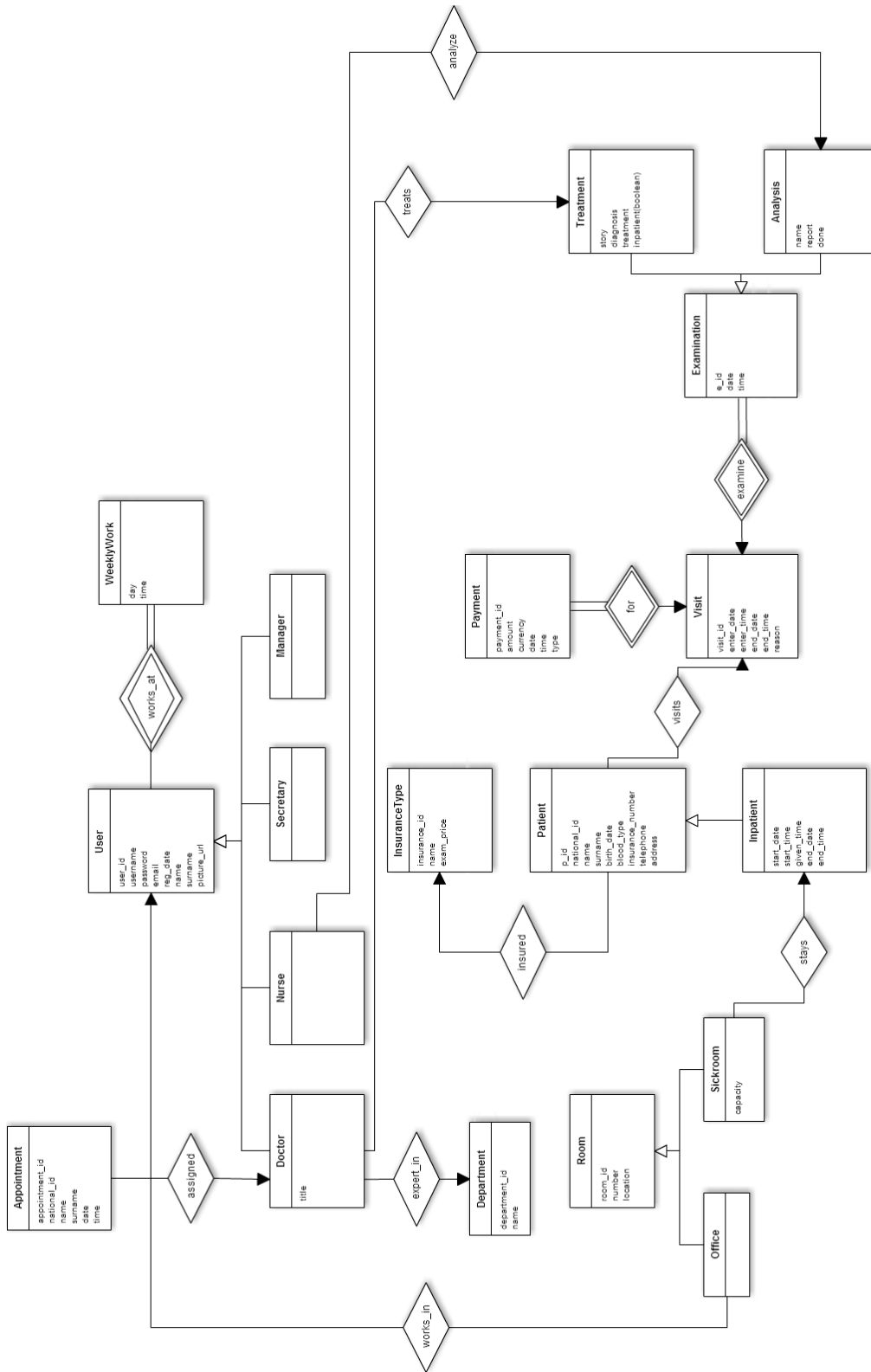# Design Report of Hospital Management System

Group - 5

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1. ER Diagram and Relations

User(user_id, username, password, email, reg_date, name, surname, r_id(FK from Office), picture_url)
username -> all attributes of User
user_id -> all attributes of User
email -> all attributes of User

username, user_id and email are candidate keys. We chose user_id as primary key.
BCNF

Doctor(d_id(FK from user references user_id), title, department_id(FK from Department))
d_id -> {title, department_id}
BCNF

Nurse(n_id(FK from user references user_id))
BCNF

Secretary(s_id(FK from user references user_id))
BCNF

Manager(m_id(FK from user references user_id))
BCNF

Patient(patient_id, national_id, name, surname, birth_date, blood_type, insurance_id(FK from InsuranceType), insurance_number, telephone, address)
patient_id -> Patient
national_id -> Patient
{insurance_id, InsuranceNumber} -> Patient
These are candidate keys.
We chose patient_id as primary key.
BCNF

Inpatient(patient_id(FK from Patient), start_date, start_time, given_time, end_date, end_time, room_id(FK from Sickroom references r_id))
patient_id -> Inpatient
patient_id is candidate key and primary key.
BCNF

Appointment(appointment_id, national_id, name, surname, date, time, d_id(FK from Doctor references doctor_id)
appointment_id -> Appointment
appointment_id is candidate and primary key.
BNCF

Visit(visit_id, enter_date, enter_time, enter_time, end_time, reason, p_id(FK from Patient references patient_id))

visit_id -> Visit
visit_id is candidate key and primary key.
BCNF

Payment(payment_id, v_id(FK from Visit references visit_id), amount, currency, date, time, type)
payment_id -> Payment
v_id -> Payment
payment_id and v_id are candidate keys.
We chose payment_id as primary key.
BCNF

Examination(v_id(FK from Visit references visit_id), e_id, date, time)
e_id -> Examination
v_id -> Examination
e_id and v_id are candidate keys.
We chose e_id as primary key.
BCNF

Treatment(e_id(FK from Examination), story, diagnosis, treatment, inpatient, d_id(FK from Doctor))
e_id -> Treatment
e_id is candidate key and primary key.
BCNF

Analysis(e_id(FK from Examination), name, report, n_id(FK from Nurse))
e_id -> Analysis
e_id is candidate key and primary key.
BCNF

Insurance_type(insurance_id, name, exam_price)
insurance_id -> Insurance_type
insurance_id is candidate key and primary key.
BCNF

Room(room_id, number, location)
room_id -> number, location
room_id is candidate key and primary key.
BCNF

Office(r_id(FK from Room references room_id))
r_id candidate and primary key
BCNF

Sickroom(r_id(FK from Room references room_id), capacity)
r_id -> {capacity}
r_id candidate and primary key
BCNF

Works_at(user_id(FK from User), day, time)
user_id -> {date,time}
user_id candidate key and primary key
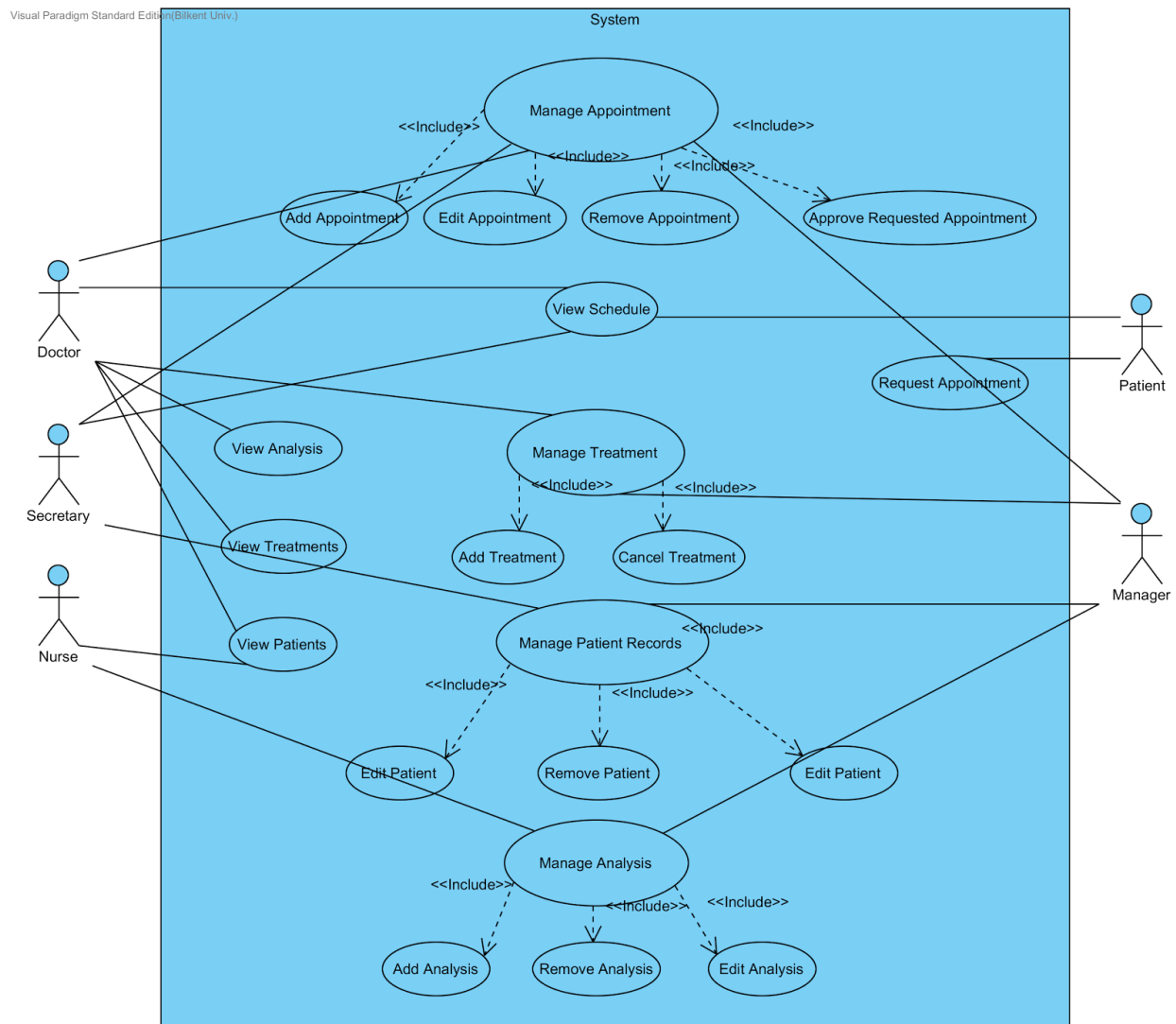BCNF

Department(department_id, name)
department_id -> name
department_id is candidate key and primary key
BCNF

2. Functional Components

Actors : Doctor, Secretary, Nurse, Manager and Patient.

Scenario: Appointment Request
- He/She selects the department of the doctor he/she wants to make an appointment with.
- Selects the doctor and the free hours of the doctor is displayed on a schedule interface.
- When an free hour is selected, an appointment request is recorded on the system.

Scenario: Approving an Appointment Request
- Doctor or his/her secretary logs on to the system.

- A list of appointment requests are listed when he/she navigates to the corresponding menu.
- From there, he/she approves a request and that potential appointment is added to the actual appointment schedule.

Scenario: Manage Treatment
- Doctor logs on to the system.
- Navigates to patient records on the menu.
- Selects a patient from the list.
- Selects view treatments.
- A list of previous, current and scheduled treatments are displayed
- From there, he/she can cancel or modify current and scheduled treatments, or may schedule a new treatment.

Scenario: Manage Analysis
- Nurse logs on to the system
- Navigates to patient records.
- Selects a patient.
- Selects manage patient analysis.
- From there, he/she can modify, add or delete an analysis record after an examination for the doctor to see.

Scenario: View Analysis
- Doctor logs on to the system.
- Navigates to patient records.
- Selects a patient.
- Selects view analysis to display analysis results for the patient.

3. User Interface Design

3.1. Login Screen
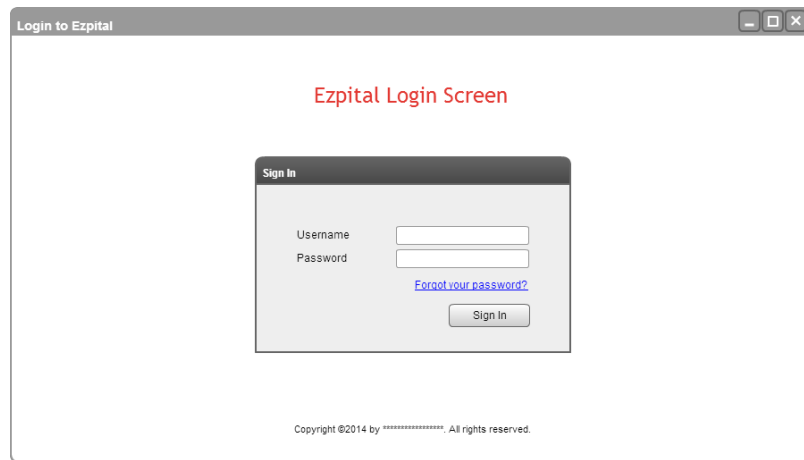
To control login information:

```
SELECT user_id
FROM USER
WHERE username='$username'
  AND password='$encryptedPassword'
```

To identify type of the user:

One of the four code segment below should return an id value, that code segment which returns a value, identifies the user type.

```
SELECT *
FROM Doctor
WHERE d_id='$username'
```

```
SELECT *
FROM Nurse
WHERE n_id='$username'
```

```
SELECT *
FROM Manager
WHERE m_id='$username'
```

```
SELECT *
FROM Secretary
WHERE s_id='$username'
```

3.2. Doctor - Appointment Screen

To get number of patients treated today and this week:

```
SELECT count(DISTINCT patient_id)
FROM Patient,
     Visit,
     Examination
NATURAL JOIN Treatment
WHERE p_id = patient_id
  AND visit_id = v_id
  AND d_id = $doctorId
  AND date BETWEEN '$startDate' AND '$endDate'
```

To get number of remaining appointments:

```sql
SELECT count(*)
FROM Appointment
WHERE d_id=$doctorId
  AND date = '$today'
  AND time BETWEEN '$now' AND '24:00'
```

To get last patients:
```sql
SELECT name,
       surname,
       e_id,
       reason
FROM Visit,
     Patient,
     Examination
NATURAL JOIN Treatment
WHERE d_id=$doctorId
  AND patient_id = p_id
  AND v_id = visit_id
ORDER BY date, time DESC LIMIT $noOfDisplayedTreatment
```

To get remaining appointments:
```sql
SELECT name,
       surname,
       appointment_id
FROM Appointment
WHERE d_id=$doctorId
  AND date = '$today'
  AND time BETWEEN '$now' AND '24:00'
ORDER BY time
```

3.3. Doctor - Patient View of Doctor

Ezpital

Patient

Find a Patient

Exeminations

My Treatments

Exeminations

My Appointments

Weekly Schedule

Halil Ozercan - Patient

National ID:	2110142445
Birth Date:	21/06/1993
Blood Type:	A+
Insurance Type:	SGK
Insurance Number:	212548751
Telephone:	+90553352239
Address:	2957 sok. NO:29/2 Karabaglar/Izmir

Visits

Reason	Date Time	Examination Count
Cold	02/12/2014	2
Headache	01/11/2013	4
Headache	24/06/2012	5

To list visits of the patient:

```
SELECT visit_id, date, reason
FROM Visit
WHERE p_id=$patientId
ORDER BY date DESC
```

To display a particular visit of the patient:

```
SELECT *
FROM Visit
WHERE visit_id=$visitId
```

3.4. Doctor - View Visit Screen

Ezpital

Patient

Find a Patient

Patient - Halil Ozercan   **Visit**

Date:	15/05/2014
Time:	13:40
Reason:	Nausea - Fever

Exeminations

My Treatments

Examinations

Type	Date Time	Examiner
Treatment	02/12/2014	Prof.Dr. Ates Balci
Treatment	01/11/2013	Doc. Dr. Alim Gokkaya
Analysis	24/06/2012	Nurse AKerim Senol

Request Analysis   Add Treatment

Exeminations

My Appointments
Weekly Schedule

To add new analysis request :

```
INSERT INTO analysis(e_id, name, done, n_id)
VALUES($examinationId,
       '$nameOfAnalysis',
       FALSE,
       $avaibleNurseId)
```

3.5. Doctor - Patient Treatment Screen

To insert a treatment:

```
INSERT INTO Treatment (e_id, story, diagnosis, treatment, inpatient, d_id)
VALUES($newTreatmentId,
        '$story',
        '$diagnosis',
        '$treatment',
        $inpatientStatus,
        $doctorId)
```

To update a treatment:

```
UPDATE Treatment
SET story = '$story',
    diagnosis = '$diagnosis',
    treatment = '$treatment' inpatient = '$inpatientStatus'
WHERE e_id=$eId
```

To view a treatment:

```
SELECT *
FROM Treatment
WHERE e_id=$eId
```

3.6. Doctor - Treatment List Screen

To list treatments of doctor:
```
SELECT date, time,
              inpatient,
              name
FROM Visit,
     Treatment
NATURAL JOIN Examination,
WHERE visit_id=v_id
  AND d_id = $doctorId
  AND date>=$dateStart
  AND date <= $dateEnd
  AND inpatient = $inpatientStatus
ORDER BY date DESC
```

Note: The following line is not included if doctor does not specify inpatient condition.
```
AND inpatient = $inpatientStatus
```

3.7. Doctor - Patient List Screen

To search patients ("Only Patients I Treated Once" checkbox is not checked):

```
SELECT patient_id,
       name,
       surname,
       visit_date
FROM Patient,
     Visit,
     Examination
NATURAL JOIN Treatment
WHERE visit_id = v_id
  AND p_id = patient_id
  AND name='$nameGiven'
  AND surname='$surnameGiven'
```

3.8. Nurse - Do Analysis Screen

Ezpital

Patient

Find a Patient

Patient - Halil Ozercan

Visit

Date: 15/05/2014

Time: 13:40

Reason: Nausea - Fever

Analysis

Name: **Blood Analysis**

Report:

Submit

```
UPDATE Analysis
SET report = '$report',
    done = TRUE
WHERE e_id = $examinationId
```

3.9. Secretary - Main Screen

Ezpital

Patient
Browse Patients
Add a Patient

Orhana Babavic - Summary

Patients Added Today:	12
Visits Added Today:	35
Inpatient Records Opened	2
Inpatients Discharged Today	5

Exeminations
Browse Visits

Last Patients | Last Visits

Halil Ozercan
Visit Reason: Cold

Selcuk Gulcan
Visit Reason: Flu

Sait Tiryaki
Visit Reason: Ebola

Selim Alimoglu
Visit Reason: Constant Headache

Fatih Atali
Visit Reason: Flu

more...

Appointment
Browse Appointments

To get number of visits added today:
```
SELECT count(visit_id)
FROM Visit
WHERE enter_date = '$today'
```

To get number of impaints records opened today:
```
SELECT count(patient_id)
FROM Inpatient
WHERE start_date = '$today'
```

To get last visits:
```
SELECT name,
       surname,
       visit_id,
       reason
FROM Patient,
     Visit
WHERE patient_id = p_id
ORDER BY enter_date,
         enter_time DESC LIMIT $noOfVisitsDisplayed
```

3.10. Secretary - Add Patient Screen

Ezpital

Patient

Browse Patients
Add a Patient

Exeminations

Browse Visits
Browse Analysis
Browse Treatments

Appointment

Browse Appointments

Add Patient

Name: Halil

Surname: Ozercan

National ID: 2110142445

Birth Date: 21/06/1993

Blood Type: A+

Insurance Type: SGK

Insurance Number: 212548751

Telephone: +90553352239

Address: 2957 sok. NO:29/2 Karabaglar/Izmir

Upload

Add

To insert a patient:

```
INSERT INTO Patient(national_id, name, surname, birth_date, blood_type,
insurance_id, insurance_number, telephone, address)
VALUES($nationalId,
        '$name',
        '$surname',
        '$birthDate',
        '$bloodType',
        $insuranceId,
        $insuranceNumber,
        '$telephone',
```

```
        '$address')
```

3.11. Secretary - View Visit Screen

To show a particular visit:
```
SELECT *
FROM visit
WHERE visit_id=$visitId
```

To calculate total payment:
```
SELECT sum(amount)
FROM Visit,
     Payment
WHERE visit_id = v_id
  AND p_id = $patientId
```

3.12. Secretary - Add Payment Screen

Ezpital

Patient

Browse Patients
Add a Patient

Exeminations

Browse Visits
Browse Analysis
Browse Treatments

Appointment

Browse Appointments

Patient - **Halil Ozercan**   Visit: 21/10/2014 14:26

Date: 15/05/2014

Time: 13:40

Reason: Nausea - Fever

Paid Amount: 500

Currency: TL

Type: Cash

Submit

To add a payment:

```
INSERT INTO Payment(v_id, amount, currency, date, time, TYPE)
VALUES ($visitId,
        $amount,
        '$currency',
        '$dateNow',
        '$timeNow',
        '$type')
```

3.13. Secretary - Add Visit Screen

Ezpital

Patient

Browse Patients

Add a Patient

Exeminations

Browse Visits

Browse Analysis

Browse Treatments

Appointment

Browse Appointments

Add Visit to Halil Ozercan

Reason: Cold

Add

Earlier Visits

Reason	Date Time	Examination Count
Cold	02/12/2014	2
Headache	01/11/2013	4
Headache	24/06/2012	5

To add a visit:

```
INSERT INTO Visit(enter_date, enter_time, reason, p_id)
VALUES('$nowDate',
       '$nowTime',
       '$reason',
       $patientId)
```

3.14. Secretary - Patient List Screen

Ezpital - Orhana Babavic - Secretary

Ezpital

Patient

Browse Patients
Add a Patient

Exeminations

Browse Visits
Browse Analysis
Browse Treatments

Appointment

Browse Appointments

Find a Patient

Name: [   ]

Surname: [   ]

Inpatient   [No   ▼]

[Search]

Search Results

Name	Last Visited	Actions
Halil Ozercan	02/12/2014	Add Visit
Selcuk Gulcan	01/11/2013	Add Visit
Sait Tiryaki	24/06/2014	Add Visit

This is screen is almost the same as patient list screen of doctor users. SQL queries are given in 4.7 Doctor - Patient List Screen.

3.15. Secretary - Browse Visits Screen

Ezpital - Orhana Babavic - Secretary

Ezpital

Patient

Browse Patients
Add a Patient

Examinations

Browse Visits
Browse Analysis
Browse Treatments

Appointment

Browse Appointments

Browse Visits

Reason: [   ]

Between: [29/10/2014 ▼] [30/10/2014 ▼]

[Search]

Search Results

Name	Date Time	Actions
Halil Ozercan	02/12/2014	Browse
Selcuk Gulcan	01/11/2013	Browse
Sait Tiryaki	24/06/2014	Browse

To search visits:
```
SELECT name,
       surname,
       visit_id,
       enter_date,
       enter_time
FROM Patient,
     Visit
WHERE patient_id = p_id
  AND reason = '$reason'
  AND enter_date BETWEEN '$startDate' AND '$endDate'
```

3.16. Manager - Add User Screen


```
INSERT User(username, password, email, reg_date, name, surname, r_id)
VALUES('$username',
        '$encrtptedPassword',
        '$email',
        '$now',
        '$name',
        '$surname',
        '$roomId')
```

4. Implementation Plan

We are going to implement our project as a web application. The database management and functional components will be implemented at server side and PHP scripting language is going to be used to provide server functionality. Also, our PHP code needs to be connected to our database system MySQL. To achieve this, PHP 5 has its own MySQL connector libraries and functions. Although these basic functions are provided, instead we are going to use the PHP framework CodeIgniter's [1] own MySQL connector helper that is easy to use. This is the server side of the application and to create views at client side, we will basically use HTML and JavaScript languages. To add more functionality and lessen the code's weight we are considering to use JQuery[2] and Bootstrap Template Theme[3] in views.

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[1] http://www.codeigniter.com/
[2] http://jquery.com/
[3] http://getbootstrap.com/examples/theme/