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Technical Report

L2 Group Project Task 5

CS2001-2014

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Abstract

This report is about the 2nd year Group project in which we were asked to make an android application.

We were mentored by Professor Panos. He was so helpful and cooperative. He always communicated with us to get to know where we stood with the activity log. We have arranged a group meeting with him every week almost. Whenever we needed help we just emailed him and he was always there with an answer in just a short period of time.

He discussed about all the important things that we needed to know and how attendance is important. He explained to us how to divide work within the members. Throughout all our meetings he kept track on our progress, which motivated us to produce something every time we met with him.

3 of our members are doing Computer Science and three of us is doing Business Computing. This helped us tremendously as we had group members that knew about coding and some member to help with the use cases and the UML diagrams.

In our first meeting we have loads of ideas among ourselves but decided to make an Android Application that helps people In London by providing them by an application for health and fitness with features like:

- Equipment's need to do exercise,
- Diet plan,
- Technical thing like calorie counter,
- Chatting facility,
- And location by using google map.

In this report I will discuss how individually and as a team we developed the technological side of our android application, how we organized ourselves and the different type of communication medium used and also talk about the overall team performance.

Following is a look back on how we handled the group project, how we tackled the obstacles and how we could have done things better.

1. Introduction: This is a technical report of my second year Group project of CS2001 module. In this report I'm going to write down a report about the technology I have used for my application, and about the technical perspective. Moreover I will explain about project idea, team meetings, benefits of the meetings, group wiki, also I will discuss about team experience, communication mechanism task allocation, my specific role. Last section of the report will be about the research topic that I have adopted.

2. Technology: In this section of the report I am going to explain what I have learnt about the technologies that I have used for my group project. About my approach of connecting application to server, the open data I have used in this application and how was it was used to support my application, also I have explained the way I would develop the project differently, the way I have used design patterns and at the end usability concerns I have with respect to my target user.

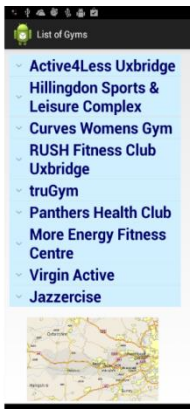
In this section I'm going to explain what I have learnt from technologies that I have used for android application development, database development and server side development.

2.1 Application development: For the android application development I have used ADT bundle which included with Eclipse IDE, java as a programming language and XML language for user interface. Eclipse IDE was the environment that I have used to develop my android application.

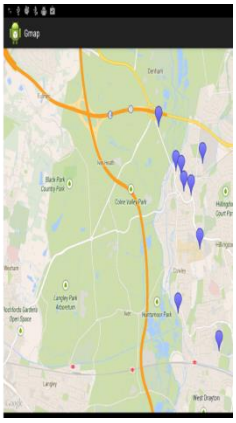
I have learnt how to use ADT bundle for android development, like creating file, importing and exporting file, or existing project. Have learnt how to use data library and jar file in Eclipse for some purpose like, importing apache, http json, internet connectivity and searching. Testing application by using virtual environment called Emulator. Also learnt how to test application using real android device by connecting that device to computer. Using google map for android, finding out SHA finger print for API key and getting android API key from Google. Moreover I have learnt how to enable features provided by Google like location for android application usage from Google and supported by google. Learnt to use XML language for user interface development and developing application for android phone and tablet at the same time.

Actual development work that I did during my task 1 android application development is added below. Screenshots are provided from the development work.

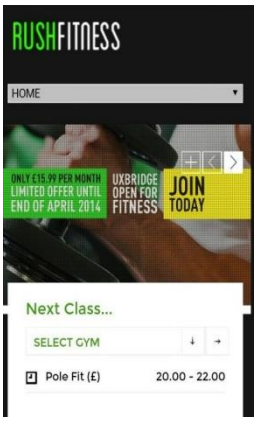
This is the first screen of the location part of the application, where two image buttons are given, by clicking on those buttons will direct the user to an expandable list and map button.



This is the second screen of the location, which is a list of gym, this list is expandable, in the list details of the gym is given. Below the list there is an image button available to view these gyms position in map.



This is the map where few markers are visible, all of them representing each gym, by clicking on each marker small info will pop up.



From the map marker there is an option to access web page of any desired gym, after clicking on marker a small window will be visible with info and link.

2.2 Database development:

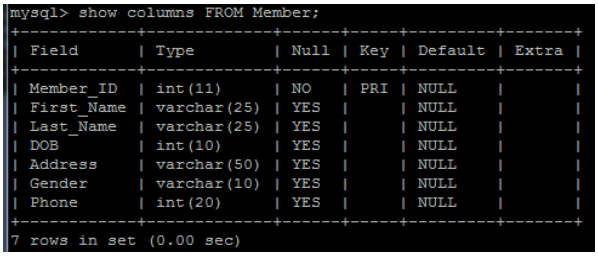
For the database development I have used MySQL which is installed in university server. By creating database I have learned a lot about database, those are listed below:

I have learnt how to create table in database, how to insert data in database by using table. Learned about data type and commands needs to use in SQL for different purpose, such as updating or modifying table, linking tables, creating 1st,2nd and 3rd normal form of table, extracting data from database, working with Java Development Connectivity.

Actual work that I did for database during my task 2 of android application development is added below. Screenshots are provided from the work.

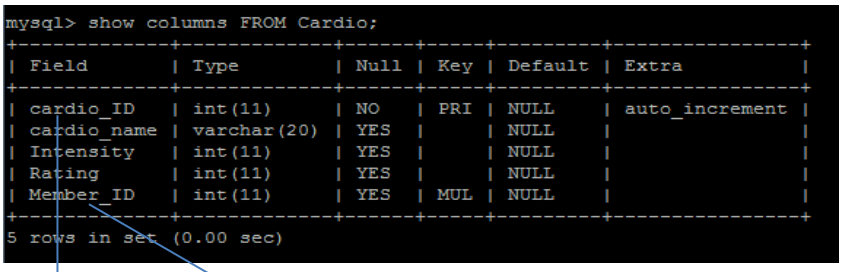
```
+--------------------+
| Tables_in_cs2001   |
+--------------------+
| Accessories        |
| Answers            |
| Blog               |
| Calories           |
| Cardio             |
| CardioDescription  |
| Description        |
| Dietary            |
| Location           |
| MaleExercise       |
| Member             |
| Questions          |
| WeightDescription  |
| Weights            |
+--------------------+
14 rows in set (0.00 sec)
```

This image shows all the tables that will be used for the mobile app.



```
mysql> show columns FROM Member;
+------------+-------------+------+-----+---------+-------+
| Field      | Type        | Null | Key | Default | Extra |
+------------+-------------+------+-----+---------+-------+
| Member_ID  | int(11)     | NO   | PRI | NULL    |       |
| First_Name | varchar(25) | YES  |     | NULL    |       |
| Last_Name  | varchar(25) | YES  |     | NULL    |       |
| DOB        | int(10)     | YES  |     | NULL    |       |
| Address    | varchar(50) | YES  |     | NULL    |       |
| Gender     | varchar(10) | YES  |     | NULL    |       |
| Phone      | int(20)     | YES  |     | NULL    |       |
+------------+-------------+------+-----+---------+-------+
7 rows in set (0.00 sec)
```

Member Table from the database. All the tables are linked with the Member table as a foreign key with Member_ID because the member will be using the app, hence his/her ID will be required everywhere.



```
mysql> show columns FROM Cardio;
+-------------+-------------+------+-----+---------+----------------+
| Field       | Type        | Null | Key | Default | Extra          |
+-------------+-------------+------+-----+---------+----------------+
| cardio_ID   | int(11)     | NO   | PRI | NULL    | auto_increment |
| cardio_name | varchar(20) | YES  |     | NULL    |                |
| Intensity   | int(11)     | YES  |     | NULL    |                |
| Rating      | int(11)     | YES  |     | NULL    |                |
| Member_ID   | int(11)     | YES  | MUL | NULL    |                |
+-------------+-------------+------+-----+---------+----------------+
5 rows in set (0.00 sec)
```

Primary key foreign key

2.3 Server side: By developing server side for android application using Jetty, Putty, Unix, Ant, and JDBC I have learnt a lot about using server in android application and extract from data. **Jetty** is a pure Java-based HTTP (Web) Server and Java Servlet container, as a result when I was dealing with Jetty I got deeper knowledge about Java. We have used Putty to access database, to access Jetty, to run Jetty Server, to edit java classes created on Jetty server, also I have learnt how to edit java classes in Jetty by using nano.

2.4 Connecting android application to server: In order to connect android application to server I have added Webview in java class inside onCreate method, enabled JavaScript, set web view client and then to load URL I have put the URL inside the code. Moreover I have created a java class to download webpage text, in this class I have added code to display the results of the AsyncTask, started the query, converted the input stream. I have done these things using ADT. At the same time I have run the Putty, then from putty I have started Jetty, then ant the Jetty server, because the server needs to be on to access the database.

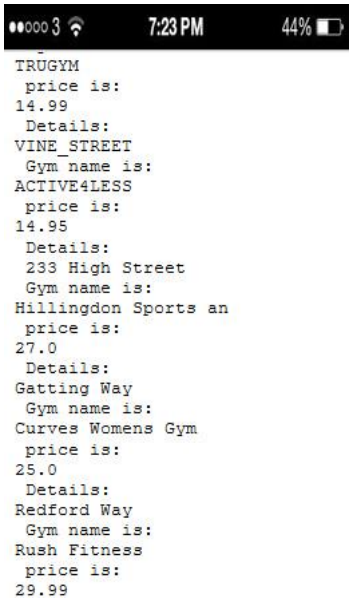


Figure: extracting and showing data from database by running server in an android device.

Figure: The code I have used for webview to extract data from server and show that in application.

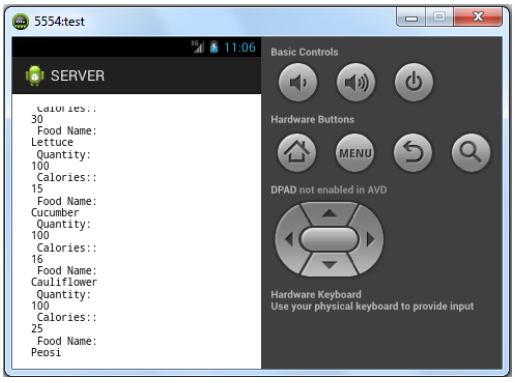


Figure: extracting and showing data from database by running server in an emulator.

2.5 Open data I used: For the concept of open data I have used few data from the websites listed in the list that I have used in my application. Then I have added those data in my database by SQL, then I have accessed those data form my application. Those data was like the name of the gym, their membership price, in which area it is and address [3].

Yes I have used those data to support my application. Because those data was used by me to help users to get information about local gym. So that they don't need to surf internet because it takes time find out desired data.

Figure: displaying data from database in application.

2.6 Developing project differently: At the terms of technical perspective, I would like to use different software for high quality development of my Android application. In that case I want to use other IDE that is Android Studio and IntelliJ IDEA for much more development option and facility. These are the IDE's to develop android application with more advanced perspective and feature; doing the development more easily and making the user interface for user friendly these environment in very productive coming with latest updates. Each of them is labelled as one of the most intelligent IDE for android development Platform as it provides many facilities, such as easy project navigation, reliable refactoring tools and instants code completion.

By considering the thing that I have to attempt a similar project I would look forward on either to use MYSQL by my own or some other environment like SQL which will help me to develop better application for targeted users.

2.7 How did I use design pattern: I did sketches by using the concept of Low Fidelity on my app by using pen and paper. After doing this I have started developing the application by using ADT and Java and XML language mainly. I did the design based on two areas actually; one on the aesthetics of the application, that is mostly based on its core functionality and the other one is based on the SQL Database. Relational database was needed to identify before I start the development period. I have created entity relation diagram to superficial our task [4].

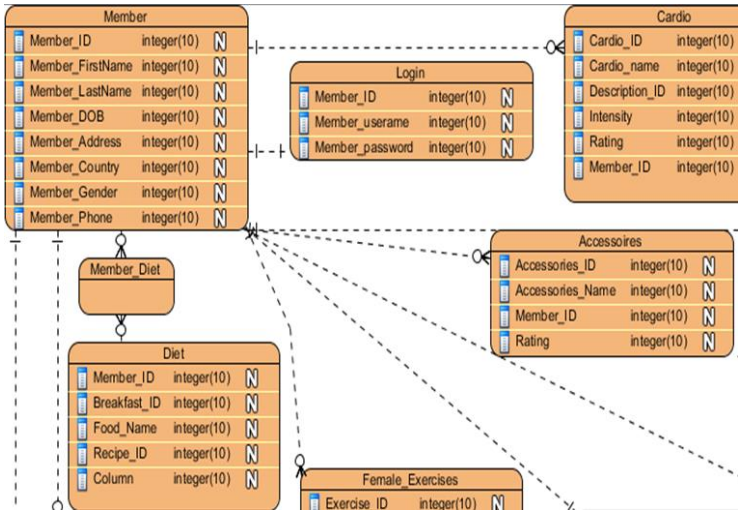


Figure: ERD of our application.

To simplify the whole process and the understanding of the application I created a Sequence diagram which is shown below.

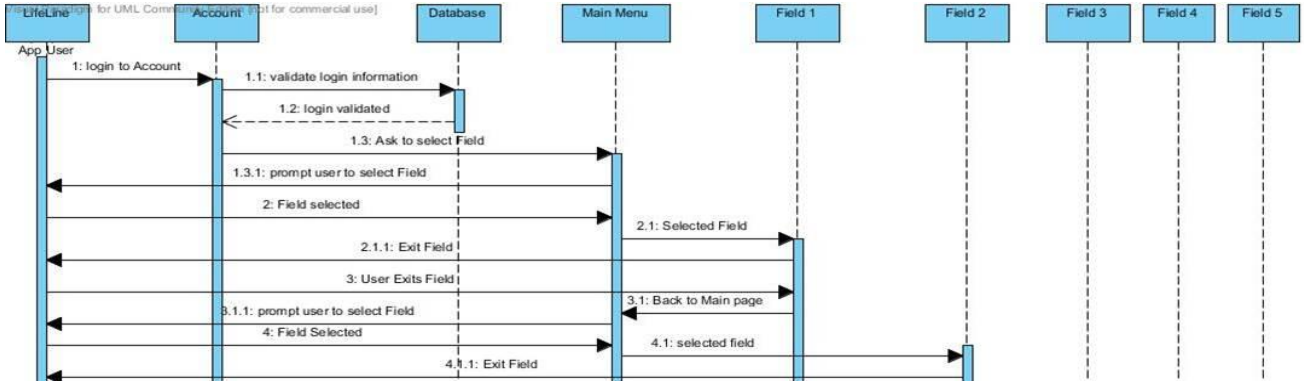


Figure: Sequence diagram of our application.

2.8 My usability context: We have decided created to make an android application to facilitate and by targeting city people those who live in London, to make their like better by following a concept "Healthier is smarter city" as a group. As a result we have created an application that will help to connect people who have same interest for health and fitness and sports. Each of the group members targeted different users, in that case my targeted users was old people. So I have adopted such design that will help older people to use android application, features that will make the application easy to use and acceptable to older people, and also some extra feature to make application usable to older people since they have different requirements.

I have used image button to make the buttons more visible and to help the older people to understand what the button is going to do. I have added animation feature for the button to help them identify that the button is clicked and also I have added vibration for the button so that, If an user has visual problem then the vibration will help the user to understand that action in done. Also I have used larger font size by considering their visual problem. I have used WebView for the users to help them surf websites instantly.

The other usability concern was the colour scheme, so I have used a colour scheme that will be eye catching and identifiable.

3. Organization: In this section of the report I have explained about the idea we have adopted as a group and how did the idea worked out actually. I have also explained how we have arranged team meetings and it's usefulness. Moreover I have mentioned the benefits of using group wiki and at the end I have mentioned how would I organize the team differently.

3.1 Project Idea: Yes the project idea chosen for the group really worked well. Group members were agree with the idea. We have successfully divided the work among six group members. We have arranged group meeting to talk about the chosen project, we have distributed the work based on group members interest.

3.2 Team Meeting: We were used to arrange team meeting by sending message in a mobile application called Whatsapp. One of the team member needed to send a message in our group account for

communication (we have created an account in Whatsapp in order to have chat with group members anytime and to reach fast, also all members in general use mobile and Whatsapp many times in a day). We needed to show our agreement for time and place for meeting and then we used to go for meeting.

Meetings were useful because we used to discuss about what we need to do, what are the requirements, the deadline, how much time left and how much the group know about that required task. Then we distributed the work among members and also sometimes start working as a group in a lab.

3.3 Benefits of Wiki: When the team had doubts on decisions and changes that have been made in past activities we always use the wiki to remind us of the decision or changes that were made. The use of wikis in projects has been shown to reduce project delivery time as well. The use of wiki reduced emails by 30% at least. There was compliance with quality standards because all documents in wiki's have version control and audit trails. The openness and transparency of wikis facilitates was a large increase in work product reuse for us. We have used wiki as a project management tool to post meeting times, resources for our group, and for individuals to post what we're working on. It was easy for us to keep track of what's going on by watching the "recent changes" on wiki [6].

3.4 The way I would organize the team differently: If I had to undertake a similar project and I had to undertake the team differently in that case I would first try to know the team members ability and interest. Then I would divide the work according to the number of group member and I would offer the work according to their ability and interest. Also I would consider their area of study. I would have arranged meetings more frequently based on the groups need. Moreover I would have checked group members progress and offer any help they need and motivate them to finish their work properly. Also I would have remind them about any deadline approaching, times about meetings and updates about group work due to any members absence [7].

4. People: In this section of the report I'm going to explain about the effectiveness of my group and hoe efficient it was. How we have allocated the tasks among group members. Also I'm going to explain about my specific role in my group and at the end I will mention those communication mechanism I have used.

4.1 Effectiveness of my team: My team was efficient and effective enough. From the beginning we have worked as a group. We were always kept communication via message, email, Whatsapp and social media. We have arranged group meetings, we have discussed about the topics, discussed about the requirements, and much more. At least two group members were active all the time. We have provide help to group members as much as possible by doing more work and taking responsibility. As a group we never made any one stressed for any reason and if someone one doesn't know anything we have finished that task by other member. Every group member always informed other group members whenever a new file was posted on group Wiki. We didn't have clashes of idea instead we were all discussing about our personal idea and willingness to work together to complete each task together. We also tried not to appoint any group leader in a sense that everyone is a leader individually thus motivating everyone to complete their work in their own pace with the expected results at the end. Overall the members who worked towards the project throughout the academic year were very efficient and effective and were able to deliver to the best of their abilities [1].

4.2 Task allocation: Task was allocated after a meeting session and a discussion was held on the skills required to complete the task. Once all the skills were listed each member was asked if they are comfortable to handle such a task or not. The member who was ready to take the responsibility and

understand that the task had to be completed in a specific time frame was assigned to it. After the allocation the member was asked for the resources required for the best results and accordingly the group was divided into sub groups, so that the work load is divided among each and every member evenly. During the course of the task the member was asked to send update on their progress and if a member or sub group fails to achieve a task in the allocated time period, other member join the sub group to finish the task as soon as possible. Therefore each group member had to be alert about the progress of other members or subgroups [2].

4.3 My Specific role: Since we had no leader; we were our own leader as we were working as a unit and everyone was concentrating on their specific user types. I was allocated with the Location section of the project and my targeted user type was old people and was doing every bit possible to help my group achieve a higher grade and improving my grade as well. Sometimes when I was the first person to message the group to organize a meeting or to update the group with the course related information; I found all the group members active and all of them replied to the message and expressed their opinion.

4.4 Used communication mechanisms: We have used several different communication mechanism, they are Whatsapp which is a mobile application, we have used this application because everyone use phone and carry phone all time and Whatsapp is very popular application for communicating, in addition we have used this application to transfer small file and image; we have used email to transfer large file, we have used cell phone messaging system, and we have used Facebook social networking site, because everyone have an account in Facebook and everyday we are using Facebook, so it is a good mechanism to communicate and a way to get to our group members fast also we have transferred files. We have adopted all these mechanisms based on situation and need [5].

5. Research Topic

REDIS

REDIS is an open source, advanced key-value store. It is often referred to as a data structure server since keys can contain strings, hashes, sets and sorted sets. REDIS works with an in-memory dataset. Depending on users use case, user can persist it either by dumping the dataset to disk every once in a while, or by appending each command in a log. User can read more about REDISs features on project's website. REDIS's original author is Salvatore Sanfilippo and on March 15 2010 VMWare started sponsoring the project. REDIS is used in several important products and services such as: GitHub, stack overflow, Guardian and many more. I have provided a link about who use page:

http://redis.io/topics/introduction

How REDIS Works?

At its roots, REDIS is a single-threaded server. This means that a single thread reads incoming connections using an event-based paradigm such as epoll, kqueue and select. When a specific event occurs on a file descriptor, it processes them and write back responses.

REDIS uses an home-made event library which abstracts low level socket management. Central object is the eventLoop which contains events that has been fired according socket I/O.

aeApiPoll(eventLoop) polls all the socket descriptors to see if there is network activity. In the aeProcessEvents() all fired events are checked and the appropriate handler is invoked.

When we can use REDIS?

Redis may not be the best solution for all applications where a database is needed, it is being incredibly used in situations where scalability is a serious issue. By scalability I do not only mean a large dataset but I mean high traffic. Redis may not be suitable for the largest of datasets.
(Introduction to Redis - In Memory Key Value Datastore, 2011)

Caching - as Redis is run from memory it can be used as memcache, this gives many advantages, it will improve the overall performance of the database through latency and throughput. The latency is the time it takes for the database to execute a query, with caching increases speed by 25%. Throughput is the speed that the database can work on the next query after one has been executed, throughput increased by 60% with caching.

When we should not to use REDIS?

REDIS has a few situations it cannot overcome without becoming costly to use.
Dataset Size - If the dataset is larger than the RAM available, REDIS will not work as it uses memory to store data. This means it is only useful for small databases of around 16GB, it is possible to scale horizontally with REDIS however it would be very costly to add a new computer every 16GB or so.
Querying large amounts of data - It has been found that when queuing large amounts of data with REDIS. This will cause RAM to fill up very quickly and cause virtual memory to be initiated causing Disk Swap.

Installing the REDIS:

I accessed the server on which MYSQL was installed using Putty. After that using the command **Sude apt-get** install REDIS. I have successfully it in the group directory.
After going to the REDIS directory using REDIS-cli I successfully run the REDIS server.

No SQL

My Research Topic was also a NoSQL database system. NoSQL encompasses a wide variety of different database technologies and were developed in response to a rise in the volume of data stored about users, objects and products, the frequency in which this data is accessed, and performance and processing needs. In comparison relational databases, were not designed to cope with the scale and agility challenges.

When compared to relational databases, NoSQL databases are more scalable and provide superior performance, and their data model addresses several issues that the relational model is not designed to address (Mongo DB):

- Large volumes of structured, semi-structured, and unstructured data
- Agile sprints, quick iteration, and frequent code pushes
- Object-oriented programming that is easy to use and flexible
- Efficient, scale-out architecture instead of expensive, monolithic architecture

NoSQL databases have numerous advantages and disadvantages. NoSQL databases have numerous advantages and disadvantages.

Figure A: The graph above (Culled from CouchBase: NoSQL White paper) compares performance with system cost of applications using NoSQL with those using the traditional relational databases. From this it can be seen that application performance with NoSQL stays relatively unchanged/ steady as system cost increases slightly and scales out even with more users, compared to relational databases where the performance deteriorates with more users as the cost increases exponentially and doesn't scale out past a certain point.

For my research topic, I will be looking at Document-based stores. These databases store and organize data as collections of documents, rather than as structured tables with uniform sized fields for each record. With these databases, users can add any number of fields of any length to a document, Neal Leavitt (2010).

The name of the database I used CouchBase Server. CouchBase is an open-source, NoSQL, document-oriented database that can be used both as a document database that stores JSON documents or a pure key-value database (Wikipedia). It is optimised for interactive applications which make it a good fit for the application that was built as some features such as retrieving pub and drink information from a database. These applications must service many concurrent users; creating, storing, retrieving, aggregating, manipulating and presenting data.

CouchBase server is strictly a document database, meaning that information is stored in the database according to its document ID (used to reference the data), and the corresponding document value. This means that there is no need to expressly set the format of the data, create a schema or even tell CouchBase server about the data that's being stored (MC Brown, 2012). It uses the JSON format to store the files and the JSON hash structure to create an individual application. This is why I believe an application such as ours would greatly benefit from this type of database. Our application pulls information from our current MySQL DB about various drinks (units, calories, name, type, etc.) which it presents to the users.

Here is an example of how data would be stored in a JSON file to be used by CouchBase. The application would then pull this information using the specific attributes it needed such as drink "id", "type", "abv", and "name" and turn it into information about a drink . This is quite similar to the current MySQL that I being used by the application but is a shorter method as a separate JSON file would not need to be created to pull the data into specific parts of the application.

6. Conclusion: It was a good experience to write down a technical report like this and creating a website. It was challenging for some perspective but I have learned a lot but doing these report, research and technical experiment. During this report I have discussed about technology I used, my group, working experience as a group member and much more. I believe this knowledge will be helpful for my future education and career.

7. References

[1] Levin, P. Successful teamwork! For Undergraduates and Taught Postgraduates Working on Group Projects, (Student-Friendly Guides series), OU Press, 2004.

[2] HRA Consulting Ltd, Project Management Book, available at http://www.hraconsulting-ltd.co.uk/projectmanagement-book-0101.htm (Free to download)

[3] Hey, T., Tansley, S. and Tolle, K., The Fourth Paradigm: Data-Intensive Scientific Discovery, Microsoft Research, 2009, available http://research.microsoft.com/en-us/collaboration/fourthparadigm.

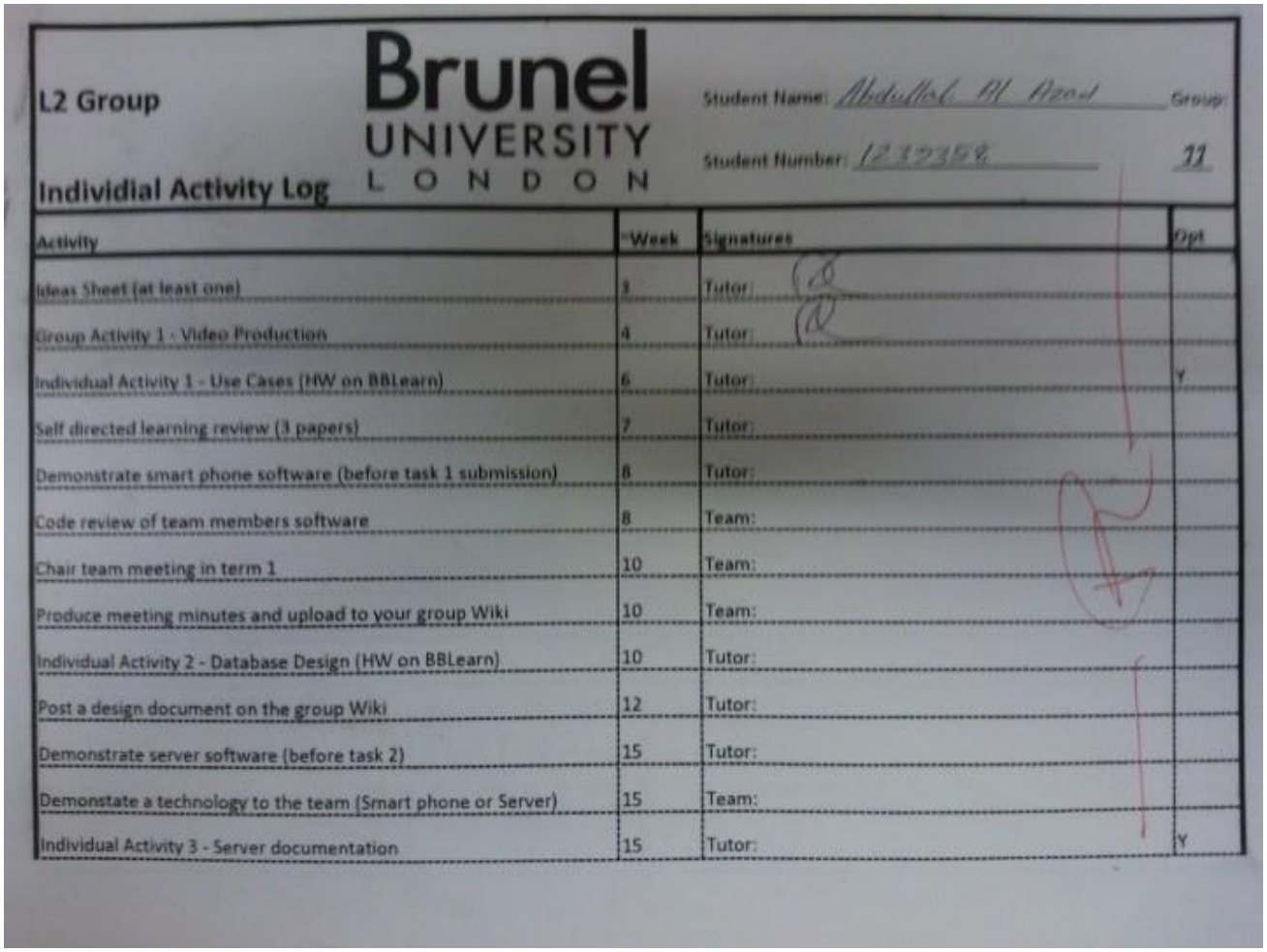
[4] Sommerville I, Software Engineering (9th Edition), Pearson, 2010.

[5] Hughes, B. and Cotterell, M. Software Project Management, (5th Edition), McGraw-Hill, 2009.

[6] Baumann, P. Baumann, H. Grassle, P. UML 2.0 in Action: A project-based tutorial, Packt Publishing, 2005.

[7] Cornford, T., and Smithson, S., Project research in information systems : a student's guide, (2nd ed.), Palgrave Macmillan, 2006.

8. Activity Log



L2 Group

Brunel UNIVERSITY LONDON

Student Name: Abdullah Al Azad Group

Student Number: 1232359 11

Individual Activity Log

Activity	Week	Signatures	Opt
Ideas Sheet (at least one)	3	Tutor:	
Group Activity 1 - Video Production	4	Tutor:	
Individual Activity 1 - Use Cases (HW on BBLearn)	6	Tutor:	Y
Self directed learning review (3 papers)	7	Tutor:	
Demonstrate smart phone software (before task 1 submission)	8	Tutor:	
Code review of team members software	8	Team:	
Chair team meeting in term 1	10	Team:	
Produce meeting minutes and upload to your group Wiki	10	Team:	
Individual Activity 2 - Database Design (HW on BBLearn)	10	Tutor:	
Post a design document on the group Wiki	12	Tutor:	
Demonstrate server software (before task 2)	15	Tutor:	
Demonstate a technology to the team (Smart phone or Server)	15	Team:	
Individual Activity 3 - Server documentation	15	Tutor:	Y

Figure: Individual activity log.