle needs	Very ex- cessive for life-cycle needs	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multi- pliers	0.81	0.91	1.00	1.11	1.23	n/a

- Execution time constraint:

This parameter describes the expected amount of CPU usage with respect to the computational capabilities of the hardware. As my-TaxiService is a quite complex piece of software, our expectance is that its CPU usage will be very high.

TIME Cost Driver						
TIME De- scriptors			$\leq 50\%$ use of available execution time	70% use of available execution time	85% use of available execution time	95% use of available execution time
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multi- pliers	n/a	n/a	1.00	1.11	1.29	1.63

- Storage constraint:

This parameter describes the expected amount of storage usage with respect to the availability of the hardware. As current disk drives



can easily contain several terabytes of storage, this value is set to nominal.

STOR Cost Driver						
STOR Descriptors			$\leq 50\%$ use of available storage	70% use of available storage	85% use of available storage	95% use of available storage
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	n/a	n/a	1.00	1.05	1.17	1.46

- Platform Volatility:

For what concerns the core system, we don't expect our fundamental platforms to change very often. However, the client applications may require at least a major release once every six months to be aligned with the development cycle of the main mobile operating systems. For this reason, this parameter is set to nominal.

PVOL Cost Driver						
PVOL Descriptors		Major change every 12 mo., minor change every 1 mo.	Major: 6mo; minor: 2wk.	Major: 2mo, minor: 1wk	Major: 2wk; minor: 2 days	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	n/a	0.87	1.00	1.15	1.30	n/a

- Analyst Capability:

We think the analysis of the problem has been conducted in a thorough and complete way with respect to a potential real world implementation. For this reason, this parameter is set to high.

ACAP Cost Driver						
ACAP Descriptors	15th percentile	35th percentile	55th percentile	75th percentile	90th percentile	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	1.42	1.19	1.00	0.85	0.71	n/a

- Programmer Capability:

We have not implemented the project, so this parameter is just an estimation; however we are fairly in our programming abilities, so we'll set this parameter to high.

PCAP Cost Driver						
PCAP Descriptors	15th percentile	35th percentile	55th percentile	75th percentile	90th percentile	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	1.34	1.15	1.00	0.88	0.76	n/a

- Application Experience:

We have some experience in the development of Java applications, but we never tackled a Java EE system of this kind. For this reason we're going to set this parameter to low.

APEX Cost Driver						
APEX Descriptors	$\leq 2$ months	6 months	1 year	3 years	6 years	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	1.22	1.10	1.00	0.88	0.81	n/a

- Platform Experience:

We don't have any experience with the Java EE platform, but we have some previous experience with databases, user interfaces and server side development. For this reason, we're going to set this parameter to nominal.

PLEX Cost Driver						
PLEX Descriptors	$\leq 2$ months	6 months	1 year	3 years	6 years	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	1.19	1.09	1.00	0.91	0.85	n/a

- Language and Tool Experience:

We don't have any experience with the Java EE platform, but we have some previous experience with databases, user interfaces and server side development. We are also knowledgeable of the development environment, so we're going to set this parameter to nominal.

LTEX Cost Driver						
LTEX Descriptors	$\leq 2$ months	6 months	1 year	3 years	6 years	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	1.20	1.09	1.00	0.91	0.84	n/a

- Personnel continuity:

This parameter is quite relevant in our case, since the time we can spend on this project is limited. For this reason, this parameter is set to very low.

PCON Cost Driver						
PCON Descriptors	48% / year	24% / year	12% / year	6% / year	3% / year	

Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	1.29	1.12	1.00	0.90	0.81	n/a

- Usage of Software Tools:

Our application environment is complete and well integrated, so we'll set this parameter as high.

TOOL Cost Driver						
TOOL Descriptors	edit, code, debug	simple, frontend, backend CASE, little integration	basic life-cycle tools, moderately integrated	strong, mature life-cycle tools, moderately integrated	strong, mature, proactive life-cycle tools, well integrated with processes, methods, reuse	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multipliers	1.17	1.09	1.00	0.90	0.78	n/a

- Multisite development:

Although we live in two different cities, we have collaborated relying hugely on wideband Internet services including social networks and emails. For this reason, we're going to set this parameter to very high.

SITE Cost Driver						
SITE Col- location Descriptors	Intern- ational	Multi-city and multi- company	Multi-city or multi- company	Same city or metro area	Same building or complex	Fully collo- cated
SITE Com- munications Descriptors	Some phone, mail	Individual phone, fax	Narrow band email	Wideband electronic communi- cation	Wideband elect. comm., occasional video conf.	Interactive multime- dia
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multi- pliers	1.22	1.09	1.00	0.93	0.86	0.80

- Required development schedule:

Although our efforts were well distributed over the available development time, the definition of all the required documentation took a consistent amount of time, especially for the requirement analysis and the design phases. For this reason, this parameter is set to high.

SCED Cost Driver						
SCED De- scriptors	75% of nominal	85% of nominal	100% of nominal	130% of nominal	160% of nominal	
Rating level	Very low	Low	Nominal	High	Very High	Extra High
Effort multi- pliers	1.43	1.14	1.00	1.00	1.00	n/a

Overall, our results are expressed by the following table:

Cost Driver	Factor	Value
Required Software Reliability (RELY)	High	1.10
Database size (DATA)	High	1.14
Product complexity (CPLX)	Very high	1.34
Required Reusability (RUSE)	Nominal	1.00
Documentation match to life-cycle needs (DOCU)	Nominal	1.00
Execution Time Constraint (TIME)	Very high	1.29
Main storage constraint (STOR)	Nominal	1.00
Platform volatility (PVOL)	Nominal	1.00
Analyst capability (ACAP)	High	0.85
Programmer capability (PCAP)	High	0.88
Application Experience (APEX)	Low	1.10
Platform Experience (PLEX)	Nominal	1.00
Language and Tool Experience (LTEX)	Nominal	1.00

Personnel continuity (PCON)	Very low	1.12
Usage of Software Tools (TOOL)	High	0.90
Multisite development (SITE)	Very high	0.86
Required development schedule (SCED)	High	1.00
Total		1.54613

### 2.2.3 Effort equation

This final equation gives us the effort estimation measured in Person-Months (PM):

$$\text{Effort} = A * \text{EAF} * \text{KSLOC}^E$$

where:

$$\begin{aligned} A &= 2.94 \text{ (for COCOMO II)} \\ \text{EAF} &= \text{product of all cost drivers (1.54613)} \\ E &= \text{exponent derived from the scale drivers. It} \\ &\text{is computed as:} \\ &\quad B + 0.01 * \sum_i SF[i] = B + 0.01 * 14.64 = \\ &\quad \quad 0.91 + 0.1464 = 1.0564 \\ &\quad \text{in which B is equal to: 0.91 for COCOMO} \\ &\quad \text{II.} \end{aligned}$$

With this parameters we can compute the effort value, which has a lower bound of:

$$\begin{aligned} \text{Effort} &= A * \text{EAF} * \text{KSLOC}^E = 2.94 * 1.54613 * \\ &\quad 10.948^{1.0564} = 56.957 \text{ PM} \approx 57 \text{ PM} \end{aligned}$$

and an upper bound of:

$$\begin{aligned} \text{Effort} &= A * \text{EAF} * \text{KSLOC}^E = 2.94 * 1.54613 * \\ &\quad 15.946^{1.0564} = 84.737 \text{ PM} \approx 85 \text{ PM} \end{aligned}$$

### 2.2.4 Schedule estimation

## 3 Schedule

In this section we are going to present a probable project schedule. Obviously this is a prototype and will be refined during the development.

In order to maintain readability and to allow a better understanding, the project schedule will be first presented in a global way and then each part will be expanded.



3.1 Global

ID	Nome attività	Inizio	Fine	Durata	T4 16			T1 17			T2 17			T3 17			T4 17			T1 18			T2 18			T3 18			
					ott	nov	dic	gen	feb	mar	apr	mag	giu	lug	ago	set	ott	nov	dic	gen	feb	mar	apr	mag	giu	lug	ago	set	ott
1	Requirements Analysis and Specifications Document (RASD)	16/10/2016	23/12/2016	69g																									
2	Design Document (DD)	24/12/2016	06/03/2017	73g																									
3	RASD adjustments	24/12/2016	06/03/2017	73g																									
4	Integration Test Plan Document (ITPD)	07/03/2017	06/04/2017	31g																									
5	RASD and DD adjustments	07/03/2017	06/04/2017	31g																									
6	Project Plan Document (PPD)	07/04/2017	15/05/2017	39g																									
7	RASD, DD and ITPD adjustments	07/04/2017	15/05/2017	39g																									
8	First release	16/05/2017	30/09/2017	138g																									
9	Documents adjustments and PPD refinements	16/05/2017	30/09/2017	138g																									
10	Second release	01/10/2017	31/01/2018	123g																									
11	Documents adjustments and PPD refinements	01/10/2017	31/01/2018	123g																									
12	Third release	01/02/2018	01/09/2018	213g																									
13	Finalizing all documents	01/02/2018	30/09/2018	242g																									





## 3.2 RASD

ID	Nome attività	Inizio	Fine	Durata	ott 2016			nov 2016			dic 2016		
					16/10	23/10	30/10	6/11	13/11	20/11	27/11	4/12	11/12
1	Meetings with local government and stakeholders	16/10/2016	22/10/2016	7g	■								
2	Brainstorming and solution overview	23/10/2016	25/10/2016	3g		■							
3	Goals definition	26/10/2016	28/10/2016	3g		■							
4	Domain assumptions definition	27/10/2016	29/10/2016	3g		■							
5	Requirements definition	28/10/2016	03/11/2016	7g		■							
6	Scenarios description	04/11/2016	05/11/2016	2g				■					
7	Meeting with stakeholders	06/11/2016	06/11/2016	1g				■					
8	Goals refinement	07/11/2016	13/11/2016	7g				■					
9	Domain assumptions refinement	07/11/2016	13/11/2016	7g				■					
10	Requirements refinement	07/11/2016	13/11/2016	7g				■					
11	Identification of use cases	14/11/2016	16/11/2016	3g					■				
12	Sequence diagrams definition	15/11/2016	17/11/2016	3g					■				
13	Initial mockups draft	15/11/2016	16/11/2016	2g					■				
14	Meeting with stakeholders	17/11/2016	17/11/2016	1g					■				
15	Goals refinement	18/11/2016	24/11/2016	7g					■				
16	Domain assumptions refinement	18/11/2016	24/11/2016	7g					■				
17	Requirements refinement	18/11/2016	24/11/2016	7g					■				
18	Use cases refinement	18/11/2016	24/11/2016	7g					■				
19	Mockups refinement	18/11/2016	24/11/2016	7g					■				
20	External interfaces description	25/11/2016	27/11/2016	3g						■			
21	Early class diagram definition	28/11/2016	04/12/2016	7g							■		
22	Consistency verification through Alloy	29/11/2016	05/12/2016	7g							■		
23	Goals revision	30/11/2016	07/12/2016	8g							■		
24	Domain assumptions revision	30/11/2016	07/12/2016	8g							■		
25	Requirements revision	30/11/2016	07/12/2016	8g							■		
26	UML diagrams revision	30/11/2016	07/12/2016	8g							■		
27	Meeting with stakeholders	08/12/2016	08/12/2016	1g								■	
28	Goals finalization	09/12/2016	15/12/2016	7g								■	
29	Domain assumptions finalization	09/12/2016	15/12/2016	7g								■	
30	Requirements finalization	09/12/2016	15/12/2016	7g								■	
31	UML diagrams finalization	09/12/2016	15/12/2016	7g								■	
32	External interfaces finalization	09/12/2016	15/12/2016	7g								■	
33	Meeting with stakeholders	16/12/2016	16/12/2016	1g									■
34	Final refinements	17/12/2016	23/12/2016	7g									■



## 3.3 DD

ID	Nome attività	Inizio	Fine	Durata	2017														
					dic 2016	gen 2017					feb 2017					mar 2017			
					29/12	5/1	12/1	19/1	26/1	2/2	9/2	16/2	23/2	1/3	8/3	15/3	22/3	29/3	5/4
1	Architecture brainstorming	24/12/2016	30/12/2016	7g	<div></div>														
2	Initial high level component view	31/12/2016	06/01/2017	7g		<div></div>													
3	Initial low level component view	01/01/2017	07/01/2017	7g		<div></div>													
4	Component interfaces definition	01/01/2017	07/01/2017	7g		<div></div>													
5	Meeting with stakeholders	08/01/2017	08/01/2017	1g			<div></div>												
6	High level component view refinements	09/01/2017	15/01/2017	7g			<div></div>												
7	Low level component view refinements	09/01/2017	15/01/2017	7g			<div></div>												
8	Component interfaces refinements	09/01/2017	15/01/2017	7g			<div></div>												
9	Deployment view definition	16/01/2017	22/01/2017	7g				<div></div>											
10	Runtime sequence diagrams definition	17/01/2017	23/01/2017	7g				<div></div>											
11	Meeting with stakeholders	24/01/2017	24/01/2017	1g					<div></div>										
12	Component views refinements	25/01/2017	31/01/2017	7g						<div></div>									
13	Component interfaces refinements	25/01/2017	31/01/2017	7g						<div></div>									
14	Deployment view refinements	25/01/2017	31/01/2017	7g						<div></div>									
15	Runtime sequence diagrams refinements	25/01/2017	31/01/2017	7g						<div></div>									
16	Algorithms design	01/02/2017	07/02/2017	7g							<div></div>								
17	UX and mockups design	01/02/2017	07/02/2017	7g							<div></div>								
18	Meeting with stakeholders	08/02/2017	08/02/2017	1g								<div></div>							
19	Component views finalization	09/02/2017	23/02/2017	15g									<div></div>						
20	Component interfaces finalization	09/02/2017	23/02/2017	15g									<div></div>						
21	Deployment view finalization	09/02/2017	23/02/2017	15g									<div></div>						
22	Runtime sequence diagrams finalization	09/02/2017	23/02/2017	15g									<div></div>						
23	Algorithms finalization	09/02/2017	23/02/2017	15g									<div></div>						
24	UX and mockups finalization	09/02/2017	23/02/2017	15g									<div></div>						
25	Meeting with stakeholders	24/02/2017	24/02/2017	1g														<div></div>	
26	Final refinements	25/02/2017	06/03/2017	10g														<div></div>	



ID	Nome attività	Inizio	Fine	Durata	mar 2017				apr 2017	
					5/3	12/3	19/3	26/3	2/4	
1	Integration strategies overview	07/03/2017	09/03/2017	3g	<div></div>					
2	Integration strategy definition	10/03/2017	19/03/2017	10g	<div></div>					
3	Individual tests identification	13/03/2017	27/03/2017	15g	<div></div>					
4	Testing tools and equipment definition	28/03/2017	30/03/2017	3g				<div></div>		
5	Final refinements	31/03/2017	06/04/2017	7g					<div></div>	

3.4 IT



ID	Nome attività	Inizio	Fine	Durata	apr 2017				mag 2017		
					9/4	16/4	23/4	30/4	7/5	14/5	
1	Initial project size, cost and effort estimation	07/04/2017	13/04/2017	7g	<div></div>						
2	Initial schedule definition	11/04/2017	13/04/2017	3g	<div></div>						
3	Meeting with stakeholders	14/04/2017	14/04/2017	1g	<div></div>						
4	Project size, cost and effort refinements	15/04/2017	21/04/2017	7g	<div></div>						
5	Schedule refinements	15/04/2017	21/04/2017	7g	<div></div>						
6	Resource allocation definition	22/04/2017	24/04/2017	3g	<div></div>						
7	Risk management definition	23/04/2017	29/04/2017	7g	<div></div>						
8	Meeting with stakeholders	30/04/2017	30/04/2017	1g	<div></div>						
9	Final schedule	01/05/2017	07/05/2017	7g	<div></div>						
10	Final Resource allocation	01/05/2017	07/05/2017	7g	<div></div>						
11	Final risk management	01/05/2017	07/05/2017	7g	<div></div>						
12	Meeting with stakeholders	08/05/2017	08/05/2017	1g	<div></div>						
13	Final refinements	09/05/2017	15/05/2017	7g	<div></div>						

3.5 PP





3.6 First release

ID	Nome attività	Inizio	Fine	Durata	mag 2017		giu 2017				lug 2017				ago 2017				set 2017					
					21/5	28/5	4/6	11/6	18/6	25/6	2/7	9/7	16/7	23/7	30/7	6/8	13/8	20/8	27/8	3/9	10/9	17/9	24/9	1/10
1	External components acquisition and study	16/05/2017	14/06/2017	30g	<div></div>																			
2	Components development	16/05/2017	29/09/2017	137g	<div></div>																			
3	Code inspection	20/05/2017	29/09/2017	133g	<div></div>																			
4	Unit tests	20/05/2017	15/07/2017	57g	<div></div>																			
5	Integration testing	01/06/2017	31/07/2017	61g	<div></div>																			
6	System testing	01/08/2017	29/09/2017	60g	<div></div>																			
7	Refinements	14/08/2017	28/08/2017	15g	<div></div>																			
8	Presentation to stakeholders	29/08/2017	29/08/2017	1g	<div></div>																			
9	Refinements	30/08/2017	13/09/2017	15g	<div></div>																			
10	Final presentation to stakeholders	14/09/2017	14/09/2017	1g	<div></div>																			
11	Final refinements	15/09/2017	29/09/2017	15g	<div></div>																			
12	Release	30/09/2017	30/09/2017	1g	<div></div>																			



3.7 Second release

ID	Nome attività	Inizio	Fine	Durata	ott 2017				nov 2017				dic 2017				gen 2018						
					1/10	8/10				5/11				3/12				7/1	14/1	21/1		28/1	
1	External components acquisition and study	01/10/2017	26/10/2017	26g																			
2	Components development	01/10/2017	30/01/2018	122g																			
3	Code inspection	05/10/2017	30/01/2018	118g																			
4	Unit tests	05/10/2017	23/11/2017	50g																			
5	Integration testing	16/10/2017	08/12/2017	54g																			
6	System testing	09/12/2017	30/01/2018	53g																			
7	Refinements	21/12/2017	02/01/2018	13g																			
8	Presentation to stakeholders	03/01/2018	03/01/2018	1g																			
9	Refinements	04/01/2018	16/01/2018	13g																			
10	Final presentation to stakeholders	17/01/2018	17/01/2018	1g																			
11	Final refinements	18/01/2018	30/01/2018	13g																			
12	Release	31/01/2018	31/01/2018	1g																			



### 3.8 Third release

ID	Nome attività	Inizio	Fine	Durata	feb 2018				mar 2018				apr 2018				mag 2018				giu 2018				lug 2018				ago 2018			
					4/2	11/2	18/2	25/2	4/3	11/3	18/3	25/3	1/4	8/4	15/4	22/4	29/4	6/5	13/5	20/5	27/5	3/6	10/6	17/6	24/6	1/7	8/7	15/7	22/7	29/7	5/8	12/8
1	Components development	01/02/2018	30/08/2018	211g																												
2	Code inspection	07/02/2018	30/08/2018	205g																												
3	Unit tests	07/02/2018	14/05/2018	97g																												
4	Integration testing	25/02/2018	09/06/2018	105g																												
5	System testing	10/06/2018	30/08/2018	82g																												
6	Refinements	22/06/2018	14/07/2018	23g																												
7	Presentation to stakeholders	15/07/2018	15/07/2018	1g																												
8	Refinements	16/07/2018	07/08/2018	23g																												
9	Final presentation to stakeholders	08/08/2018	08/08/2018	1g																												
10	Final refinements	09/08/2018	31/08/2018	23g																												
11	Release	01/09/2018	01/09/2018	1g																												

## 4 Risk management

We are going to summarize in tabular format the main risks we think can threat the project and the corresponding mitigating actions we planned. We adopt a proactive strategy against most serious risks related to business and a reactive strategy (for which we have allocated additional time in project schedule) for unpredictable threats.

### 4.1 Business risks

Can jeopardize the entire project and menace the business viability of the project.

<b>Risk</b>	<b>Probability</b>	<b>Impact</b>
Due to the high number of competitors in the car sharing panorama, the product can not be noticed if not properly advertised	High	Catastrophical
Unintuitive user interface or wrong set of functionalities drastically reduce the user's adoption of the service	Medium	Catastrophical
Lost of interest in the product by market users / new competitors introduction in the market	Low	Significant
Unintuitive user interface reduce the efficiency of the staff	Low	Minor

Risk	Mitigation plan
Not properly advertised	Designers, advertisers and sales personnel actively take part to the early stages of UX designing, in order to have a shared vision of the project through all the involved personnel.
Unintuitive user interface / wrong set of functionalities	Surveys and user group to fit the service experience to the average market user. Analysis of other car-sharing services experience to offer a fast learning curve to their users and emphasize our strength points.
Lost of interest / new competitors	Occasional in-app quality assessment of the user's service experience in exchange of car sharing credit.
Low staff enthusiasm / efficiency	Interaction with staff exponent during the early phase of the user interface design through the presentation / assessment of mockups. In-house usability test for UI prototypes during the early phases of implementation.

## 4.2 Project risks

Threaten the project schedule and can increase the project cost.

Risk	Probability	Impact
'Goldplating' software features results in a delayed schedule	Low	Significant
Personnel shortfall in proximity of milestones / meeting can delay the release date	High	Minor



Risk	Mitigation plan
‘Goldplating’ software features results in a delayed schedule	Planning of 3 features-incremental releases that can be adjusted in feature-richness if schedule problems arise.
Personnel shortfall	Introduction of additional time in the schedule between predicted milestone date and milestone release date in order to mitigate personnel absence or for fix eventual problems. Encourage developer motivation through involvement in early analysis phases and in following meetings, thus incentive a shared product vision that lead to better teamwork.

### 4.3 Technical risks

Threaten the quality and timeliness of the project, leading to a more difficult implementation.

Risk	Probability	Impact
Integration test fails require a redesign of part of the components	Medium	Significant
Unstable external software components / services lead to service partial or full crashes	Low	Significant

Risk	Mitigation plan
Integration test fails	Adoption of critical modules test strategy to be able to deal with this kind of issue as soon as possible.
Unstable external software	Selection of widely adopted services (such as Google Map services). Exploration / planning of possible external services’ alternatives in case of downtime or discontinuation of those services.

## 5 Effort Spent

- Alessandro Erba  $\approx 10\text{h}$
- Filippo Leveni  $\approx 10\text{h}$
- Luca Lodi  $\approx 10\text{h}$