



# **Travel n Study Final Project Report**

**Version 1.0**

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Final Project Report	Date: 2013-01-20

## Revision History

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2002-00-00	0.01	Initial Draft	DSD staff
2013-01-20	1.00	Final version	Travel n Study project team

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## 1. Introduction

### 1.1 Purpose of this document

The purpose of this document is to provide an overview of the Travel n Study project results and team member performance during the Distributed Software Development (DSD) course of 2012 / 2013. This document is defined at the final phase of the project work and will not be revised beyond the initial version.

### 1.2 Intended Audience

This document is intended to all the stakeholders in the Travel n Study project including but not limited to:

- Project team members
- Project supervisor (Ivana Bosnić)
- DSD course staff

### 1.3 Scope

The document covers the results of the Travel n Study project via metrics, tables, snapshots from other documents and more. It will also cover some of the differences between the initially planned and finally delivered metrics and milestones.

### 1.4 Definitions and acronyms

#### 1.4.1 Definitions

Keyword	Definitions
Travel n Study	The project name

#### 1.4.2 Acronyms and abbreviations

Acronym or abbreviation	Definitions
FER	Faculty of Electrical Engineering and Computing
MDH	Mälardalen University
POLIMI	Politecnico di Milano
SVN	Subversion
DSD	Distributed software development

### 1.5 References

Project homepage: <http://www.fer.unizg.hr/rasip/dsd/projects/travelnstudy>

Project application: <http://travelnstudy.azurewebsites.net/>

(hosted by Windows Azure)

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## 2. Background and Objectives

### 2.1 Project goals

The goal of the project is to build a web application which will provide a service to the user in a form of a recommendation system for deciding where to go to study abroad. The application will gather data needed to make that decision from various open data sources and present the data to the user in an organized and visually attractive user interface. The application will allow the user to input data on a number of options so the system can provide the user with choices which are suitable to his preferences.

Additionally an important project goal is to learn how to overcome obstacles in the process of developing software in a distributed environment.

### 2.2 Project requirements

In general there are several main requirement categories of our project. There is the collection of data that needs to be gathered from various data sources, presentation of that data, the filtering system for narrowing down the search and the recommendation system.

#### 2.2.1 Data sources

Several open data sources will be used for providing information in different categories like:

- General information
- Financial information
- Maps and Landmarks
- Education

#### 2.2.2 Visual presentation

Data gathered will be presented to the user in a visually attractive user interface which will make the user experience enjoyable. Several modules will be used to construct a modern, stylish and useful interface:

- Minimal textual information (the user will not be burdened by volumes of text)
- Images, photos
- Maps (tagged with all the most important locations)
- UI gadgets (graphs, charts and more)

#### 2.2.3 Suggestion system

In order for the application to help the user decide where he would like to go to study abroad some information will need to be provided by the user. There will be several different criteria on which the user will be able to provide information which combined will allow the application to present a list of recommended locations to the user. Some of the criteria follow:

- Country: One of the most important factors is the destination country. The users will be able to enter their preferences based on a general geographical location of the country.
- University: Another important factor is what does the university they plan to study abroad look like. The users will be able to enter whether or not the ranking and/or reputation of the university is important to them and also get recommendations on universities based on the study programs that interest them.
- City: The city of the university is also very important. Is it a metropolis or a small town, is it seaside or continental, how expensive is it, is it warm/cold, is it safe, is it eventful. All of these are factors important to the user decision so before the system makes any recommendations the user will be able to provide his preferences on a number of questions related to the city they want to study abroad at.
- Financing options: Possibility of scholarships, student loans, part time work. The user will be asked if this is something that is important to him.

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#### 2.2.4 Recommendation system

The application will gather information about the user during his time spent using the application in order to provide additional suggestions, hints and other types of feedback designed specifically for the user.

### 2.3 Project milestones

Project goals will be accomplished through several milestones. In general the milestones are:

- Project vision
- Project plan
- Requirements definition
- System design
- Alpha prototype
- Beta prototype
- Acceptance test
- Final product

The alpha and beta prototype will contain additional application specific milestones such as: database definition and implementation, acquiring data sources, recommendation system development, user interface mockup, core keywords functionality, user reviews and comments, scientific functionalities, Google maps interaction and more.

### 2.4 Project deliverables

General project milestones will be followed by several project deliverables. The main part of the deliverables is the documentation that sets grounds for future development such as:

- Project plan document
- Requirements definition document
- Design description document

Besides documentation the milestones will be accompanied by presentations of work accomplished so far. There will be six presentations in total:

- Team and Project vision presentation
- Project plan presentation
- Requirements Definition and System Architecture presentation
- Alpha prototype presentation
- Beta prototype presentation
- Final project presentation

Finally, the last deliverable will be the final product delivered with installation setup and source code.

### 2.5 Project testing

Project testing will be done in cooperation with the project supervisor and will produce the acceptance test plan document. Acceptance tests will be performed for detection of possible defects and a test report will be published. Testing manager will be in charge of the test team and the testing campaign.

### 2.6 Product delivery

After project testing a final project report document will be published and all the other documents (such as various technical documents, user manuals, etc.) will be finalized. The packaged product (together with installation and source code) will be delivered to the project web page.

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### 3. Organization

#### 3.1 Project management

- Project home: Zagreb, Croatia (FER)
- Project supervisor: Ivana Bosnić (FER)
  
- Project leader: Branimir Lochert (FER)
- Team leader: Alessandro Sisto (PoliMi)

The project leader Branimir Lochert is also the team leader for the Croatia (FER) local team.

Project management is responsible for guiding the project towards its goals by distributing work to all team members and meeting project deadlines which includes accomplishing project milestones and producing the required deliverables on time. Team leaders are responsible for their local team while the project leader is responsible for the whole project and communication with the project supervisor.

#### 3.2 Project group

The project team is distributed with three team members from Milano, Italy attending PoliMi and three team members from Zagreb, Croatia attending FER. Explicit list of all project team members and their responsibilities follows:

Name	Initials	Responsibility (roles)
<b>Branimir Lochert</b>	BL	Project leader, Documentation manager, Developer (Server)
<i>Alessandro Sisto</i>	AS	Team leader, User interface manager, Developer (Client)
Katarina Sekula	KS	Requirements manager, Testing manager, Developer (Server)
Milan Čop	MČ	Lead Developer, Database manager
Daniele Rogora	DR	Virtual Machine manager, Backup manager, SVN Manager, Developer (Client)
Javier Hualpa	JH	Server-Client coordinator, Data sources manager, Developer (Server)

Some responsibilities and roles may change during the project.

#### 3.3 Project responsibilities

##### 3.3.1 Project leader (manager)

The project leader (manager) responsibilities include planning, organizing, managing, leading and controlling the project and project team members for the purpose of achieving all of the project goals and objectives inside the preconceived deadlines.

##### 3.3.2 Team leader (manager)

The team leader (manager) responsibilities include providing guidance, instructions, directions and other forms of management to the assigned local team. The team leader reports the status and progress of his team to the project leader.



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### 3.3.3 Documentation manager

The documentation manager reviews and edits all written documentation before it is published to make sure it conforms to documentation policies specified for the project.

### 3.3.4 Backup manager

The backup manager makes sure all the production material is backed up on regular intervals. In case of any data loss he is responsible for the recovery process.

### 3.3.5 User interface manager

User interface manager has a primary role in user interface design and implementation. He/she also makes sure that the user interface is ergonomic and accessible to the user.

### 3.3.6 Requirements manager

Requirements manager is the person responsible for gathering requirements from communication with relevant stakeholders. Additionally he/she is responsible for the documentation, analysis, tracing and prioritizing gathered requirements.

### 3.3.7 Lead developer

Lead developer's responsibilities are to manage items and tasks his developing team is supposed to accomplish in the current iteration. He/she is to provide guidance and assistance in case a member of his team is stuck on a certain task. Additionally he is to make sure that his team is adhering to the software quality standards agreed by the project team.

The lead developer also takes the role of system architect and designs the system architecture on an abstract level by defining core framework elements which provide the basis for implementation of functional requirements.

### 3.3.8 Testing manager

Testing manager is responsible for leading the test team and effectively implementing a testing process. The testing manager must create a test plan and execute the test campaign described in the plan. Finally the testing manager is responsible for producing test reports and metrics and assuming the role of the quality assurance manager.

### 3.3.9 Database manager

Database manager is expected to determine the best possible method of organizing and storing data and then implementing that method. After implementation he/she is responsible for maintaining the database.

### 3.3.10 Virtual machine manager

Virtual machine manager is in charge of setting up and maintaining a development environment for the project team. He/she controls which software is installed on the virtual machine.

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### 3.3.11 SVN manager

The SVN manager is in control of the project SVN repository. His/hers responsibilities are to determine the project SVN policies and to enforce them in the repository.

### 3.3.12 Data sources manager

The data sources manager is responsible for collecting and organizing open sources of information found on the web which are required for the project goals. His/hers responsibilities also include studying ways to interface with the data sources.

### 3.3.13 Server – Client coordinator

The server client coordinator works with both the server and the client team in order to ensure seamless integration of work into a complete product. He knows what the client side needs from the server side in order to accomplish project requirements and communicates the need to the server side. He understands the server side interface and provides steps to the client side on how to use it.

## 3.4 Project tools

Project tools used:

- Management: MS Project
- Collaboration: Google groups, Planbox, SVN, Gliffy

## 3.5 Customer

Customers: Prof.dr.sc. Mario Žagar (FER), Prof. Raffaella Mirandola (PoliMi)

Students, postdocs and generally people who wish to study abroad are the external customers/users for the project. Surveys will be performed targeting this group of people to find out what are some of the important criteria students use to decide where they want to go to study abroad.

## 3.6 Supervisor

Project supervisor is Ivana Bosnić (FER).

## 3.7 Others

Marin Orlić (FER) – virtual machine coordinator.

All of the DSD course staff from all three of the countries: Croatia (FER), Italy (PoliMI) and Sweden (MDH).

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## 4. Development process

### 4.1 Personal RUP – overview

Strict deadlines for the first deliverables have been defined, as shown in Section 5. Thus the group doesn't have many options available for the development of the first phases of the project; indeed, to be able to present a Design Description Document in time it will be necessary to focus heavily on the whole system architecture and on the requirements prior to any other kind of activity.

This leads to a preliminary feasibility study followed by requirements specification and design of the system. The nature of our project, that is prone to risks and that tries to produce something innovative, on the other hand, makes it very difficult to really identify and analyze these requirements in the first phases. Thus after the inception phase the group will follow an iterative approach. Each iteration will last exactly one week. More details about these iterations are in the following sections.

The requirements and design documents will be followed as much as possible, but should the requirements change, the group will be able to revise them, as deeply as needed.

The Rational Unified Process will be used as a reference for the development: small and short iterations will focus on relatively small system modules, as in the elaboration phase of the RUP. In this way risks related to the information sources will be addressed immediately, and also preliminary unit testing will take place during the implementation phase.

The picture represents the usual RUP development plan, showing also the effort of a particular kind needed in each of the phases. It is worth noting that analysis and design has a greater importance in our project than in the usual RUP because of the deadlines for the related documents that we must respect.

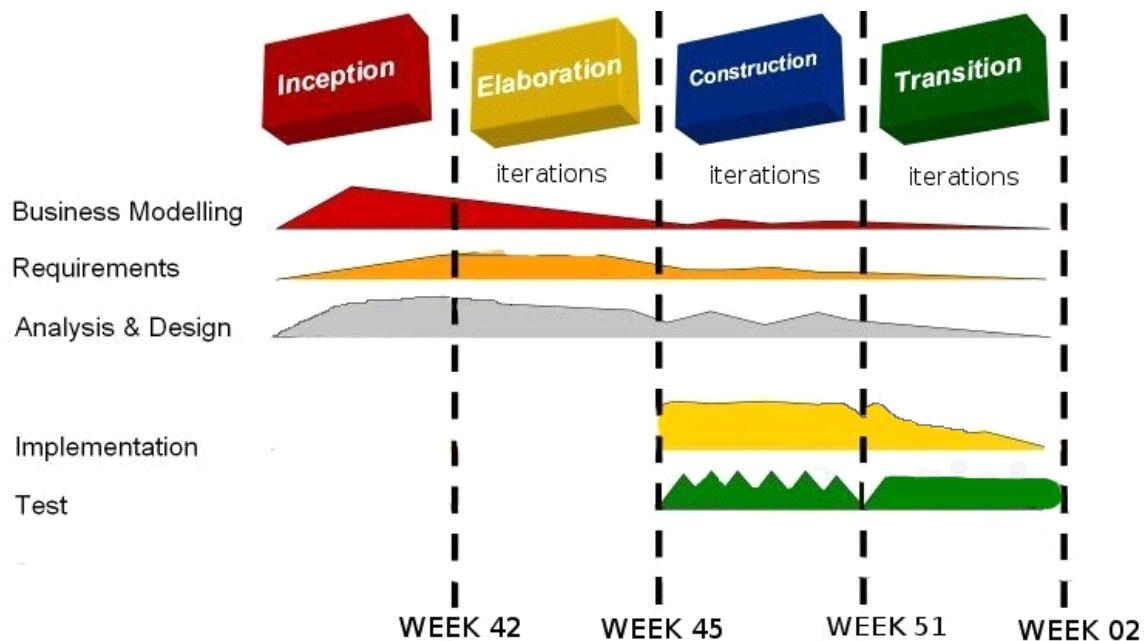


Figure 1. Travel n Study personal RUP

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## 4.2 Detailed process

### 4.2.1 Inception phase

All team members build a shared project vision, talking with the customer and adding new ideas, exploring the web sources and interviewing possible stakeholders. The artifact produced is a shared project vision approved by each team member, stating what the project is and isn't about, who are the stakeholders and the users and why they will need and use it.

### 4.2.2 Elaboration phase

In this three weeks long phase most of the requirements instability will be targeted. It will be the core of the analysis and design of the project's critical modules. Different local teams will work concurrently and iteratively on designing different system modules based on requirements analysis. The division will be on the server and client side modules (background service and the user interface).

Each iteration will have a fixed time length of 1 week and will result in a documentation paper that may be either a new one or an enhanced version of an existing one, ready for evaluation by the team members.

The phase will have as a final artifact a set of documents. One will describe our business model and our project plan, in terms of artifacts produced and deadlines, work and roles division among the project members and development methodologies. A second one will target the requirements and the use cases of the application, giving them priorities and identifying their stakeholders. The last one will describe the system architecture and design, specifying the main software components and their interfaces, the environment in which they will run and the technologies they will use. It will also give an insight of each component, showing its composition and interactions with other components.

Details of each iteration are in the activity plan table, section 2.1 (i1 to i3).

### 4.2.3 Construction phase

This is the longest phase of the whole project. It lasts six weeks. The main task of this phase is the implementation of the core system. Again, an iterative approach is taken; each short and time fixed iteration (one week) produces a working and tested system snapshot. Every iteration will have an assigned time slot for unit testing.

After 3 weeks an alpha version of the system should be ready, having all the high priority requirements implemented. The final artifact should be a working beta of the product, where also the medium priority requirements should be met.

Details of each iteration are in the plan table, section 10.2 (i4 to i9).

### 4.2.4 Transition phase

Implementation of low priority features, integration testing, and final polishing are the goals of this phase. Once again each short and time fixed iteration (one week) produces a working and tested system snapshot.

The artifacts produced are the software package containing the final version of the system and an acceptance test plan, defined in collaboration with the customer.

Details of each iteration are in the plan table, section 10.2 (i10 to i12).

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### 4.3 Roles

Reference: <http://www.ibm.com/developerworks/rational/library/apr05/crain/>

An iterative process like RUP defines two kinds of roles: breadth and depth roles. The former kind is such that must focus on the overall process within each iteration; it has a wider perspective, and drives and adjusts the overall solution. The latter instead must focus more deeply on details of a smaller piece of the project within each iteration.

In our project team that is composed of six members, we don't plan to embrace this separation between breadth and depth roles, but each team member is required to always have an updated view of the overall project, apart from focusing on his specific task.

Indeed every role detailed in section 3.3 is a breadth role, since it is project-wide, i.e. it has responsibility for the whole project. Also each team member will also have the depth role of developer.

### 4.4 Progress tracking

Project progress reports are written weekly by each team member.

### 4.5 Quality assurance

Apart from periodic testing during each iteration of the elaboration and construction phases, a constant customer involvement is prospected to keep the project always aligned with the customer desires.

The testing manager will constantly monitor the project and check that it meets the quality standards defined by the group and the customer.

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## 5. Milestones

Id	Milestone Description	Responsible Dept./Initials	Finished week				Metr.	Rem.
			Plan	Forecast Week +/-	Actual			
/	---Inception phase---							
M001	Project vision	BL	42	42	0	42	0	
/	---Elaboration phase---							
M002	Project plan	BL	43	43	0	44	+1	
M003	Requirements Engineering	KS	44	45	1	45	+1	
M004	System Design	DR	45	45	0	45	0	
/	---Construction phase---							
/	---Alpha prototype---							
M005	Application domain model	MČ	45	45	0	45	0	001
M006	Interfacing/parsing data sources #1	JH	46	47	1	47	+1	002
M007	Dynamic loading framework	BL	46	46	0	46	0	003
M008	Server – client interface	JH	47	47	0	47	0	004
M009	GUI Modules/Mockups #1	AS	48	48	0	48	0	005
/	---Beta prototype---							
M010	Database definition	MČ	48	48	0	46	-2	006
M011	Data Access Layer	BL	48	48	0	46	-2	007
M012	Log in/Registration system	KS	48	48	0	50	+2	008
M013	Interfacing/parsing data sources #2	JH	49	49	0	50	+1	009
M014	Suggestion system	BL	50	50	0	51	+1	010
M015	Interacting with Google maps	DR	50	50	0	50	0	011
M016	Postdocs recommendations	BL	50	50	0	never		012
M017	GUI Modules/Mockups #2	AS	51	51	0	51	0	013
	---Transition phase---							
M018	Commenting system	KS	52	52	0	02	+2	014
M019	User profile system	KS	52	52	0	01	+1	015
M020	Interfacing/parsing data sources #3	JH	52	52	0	never		016
M021	Recommendation system	MČ	01	02	+1	02	+1	017
M022	GUI Modules/Mockups #3	AS	02	02	0	02	0	018
M023	Documentation	BL	03	03	0	03	0	
M024	Testing	KS	03	03	0	03	0	
M025	Final delivery	BL	03	03	0	03	0	

### 5.1.1 Remarks

Remark Id	Description
001	Developing C# domain model classes to abstract data gathered from data sources (University, City, etc.)
002	Parsing/scraping data source DS1; Interfacing with data source DS2 API
003	Developing a set of C# classes for loading data only on demand
004	Developing a set of C# classes and JavaScript functions to interface between the client and the server
005	GUI modules for browsing the universities by location, for displaying university and location information. Also a basic page layout and style
006	Database model definition and implementation
007	Developing a set of C# classes to interface with the database
008	GUI and server modules for enabling user registration and login

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009	Parsing/scraping data source DS3; Interfacing with data source DS4 API
010	GUI and server modules for a suggestion system
011	JavaScript functions for interacting with Google maps API
012	GUI and server modules for a recommendation system postdocs module
013	GUI modules for preferences questionnaire, registration forms, login dialogs, Google maps holder and controls
014	GUI and server modules for a commenting system to comment universities and locations
015	GUI and server modules for a user profile system
016	Interfacing/parsing any additional data sources needed
017	Recommendation system, editing recommended universities list, editing preferences
018	GUI modules for user profile page, commenting sections, recommended for you section

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## 6. Project Results

### 6.1 Requirements

#### 6.1.1 Requirement Compliance Matrix

Id	Requirement Description	completed	Rem
EDA-1	Acquire raw data from DS1: <a href="http://www.4icu.org/">http://www.4icu.org/</a>	Yes	
EDA-2	Acquire raw data from DS2: <a href="http://dev.mendeley.com/">http://dev.mendeley.com/</a>	Dropped	001
EDA-3	Acquire raw data from DS3: <a href="http://www.freebase.com/">http://www.freebase.com/</a>	Yes	
EDA-4	Acquire raw data from DS4: <a href="http://www.numbeo.com/">http://www.numbeo.com/</a>	Yes	
EDA-5	Acquire raw data from other data sources	Yes	
SC-1	Dynamic loading of raw data	Yes	
SC-1.1	Mapping of raw data to an higher abstraction layer	Yes	
SC-1.1.1	Universities	Yes	
SC-1.1.2	location/continent/region/country/state/city	Yes	
SC-1.1.3	postdocs publications	Dropped	002
SC-1.1.4	cost of living	Yes	
SC-2	Provide interfaces to request data to the UI	Yes	
SC-3	Save user's preferences	Yes	
SC-3.1	Provide a recommendation system based on user's preferences	Yes	
SC-4	Authenticate a user by his Username/Password	Yes	
SC-5	Database definition and implementation	Yes	
SC-6	Domain model definition	Yes	
UIF-1	Interface with the server	Yes	
UIV-1	General template	Yes	
UIV-2	Home page	Yes	
UIV-3	Suggestion page	Yes	
UIV-4	Exploration map page	Yes	
UIV-5	University Page	Yes	
UIV-6	City Page	Yes	
UIV-7	Direct Search Page	Yes	
RUA-1	Preference page	Yes	
RUA-1.2	Registration page	Yes	
RUA-2	Login page	Yes	
RUA-2.1	Recommendation system page	Yes	
RUA-3	Provide a visual interface to add reviews and ratings	Yes	
RUA-3.1	to universities	Yes	
RUA-3.2	to locations	Yes	
FR-1	Explore interactive map	Yes	
FR-2	Getting university suggestions	Yes	
FR-3	Viewing selected city information (basic)	Yes	
FR-4	Viewing selected city information (basic)	Yes	
FR-5	User registration	Yes	
FR-6	User log in	Yes	
FR-7	User log out	Yes	
FR-8	Viewing user's profile and preferences	Yes	
FR-9	Editing user's profile and preferences	Yes	
FR-10	Delete user's account	Yes	
FR-11	Commenting university	Yes	
FR-12	Commenting city	Yes	
FR-13	Rating university	Yes	
FR-14	Rating city	Yes	
FR-15	Direct university search	Yes	



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FR-16	Viewing university recommendation	Yes	
FR-17	Viewing selected university information (advanced)	Yes	
FR-18	Viewing selected university information (advanced)	Yes	
FR-19	Delete users' comments	Yes	
FR-20	Modify users' comments	Yes	
FR-21	Delete/Modify user's account	Yes	
FR-22	Reviewing university	Yes	
FR-23	Reviewing city	Yes	
FR-24	Discover how suggestion system works	Yes	

*Completed: Yes (completely implemented)*

*No (not implemented at all)*

*Partially (partially implemented, more description under Remarks subsection)*

*Unknown (completion status not known)*

*Dropped (requirement was dropped during the course of the project)*

### 6.1.2 Requirements Compliance Summary

Total number of requirements	56
Number of requirements implemented	54
Requirements partially fulfilled	0
Requirements not fulfilled	0
Requirements dropped	2

### 6.1.3 Remarks

Remark Id	Description
001	Data source dropped for not being useful to the project
002	Functionality dropped because of a lack of necessary data source

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## 6.2 Deliverables

To	Output	Planned week	Promised week	Late +/-	Delivered week	Rem
Customers/Project supervisor	Project plan document	43	44	1	44	
Customers/Project supervisor	Requirements definition document	44	44	0	44	
Team Members (internal)	SVN Policy Document	44	44	0	44	
Customers/Project supervisor	Design description document	45	45	0	45	
Team Members (internal)	Coding Conventions Document	45	45	-3	42	
Team Members (internal)	Domain model class diagram (Alpha Milestone)	45	45	0	45	
Team Members (internal)	Domain model c# classes – source code (Alpha Milestone)	45	45	0	45	
Team Members (internal)	Data sources DS1, DS2 report	45	45	+1	46	001
Team Members (internal)	C# classes for parsing /scraping data source DS1 - source code (Alpha Milestone)	46	46	0	46	
Team Members (internal)	C# classes for interfacing with data source DS2 - source code (Alpha Milestone)	46	46	0	46	
Team Members (internal)	C# classes for dynamic loading framework (Alpha Milestone)	46	46	0	46	
Team Members (internal)	C# classes for server interface to client (Alpha Milestone)	47	47	0	47	
Team Members (internal)	JavaScript code for client interface to server (Alpha Milestone)	47	47	0	47	
Team Members (internal)	Complete GUI modules source code (Alpha Milestone)	48	48	0	48	
Team Members (internal)	Complete backend modules source code (Alpha Milestone)	48	48	0	48	
Customers/Project supervisor	Alpha prototype (Browsing universities by location) – Complete source code	48	48	0	48	
Team Members (internal)	Database ER diagram (Beta Milestone)	48	48	-2	46	
Team Members (internal)	Database creation SQL script (Beta Milestone)	48	48	-2	46	
Team Members (internal)	Database file (Beta Milestone)	48	48	-2	46	
Team Members (internal)	C# classes for a data access layer (Beta Milestone)	48	48	-2	46	
Team Members (internal)	Log In / Registration C# classes source code (Beta Milestone)	48	48	0	48	

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Team Members (internal)	Log In / Registration GUI source code (Beta Milestone)	48	48	+1	49	
Team Members (internal)	Data sources DS3, DS4, DS5 report	48	48	+1	49	002
Team Members (internal)	C# classes for interfacing with data source DS3 - source code (Beta Milestone)	49	49	+1	50	
Team Members (internal)	C# classes for interfacing with data source DS4 - source code (Beta Milestone)	49	49		Dropped	
Team Members (internal)	C# classes for interfacing with data source DS5 - source code (Beta Milestone)	50	50	0	50	
Team Members (internal)	Recommendation system C# classes (Beta Milestone)	50	50	0	50	
Team Members (internal)	Recommendation system GUI source code (Beta Milestone)	50	50	0	50	
Team Members (internal)	Google maps API JavaScript source code (Beta Milestone)	50	50	0	50	
Team Members (internal)	Postdocs recommendation system C# classes (Beta Milestone)	50	50		Dropped	003
Team Members (internal)	Postdocs recommendation system GUI source code (Beta Milestone)	50	50		Dropped	
Team Members (internal)	Complete GUI modules source code (Beta Milestone)	51	51	0	51	
Team Members (internal)	Complete backend modules source code (Beta Milestone)	51	51	0	51	
Customers/Project supervisor	Beta prototype (Recommendation system) – Complete source code	51	51	0	51	
Team Members (internal)	Commenting system C# classes (Final Milestone)	52	52	+2	02	
Team Members (internal)	Commenting system GUI source code (Final Milestone)	52	52	+2	02	
Team Members (internal)	User profile system C# classes (Final Milestone)	52	52	+1	01	
Team Members (internal)	User profile system GUI source code (Final Milestone)	52	52	+1	01	
Team Members (internal)	Additional data sources report	52	52		Dropped	
Customers/Venture capitalist	Acceptance test Plan	01	01	0	01	
Team Members (internal)	Advanced recommendation system C# classes (Final Milestone)	01	01	+1	01	
Team Members (internal)	Advanced recommendation system GUI source code (Final Milestone)	01	01	+1	01	
Team Members (internal)	Complete GUI modules source code (Final Milestone)	02	02	0	02	
Team Members (internal)	Complete backend modules source code (Final Milestone)	02	02	0	02	

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Customers/Venture capitalist	Test report	03	03	0	03	
Customers/Venture capitalist	Revised version of all Documents	03	03	0	03	
Customers/Venture capitalist	Final product (with Social System) – Complete source code	03	03	0	03	

6.2.1 Remarks

Remark Id	Description
001	DS1 – Data Source 1 : <a href="http://www.4icu.org/">http://www.4icu.org/</a> , DS2 – Data Source 2 : <a href="http://freebase.com/">http://freebase.com/</a>
002	DS3 – Data Source 3 : <a href="http://www.numbeo.com/">http://www.numbeo.com/</a> , DS4 – Data Source 4: <a href="http://www.mendeley.com/">http://www.mendeley.com/</a> , DS5 - Data Source 5: <a href="http://data.worldbank.org">http://data.worldbank.org</a>

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## **7. Risks**

### **7.1 Unrealistic schedules risk**

This risk appeared but has had a low to none impact on the results of the project because of preventive actions. Some tasks went over their deadlines and as soon as it started to affect the timeliness of the project preventive actions were taken and this risk had no impact on the project results.

### **7.2 Lack of technical skills**

This risk appeared and had low impact on the results of the project because of preventive actions. While working on interfacing with external data sources new technologies and technical skills had to be absorbed in a short period of time. Each new technology was divided against team members who became proficient with them and then helped others to learn them quicker.

### **7.3 Virtual machine problems**

This risk appeared but was not foreseen at the start of the project. Lack of minimum hardware requirements to efficiently run the application on the provided virtual machine introduced significant performance problems during the project. Since there were no preventive actions defined this risk caused havoc right until the last week of the project when an alternative was found. The project application is now hosted on the Windows Azure cloud and the impact of this risk on project results has been significantly lowered.

### **7.4 Problems with integration**

This risk appeared but was not foreseen at the start of the project. The team did not think to include this risk because it seemed this issue would never appear if communication was at a satisfactory level. However even though the communication was satisfactory it showed that communication without a strictly defined standard (documentation) is very lethal when defining interfaces between two separate systems. The team was quick to jump on this problem and resolved it in record time so the risk had no impact on the project results.

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## **8. Project Experiences**

### **8.1 Positive Experiences**

#### *8.1.1 Documentation*

Although we are not happy with the forced template format of most of the required documents we are happy we put effort into some parts of the documentation. For example we placed a lot of effort at the beginning of the project in the project plan and precisely defined our activities in the project with a detailed milestones and deliverables list. This helped keep us on track and helped us plan our work when we always knew what were the minimum number of activities we had to accomplish in any given week. The requirements document was useful as a place where we could always reference to what was agreed to be implemented and how. The design document helped everyone in understanding how our code was supposed to work. The test documents were a good place to have all the bugs in one place in the process of testing and bug fixing.

#### *8.1.2 Work dedication*

All team members worked from the beginning of the project till the end with constant intensity. There were no missing team members or members that did not pull their own weight. Because of that each team member produced a part of the final application and we are very happy to see that after fitting every piece of that puzzle together the end product works and is something we can be proud of.

#### *8.1.3 Good project management tools*

We were very lucky to be able to acquire and quickly transit to using Planbox as our project management tool. This helped us quite a bit in dividing tasks and reporting the status of these tasks. By using the tool we were able to easily divide the work and assign it to team members without any unnecessary wasting of time with additional meetings.

#### *8.1.4 Good communication*

Throughout the project, as soon as the need arose, problems were communicated through various channels (emails, Skype, Google group). When you pair this up with good availability of members (8.1.2) you can see how it can be beneficial to the project work. Problems were resolved quickly and there was minimal to no lag at all caused by faulty communication. It is one of many but a very important factor to the success of this project.

#### *8.1.5 Good work hierarchy*

During the project there was a good work hierarchy established. The project leader took care of his own local team and allowed the team leader to do the same for his local team. The team leader received general tasks from the project leader to refine and assign to his local team and then reported back on the status of those tasks to the project leader. This worked very well 99% of the time (see 8.2.3).

#### *8.1.6 New knowledge*

We covered quite a bit of technical knowledge in this project. From various technologies we used to accomplish our requirements to getting to know protocols such as ODATA. Since our application uses quite a bit of external (open) data sources we have collected experience and learned about how developed and accessible are open data sources on the web.

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### 8.1.7 *Distributed team experience*

Working in a distributed team brought along a lot of experience in how to handle work distribution and communication while working on a project like this. It is experience we will be able to pass on to our children.

## 8.2 **Improvement Possibilities**

### 8.2.1 *Documentation*

The general template for most documents is too restrictive and causes the effect of having to write non sense for some sections just because the section is forced in the template. General guidelines of what should be in documents would be better than a restrictive template.

### 8.2.2 *Role assignment*

Now that the project is complete and we know our team well we would divide roles differently in order to better take advantage of what each member is good at.

### 8.2.3 *A touch more micromanagement*

At times during the project a little bit more micromanagement would have been beneficial. Some small amount of time was wasted because of looser deadlines and not following the status of some team members more closely.

### 8.2.4 *Project policies*

During the project the importance of project policies became clearer as the project went on. Next time stricter project policies would definitely benefit work efficiency as even less time would be spent on unnecessary communication to refine details which could have been covered by policies.

### 8.2.5 *Integration*

Even though this problem was resolved around halfway through the project, problems with integration plagued work efficiency. This was resolved through documentation and code by defining a strict standard by which the interface needs to be defined. This way there was no chance of misunderstanding and then badly defining the interface, or even worse working on top of a badly defined interface.

### 8.2.6 *Virtual machine*

The application we built makes hundreds of complex queries to external data sources, calculates data using complex algorithms, loads a lot of data from the local database and all of this is usually done at the same time. For all of this the supplied virtual machine was completely inadequate to provide the necessary hardware support to run our application with desired nonfunctional requirements met. This was resolved by switching to Windows Azure cloud. Next time we would do it a lot sooner because then all of our hard work would not be hidden behind the incompetence, of the provided virtual machine, to perform.

### 8.2.7 *ODATA*

The current capabilities of some of the most popular ODATA sources (such as dbPedia, Freebase) still need time to grow. The biggest problem is the big difference in data coverage of the same types of entities. For some entity there may be a lot of data, but for some other of the same type there may be very little data. The second

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problem is the query performance. A single query is fast, however once a lot of queries are batched then that single query speed is not so fast anymore. Although we were able to produce an application that works in average with a moderate amount of queries to external data sources and were able to make it perform in an understandable amount of time any more serious querying brings into question how useful it is to use open data sources in this way.



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## 9. Metrics

### 9.1 Work per Member

Member	W43	W44	W45	W46	W47	W48	W49	W50	W51	W52	W01	W02	W03	Total
Branimir Lochert	26	26	22	27	29	26	31	24	23	10	14	22	28	308
Alessandro Sisto	29	20	36	14	25	13	27	56	19	8	18	50	22	337
Katarina Sekula	20	27	20	22	31	9	26	25	15	10	8	18	17	248
Daniele Rogora	19	22	24	19	29	21	18	36	20	5	14	30	15	272
Milan Čop	19	21	20	16	26	20	25	29	10	10	6	18	15	235
Javier Hualpa	20	17	22	18	15	27	21	42	18	15	26	51	16	308
<b>Total</b>	133	133	144	116	155	116	148	212	105	58	86	189	113	<b>1708</b>

Forecasted (hours)	Actual (hours)	Deviation (%)
1544	1708	+11%

#### Avg hours = 285 hours per member

Member	Worked hours	Deviation from avg (%)
Branimir Lochert	308	+8%
Alessandro Sisto	337	+18%
Katarina Sekula	248	-13%
Daniele Rogora	272	-4%
Milan Čop	235	-17%
Javier Hualpa	308	+8%

Members of the client side worked 917 hours while the members of the server side worked 791 hours. In percentage terms members of the client side worked 15% more than members of the server side which is to be expected in an client oriented (focused) web application such as the one produced by this project.

### 9.2 Milestone Metrics

Completed as planned or earlier	Total	Timeliness
14	25	56%

### 9.3 Effort Metrics

ID	Activity	Actual Effort	Planned Effort	Deviation (%)
/	---Inception phase---			
M001	Forming project vision	4	6	-33%
/	---Elaboration phase---			
M002	Project planning	8	5	+60%
M003	Requirements Engineering	6	5	+20%
M004	System Design	6	6	0%
/	---Construction phase---			
/	---Alpha prototype---			

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M005	Developing application domain model	4	3	+33%
M006	Interfacing/parsing data sources #1	8	4	+100%
M007	Developing dynamic loading framework	5	4	+25%
M008	Server – client interfacing	4	4	0%
M009	GUI Modules/Mockups production #1	5	8	-38%
/	---Beta prototype---			
M010	Database implementation	2	1	+100%
M011	Developing a data access layer	2	2	0%
M012	Developing a log in/registration system	6	2	+200%
M013	Interfacing/parsing data sources #2	6	6	0%
M014	Developing a recommendation system	12	12	0%
M015	Interacting with Google maps	6	6	0%
M016	Developing postdocs recommendations system	0	6	-100%
M017	GUI Modules/Mockups #2 production	4	10	-60%
/	---Transition phase---			
M018	Developing a commenting system	2	2	0%
M019	Developing a user profile system	2	2	0%
M020	Interfacing/parsing data sources #3	0	2	-100%
M021	Developing an advanced recommendation system	8	7	+15%
M022	GUI Modules/Mockups #3 production	10	7	+43%
M023	Finalizing documentation	1	0	0%
M024	Testing	5	0	0%
/	<b>Total</b>	116	110	+6%

<b>Effort estimation accuracy (%)</b> <i>(100*(1 - abs(Actual – Planned)/Actual))</i>	95%
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### 9.3.1 Interfacing/parsing data sources #1

This activity took double the time planned because of new technologies that had to be learned in order to interface with open data sources and to parse html pages.

### 9.3.2 Database implementation

This activity took double the time planned because of having to change the database schema several times to maximize performance of queries.

### 9.3.3 Developing a log in / registration system

This activity took three times the planned time because of delays on the client side.

### 9.3.4 Developing postdocs recommendations system

This activity was dropped

### 9.3.5 Interfacing/parsing data sources #3

This activity was dropped