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Big Data Cloud for Social Networks

MSc Advance Computer Science

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LITERATURE REVIEW

JustGym:

Big Data Cloud for Social Networks

MSc Advance Computer Science

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Abstract

This project highlights and focuses on the importance of delivering customers with high and fast reliable means for getting information without any hassle or fuss. This project talks about big data and the importance of having big data in organisations.

It also talks about cloud services such as Google and Amazon service who offer customers with online services for cost reduction and time reduction which helps in boosting organisation profitable means.

It has been noticed in the gym sector that customers in a newly located area find it difficult to find different services and information around their area quick. And also focusing on how big data can be implemented into small organisation and community

The aim of the project is to create a solution where by customers in a new or existing area can get services and information all in one place. JustGym application after implementation has been able to show both existing and new customers in an area services the render within their given location and the quickest way to get these services.

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Chapter 1

1.1 Introduction

Davenport et al (2013), states that data is put into different sectors and functions within the economy world, although not forgetting other essential factors of production such as human capital and hard assets. Modern economy could not take place today without certain factors put in place, through the use of big data. Very large amount of data can be put together and analysed to determine certain patterns and make decision easier and better. Individual firms and some organisations benefits from the use of this services to stay ahead of competitors. It enhances productivity and provides significant values for the world economy by reducing waste which increases the quality of services and products.

According to researchers from Mckinsey Global Institute, the large volume of data which has been generated, stored and mined for insight has become economically and highly important to businesses, consumers and government services.

With the Previous history and trends in IT innovations and investments and the impact towards its competitiveness and productivity has proven that the Big Data can have a huge impact in transformations of our lives. The same pre-conditions that allowed previous stages of IT-enable advancement to power productivity. This means that technology advancement followed by the adoption of complementary management innovations, is in place for this big data and the expectation for the suppliers of big data technology and advanced analytic capabilities to have greater impact on the productivity as suppliers of different kinds of technology.

Davenport et al (2013), big data usage will create new growth opportunities and open new categories for companies, such as those that collect huge amount of data for analysing. Many of these companies in the middle of large information flow where data about the product/services, consumer's preferences, buyers /suppliers can be captured and analysed, This will make leaders of bigger organisations across different sectors to begin to look into the usage and huge services of the capabilities of big data.

The period of big data can yield new management principles. This will take us back to the early days where some corporate management leaders found out that the minimal efficient scale was a key success for competitive growth. The likelihood for future competitive benefits are most likely to occur to companies that only capture more and better data but at the same time use this data effectively at a huge scale. I hope by reflecting on such issues in this project will give some companies and organisations some insights to understand how big data could overturn their assumptions behind their strategies as well as the fast growing trend of the usage of Big Data.

This written project will also outline the huge importance of cloud services and how they work hand in hand with Big Data. It would also state the pros and cons of cloud services the various types of cloud services and how organisations use cloud services to stay ahead of their competitors.

This Project will also highlight how the use of a website creates avenues for consumers to assess quality services and information on a faster pace giving the organisation profitable benefits. It will also feature how the use of location base services helps customers get the rightful information they want, making the organisation known and advertised. The organisation which I will focus on will be Just Eat and its services outlining how they use their service and try and incorporate it to my own implementation, which will be a Gym scenario and the name of this service will be JUSTGYM.

Further analysis and deep research are yet to be carried out on the various means on how to create and implement the system that will be used.

1.2 Aims and objectives

1.1.2 Aims

The aim of this project is to design and develop a data driven website showing the usefulness of big data usage in the society and also analysing the usefulness of big data and cloud services. It will also aim at showing how big data works.

1.1.3 Objectives

- To carry out research on Big data outlining the benefits of Big Data
- To research on cloud services and the importance of Cloud services
- To research on Just Eat services and other services like Just Eat
- Analysis and the useful requirement of JustGym services
- To research on the most suitable tools/ methods and also techniques which can be used in developing JustGym
- Implementation of a test prototype for JustGym
- To incorporate the use of Location base services in JustGym
- To carry out various Evaluation on the project and also make further recommendations

Facilities required

WAMP, MYSQL, JOOMLA.

1.1.4 Business Proposed

JustGym is a new and lucrative means in which customers can find their nearest Gym and fitness location within their given area. It has been noticed that a lot of customers when they move area it is difficult to find their desired Gym or fitness centre location, and as this has been the case Gym and fitness organisation's loose customers and profit.

The proposed solution to this problem is to have a means of advertising different Gym and fitness organisation in one place for customers to get relevant information quick and fast around their comfortable zone. This will be done using a website, where all this relevant information can be published. This helps both the organisation owners which can be the Gym organisation and the service providers advertise their services which in return earn profitable income and also recognition, because it works as a chain whereby the customers using the services get relevant information needed. The Gym originations get increase in customers and the service provider rendering this service gains significant recombination and also profitable earning.

Another purpose for this proposed application is to forge a strategic relationship between the customers and the service providers, to make the organisation owners have a new sense in how to increase their awareness to customers and gain more of them.

This proposed business has a window of opportunity to introduce its services and gain a huge significant piece of the market share. This new service will cater for a wide range of gym users, both the old and the new, which will yield profit for the services providers and the Gym organisations.

Project timeline for this proposed application will take three months (12 weeks or less) to develop and below are phases to be considered :-

- Phase 1 - Research and analysis's (2 weeks)
- Phase 2 - construction of application (3 weeks)
- Phase 3 - Initial testing of application with reviews (2 weeks)
- Phase 4 - Amending of application if necessary (1 week)
- Phase 5 - Documentations of application (2 weeks)
- Phase 6 - Finalized application (2 weeks)

1.1.5 Business Model

The business model of this project will be in a charitable form whereby no profit is made at this early stage. These helps the application to get necessary awareness it needs before it goes to the section of been profitable. This application is just solely helpful for the communities it's based in and helps customers find services faster and easier all in one place. JustGym application have been shown around to different users in different age range as a prototype and have been given different options and all these options have been taken note of and also added into the development of the application. This application can be profitable in the nearer further whereby services providers can add their services on JustGym application and with any service JustGym provides, JustGym commission on it. This profit will help in the maintenance of the application and also the expansion of the application. The advantage having this sort of application like this is because both the service providers such as local gym owners and local shop owners in the area can publish their services on JustGym application and then with customers visiting the Website (application), the use this application to find services and this gives local gym owners more customers and so on. It works like a triangle whereby it involves customers, service providers and JustGym as a service

Chapter 2

2 Research on Big Data

The 21st century, is the era when big data exploded upon the scene and big organisations of the online and start-up firms had to embrace it. Firms such as Google, LinkedIn, Facebook, eBay were all built around having the big data structure from the beginning. This big organisation's didn't have to integrate big data to their traditional source of data, because they didn't have those sorts of traditional forms. This organisation didn't have to merge big data technology into their traditional IT infrastructure because those infrastructures didn't exist. The word big data could stand alone, whereby big data technology architecture could be the only architecture.

However, big data in large and well established business should not be separate, but must integrate and merge with everything else that's going on in the organisation or company. Big data has to co-exist with other types of data. IBM mainframe and Hadoop clusters which mostly deals with virtualisation work hand in hand to accomplish certain jobs. Data scientists must somehow work closely and jointly with other quantitative analysts to get a better result, In order to understand the co-existence aspect the interviewed 20 large companies early 2013 about how big data fit into their overall data and analytics environments. Overall it came out that the expected co-existence in all this large companies big data were not managed separately from other types of data and analytics. Their future research leads to them finding out about a new management perspective, on analytics which they called "Analytics 3.0".

Big data may come across new to some online firms and start-up business, but some other firms view it as something they have been battling with for a while. Some managers appreciate the ground breaking idea of big data while others find it as business as usual or as part of the evolution towards more data. Some addition to the form of data to their system was going on for many years by some companies and thus they didn't see anything special about big data. When this managers in big firms were stunned by big data, it is not the word BIG that impresses them, rather it's one of the three aspects of big data and this can be: - the opportunities offered, low cost of the technology itself and the lack of structure.

According to a survey of more than fifty large companies by Newvantage partners in 2012, "it found out that it is about variety not volume. It also showed that companies are more focused on the variety of data not the actual volume both in the past and the present years to come. The most important objective and potential reward of big data is the ability to analyse a very large and diverse data source and new data types and not managing very large data sets".

Furthermore, some companies are using advanced techniques from the usage of more structured data from sensor and operational data-gathering devices. Some of these companies are GE, Schneider national and UPS. All these companies are widely putting sensors in objects that move or spin and this helps in capturing the resulting data which helps in optimizing their businesses. And small benefits from this techniques provides very large payoff when it's been adopted on a large scale. GE which is one of the companies adopting this technique estimates that 1% fuel reduction in the use of big data from aircraft engines would result in a $30 billion (dollar) savings for the commercial airline industry over the next 15 years. Also GE estimates that 1% efficiency improvement in global gas fired power plant turbines could profit a $66 billion savings in fuel consumption.

UPS has been an organisation that uses big data a lot and this began in the early 1980s, where by the capture and track variety of movements and transactions. The company of recent is said to track data on 16.3 million packages per day for over 8.8milliom customers, with an average tracking request of 35.5 million per day. Now UPS stores over 16 petabytes of data in which much of it comes from big data, however most of it comes from its telematics sensor in over 46,000 vehicles. The sort of data in this UPS package cars or trucks includes their direction, speed, braking and drive train performance. This data is not only used for monitoring daily performance but also to drive a major re-design in how a UPS driver operates/route structure. This innovation is called ORION (OnRoad Integrated Optimization and Navigation), which is or could be said to be the world largest operation research project. This operation relies heavily on online map data which helps in giving real time data of the drivers pick off and drop off times. This project also led to saving of 8.4 million gallon of fuel in 2011 by cutting 85 million miles off daily routes. UPS is also looking onto the use data to analytics to optimize the efficiency of its 2000 aircraft carries per day.

2.1 Section 1 - Objectives of Big Data

Barth (2012), many new up springing information technologies, can profit from big data. This will be in the cost reduction and substantial improvement sectors and also increase the time to perform a computer task faster. The technologies behind big data will allow companies and organisation to accomplish a variety of objectives. Below will be some objectives which can be accomplished by using big data -

- **Cost reduction** - some organisations that use big data think that MIPS and terabyte storage for structured data are now cheaply developed through big data technologies like Hadoop clusters. For example a cost comparison of one company estimates that cost of storing one terabyte for a year was $37,000 for a typical traditional relational database, then $5,000 for data appliance, and the estimate of $2000 for Hadoop cluster was low cost. These figures are not directly comparable in the more traditional technologies but more reliable and easily managed. Organisation that focused on the cost reduction aspect made a decision to adopt

big data tools primarily within the IT organisation on largely technical and economic criteria.

- **Time Reduction** - to give a prime example of how time reduction is useful is from Macys merchandise pricing optimization application which provides a reducing cycle time for complex and very large scale analytical calculations from hours or even days in the case may be to minutes or seconds. By doing this the store has been able to reduce the time which it uses to optimize its pricing by 73 million items for sales over a period of 27 hours which took it only 1 hour to complete. This can be described by some big data analytics this development made it possible for Macy's to re-price items more frequently to adapt its changing conditions in the retail marketplace. This big data analytics application which takes out data of its Hadoop cluster and puts it into parallel computing and into memory software architectures. Macy's also achieved 70% reduction in hardware cost. It is also using similar approaches to reduce time for marketing offers to customers in Macy's. The company can now run more models with this time saving development which generates thousands of models on granular data compared to only 10, 20, 100 that were used to be able to run and aggregate data, which is really the key difference between what they do now and what they will be able to achieve with high performance computing. Another objective time reduction has is the ability to be able to interact with customers in real time; this is done by using analytics and data derived from the customer's experience. In the case of say the customer exists these building these targets offer and services which are likely to be much less effective. This means rapid data capture, processing, aggregation and analytics.

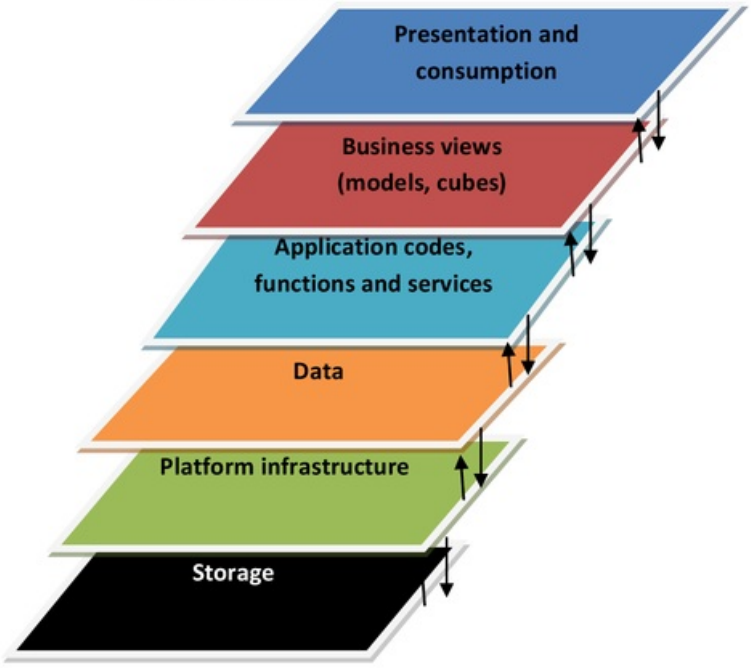
2.2 Section 2 - Development in New Big Data

The most important thing an organisation can do with big data is by employing it to develop new products and services which base around data. Some of these companies who employ these approaches are the online firms, which have already employed this data base products and services. An example of this is LinkedIn; this organisation has used big data and data scientists to develop a variety of products offerings and features, which include groups you may like, people you may know, jobs you may like, who viewed your profile, and other services. These offerings and services have attracted millions of new customers to LinkedIn. Another giant of this product and service in big data is Google. This company uses big data to refine its core search and ad serving algorithms and also it's currently developing new services and ads which have big data algorithms to optimize its search functions.

2.3 Section 3 - Big data stack

Davenport et al (2013), as a growing trend big data technology have a highly specialized feature which is different from the legacy systems. The Fig 1 will show these typical components of big data stack, and how the operate and interlink with each other. Each of these components revolves

round the large unstructured and semi structured nature of big data. When working together this part creates a holistic solution that is fine tuned for the high performance processing power and storage.



Storage: Storing of large and huge amount of data on a disk has become one of the most costly effective ways as the disk technology becomes more commoditized and efficient. Such companies are like EMC who sell storage solutions which allow disks to be added cheaply and quickly, therefore scaling storage in the lock with the growing data volumes. All these make many companies see Hadoop as a low cost alternative for the archival and speedy retrieval of large amounts of historical data.

Platform infrastructure: this part of the component is in charge of the collection of functions that comprises of the high performance processing power of the big data. The platforms capabilities include the management, integration and application of sophisticated computational processing to the data. Typically, in the big data platforms it includes a Hadoop foundation or a open source project. This Hadoop was designed to build and optimize various complex manipulation of large amount of data while hugely exceeding the performance or price of the traditional database. Hadoop is a combined storage and processing environment which is highly and vastly scalable to the large and complex data amounts of volumes.

Figure 1 Big data stack

Data: The expansion of big data is as complex and broad as the application used for it. Big data can mean from oil well sensors to genome sequences, cancer cell behaviour, and location of products, patient vital signs, and social media interactions. All these are examples of what big data comprises of. The data layer in the stack shows that data is a separate asset which is managing and governing the transactions. Which also takes us to 2013 where a survey was taken place and the found out that 339 companies responded, 71% admitted that the planning of big data strategies was yet to begin,

and giving them a highlight about reconciliation, timeliness, security, data quality are all significant barriers to big data adoption.

Application code, services and function: as big data varies with different business application, this will mean that code used to operate and process data can vary as well. MapReduce was used by Hadoop to distribute data across the disk and also to apply complex computational instructions to that data. Keeping in line with the high performance capabilities of the platform, MapReduce objectives are to process in parallel across various nodes on the big data platform, and then quickly assemble it to provide a new structure set or answer set. A good example of big data in Hadoop could be to calculate the amount of users who like them on social media sites. In MapReduce a text mining application would search through social media transactions, looking for words such as bought, love, fans, awesome and they list the customers who made this comments of transactions.

Business view: processing via MapReduce or java code depending on the big data application, might be used to construct intermediate data structure, which can be statistical model, a flat file, a cube or relational table. The resulting structure could be used for additional analysis, or could be queried by a typical SQL based query tool. The business view sector ensures big data is more delicate by the tools and knowledge workers who already exist in an organisation. One of Hadoop project is called HIVE which enables raw data to be restructured into relational tables which can be accessed via SQL and other SQL toolsets, capitalizing on the skills that a company may already have in their system.

Presentation and consumption: one of the major developments in the big data world is the adoption of data visualization. Unlike the use of spreadsheets and other business intelligence technology, data visualization tool is used to view vital and useful information in an insightful way. An example is a wireless carrier looking for better information on its network, finding a particular pattern in dropped calls; it can be a very difficult process and complicated spreadsheet filled with different columns and figures so data visualization deploys an easy to use graphical trend report to its field service staff which shows three different views of the data. First graph will show calls dropped by the regional status grouped by the network generation. The second displays how each hour the distribution of dropped calls is different. And then the third shows an increase in the percentage dropped calls in 4G network at 17:00. This helps problem analysis and network operator to pin point the cause of the problem on the network and also see which high value customers would be affected by them.

This visualization processes can be pulled by network operators into their PC, or sent to mobile devices of a service technician in the field, which will reduce the time to resolve the issue. This can be done in a small given amount of time in the finding and accessing and loading of the data from the countless billing and customer system.

2.4 Section 3 - Big data Management System

(C.Ji 2012) et al in his report states that the commercial Database management systems are not the suitable system for processing of extremely large scale data. A database server has restriction of how scalable or the cost which are two important objectives of big data processing. In various large data processing models, four different architectures are based on the classic database applications which are the replication, partitioning, distributed control and the caching architecture. This shows that providers have different business model targets and applications. Google is more interested in small application with light workloads whereas another company like azure is most likely the most affordable service from the medium to large services. Most recently service providers or cloud service providers are utilizing hybrid architecture which is capable of fulfilling their actual service requirements. Hence there are three key aspects of big data architecture that will be briefly discussed - non structural and semi structured data storage, distributed file system.

- ***Non structural and semi structural data storage*** - Web 2.0 came with a high advantage which made IT companies have an increase in demand to store and analyze more growing data, such are crawled web content, click stream, search logs and this are usually in petabytes, and they are collected from various varieties of web services. However, web data sets frequently are non relational or less structured which means processing such semi structured data set at a huge scale will be more than challenging. Furthermore, a simple and traditional distributed file system which was mentioned above would not gratify service providers like Yahoo, Microsoft, Google, and Amazon. All these providers have got their own purpose to serve potential users and this makes them to own their more developed and advanced big data management system in the cloud environments. Bigtable is a Google based distributed system which is used for managing structured data which are designed to scale very large size petabytes of data across large amount of servers. Bigtable is not in support of full relational data model. However, it provides clients with an effortless data model which support dynamic control over data layout or format. PNUTS is used mainly by Yahoos web application for its capability to massive scale and host database design. Its major concern is for data serving for web applications rather than difficult queries. With PNUTS applications that are in development will be built easily and the overhead of creating and maintaining these applications are effortless. The dynamo is another scalable and highly available distributed key/value base data store, which is used by amazon's applications. A simple primary key interface is provided to meet the requirements of its applications. But it differs from key-value storage system. A newly proposed cluster based data warehouse system design by Facebook is called Llama, which is a hybrid data management system used for combining features of rows and column in the database system. Also is a new column wise file format for Hadoop called Cfile, which provides high and better performance than the other file formats in data analysis.

- ***Distributed file system*** - an application called GFS (Google file system) distributed file system which supports fault tolerance by using data partitioning and replication. As it is a storage layer of Google's cloud computing platform, it is mainly used for the reading of input and storing of output of MapReduce. As well as Hadoop which also has a distributed file system which its data storage is called Hadoop distributed file system HDFS, which is an open source equivalent of GFS. Both HDFS and GFS are user level file systems that do not operate or work with the POSIX semantics and are heavily optimized for the cases of larger files which are in gigabytes. Another public storage web service which is offered by Amazon web services is called the (s3) Amazon simple storage service. It is hosted on the Amazon elastic compute cloud server on demand infrastructure. Its main aim is to provide high availability, scalability and low latency at a cheaper rate. Another storage system is the ES2 which is an elastic storage system of epic6, which is developed to support functionalities in the same storage. This system provides data efficiency loading from different sources, flexible data partitioning scheme, index and parallel sequential scan.

2.5 Section 4 - Application in Big Data

Dewitth et al (2008), with the use of algorithms and parallelization techniques is the key to accomplish profound scalability and high performance for processing big data. Some common parallel process models for processing big data are MapReduce, MPI etc. MapReduce which is used by Google is very popular for their big data processing model which has been studied closely and applied in different field of life. It has one major advantage which is the MapReduce model been able to hide details which are related to the distribution, replication, data storing, load balancing etc. It also has two separate functions which is the Map function for location and the reduce function and these two help in processing of the big data. Furthermore the MapReduce application also has three categories - decomposing sub-processes, partitioning sub-space and approximate overlapping calculations.

MapReduce which is said to be the new approach in the processing of big data in cloud environments has its set back which is compared to the relational DBMS, (Dewitts, 2008). Knowing how MapReduce is a schema-free and index free, because MapReduce framework requires the use of passing records in the initial reading input stage. Some DBMS vendors incorporated MapReduce frontends in their systems such vendors are:-HadoopDB whose aim is to achieve full fault tolerance and ability to work in mixed environment by inheriting the scheduling and the job tracking operation from Hadoop. It also offers high scalability efficiency performance etc, Abouzeid et al (2009).Greenplum and Vertuca, which has evolved in three primary waves, mainframes, online transactional processing database, and data warehouse. After all testing the outcome showed that HadoopDB improves task processing times by a very high margin to match the Shared nothing

DBMS. There is a new proposed system Hadoop++ which has indicated that HadoopDB has its drawbacks like making users DBMS and also changing the interface to SQL and so on.

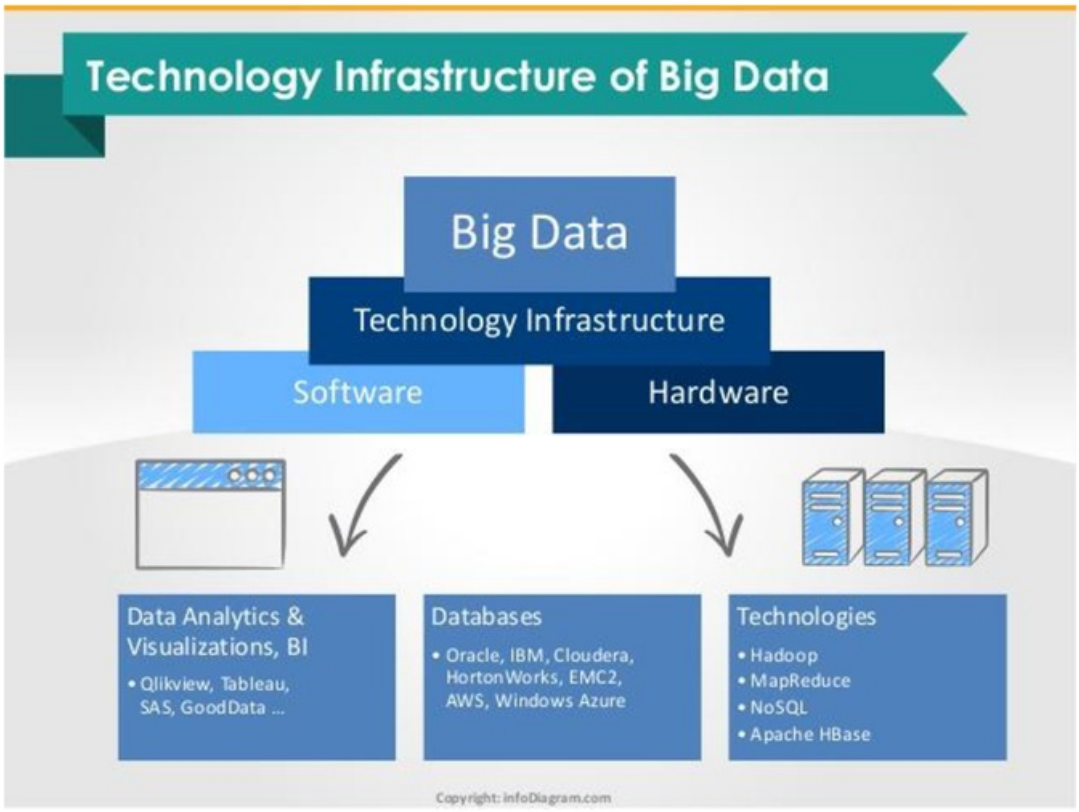


Figure 2 Infrastructure of big data

Available at – www.slideshares.net

2.6 Section 5 – Challenges in Big Data

Management of Big Data Storage: **-** Ji et al (2012) discussed that because of the growing technology of data management system it is difficult to satisfy the high demands of big data, and the speed of storage capacity is higher than that of the data, hence reconstruction and revolutionising of the information framework is desperately necessary. "The design of hierarchical storage architecture is needed he said". Apart from that the older version computer algorithms were not able to store data effectively which were obtained from the actual world, because the heterogeneity of the type of big data they were. Hence the Reorganisation of data is a very huge problem in the big data management. Virtual server technology can worsen the problem at hand by raising the prospect of over committed resources, and this happens mostly when the communication is poor between the application, the server and the storage administrator who is in charge of controlling the different resources that can be stored.

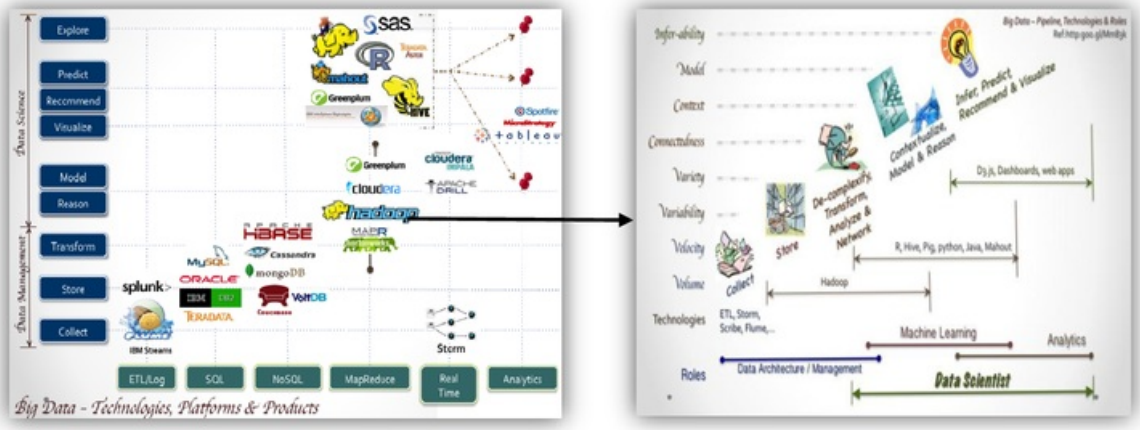


Figure 3 – Reorganisation of Big data technologies

Computation and analysis: **-** the demand in which query in big data speed should be processed is always significant high, X.Zhou et al (2012). Nevertheless the processing time that it takes to pass through all the related data in the entire database in a short time. Index will be optional and at present the indexes in big data aims at the simple types of data, while the big data is becoming more complicated than ever. In other to counter this problem the combination of appropriate index for big data and also with the up to data processing technologies will be the advantageous solution. The use of application parallelization and divide conquer mechanism is a natural computational paradigms for solving big data problems. But getting more computational resources is not an easy process like upgrading it to a bigger and powerful machine because it's difficult and cost a lot. Traditional serial algorithm is incompetent for the big data, because if there was enough data parallelism in the application the advantages will be high whereby users will be using cloud services at a reduced cost and using computers for a short period of time with very little cost.

Big Data Security: **-** With the use of online big data applications companies can finally reduces their IT sector cost. Nonetheless the security and privacy control will affect the whole big data storage and processing unit, because the high use of third party services and infrastructures which are used to host very sensitive and important data. The degree of data and applications grows widely, which bring the challenges of monitoring and security protection. Compared to the traditional security method, the new security in big data is the high form of how to process data mining without revealing sensitive information of users. However current technologies which deal with privacy protection are based on static data set while data is always dynamically changed, which can include the pattern, the variation of the attribute and additional data. It is necessary to add this effective privacy protection into compound conditions, also giving attention to the regulatory issues and legal aspect.

2.7 Research on Cloud services

Li et al (2009), highlighted cloud computing as an existing technology which has a new method of sharing infrastructure that provides customers with high strong computation abilities and a space for very large memory storage with low cost involved.

Liang Yan et al (2009) defined cloud computing as a type of computing model that distributes computer resources on a massive scale. This results to different services such as: - software as a service (SaaS) infrastructure as a service (IaaS) platform as a service (PaaS) which are all linked together and useful models in cloud computing. The internet makes it easier for users to be able to acquire computing resources, storage spaces and services and many other services of their choice. In cloud computing terms when large amount of computing resources are available users can easily solve their problems and difficulties with resources which have been provided by cloud services and in return brings great flexibility for the user. With the use of cloud computing services users will be able to store their critical data in servers and also be able to retrieve this data's and services anywhere there is an internet connection and this makes the worry about system faults and breakdown minimal. Also with cloud services information sharing becomes more easy and swift, because there will be different users using one system. Big companies like Google, Amazon, IBM, Microsoft and Yahoo all provide cloud services to users and other small medium companies. Recently other companies such as Facebook, Saleforce, Myspace, Youtube etc have joined in giving cloud computing services to users.

Rajkumar Buyya et al (2009), the vision of computing utilities, are based on service providing models, which is expected to transform the entire computing industry in the 21st century whereby services are readily available on demand like electricity, gas, water, telephone services. However computing services are allowing users to have the means of paying providers only when the access computing services, helping them not to invest heavily or find difficulties in building and managing this not easy IT infrastructure. The get this services on the requirements they specified and not regard where the services is being hosted. This sort of model is called utility computing and now recently called cloud computing. Armbrust et al (2009) stated that cloud computing is the long held dream of computing as a utility, and has the potential to transform a large part of the IT industry, which makes software more attractive as a service than ever. Cloud services are divided into three parts platform, infrastructure, and software as a service. These are made available to users on subscription- base services? With the use of pay as you go model.

Clouds promised to power the next generation data centres by making them a virtual service, such as hardware, databases, and user-interface, application logic, which means users can be able to access and set up applications from anywhere around the world on demand at a very competitive cost which will also be depending on the users quality of service (Qos) Buyya et al. (2008). This will help IT services and companies to free up the low level duty setting up basic hardware servers

and software infrastructure. This will enable them to concentrate more on creating business value for their services. The business aspect of cloud computing is highly recognised by several market research firms which includes the international Data Corporation (IDC) which reported that cloud services spending will grow from $16 billion by 2008 to $42 billion by 2012, but the latest report shows the spending in cloud services like (storage, sever) has risen. The growth will be 26.4% in 2015 and will reach $33.4 billion in 2015, the private cloud IT infrastructure spending will grow from 16.8% yearly to $11.7 billion while public cloud IT infrastructure spending will grow by 32.2% in 2015 to $21.7 billion, Framingham press release 2015 IDC. In addition many cloud application users simply emerge as catalysts or the market makers who bring together the buyers and sellers. Bill Joy (2012) noted that doing this creates several trillions of dollars of different business opportunities in utility computing industry.

Cloud computing has a very high potentiality to provide infrastructure, capabilities and services which is required for harnessing this business potential. And this has been identified as one of the emerging technologies in the IT adoption as noted by "Gartner's IT Hype cycle". The figure 4 below is a representation of emerging adoption, maturity and impact on application of a specific technology. As of 2009 cloud computing was at the top of the technology trend which made it reach its peak of expectations in just 3-5 years, This made it possible because providers such as Google, Amazon, Saleforce, IBM, sun Microsystems, Microsoft all began this journey to establish new data centers for hosting of cloud computing applications for social networking which includes Facebook, Myspace, and some gaming portals like BigPoint. For the business application side, Saleforce is the leader in that section and also for scientific workflow and media content delivery. It also predicts that within that time of 2009 the next 2-5 years, cloud computing will be a part of the middle-of-the-road computing which means it enters into the plateau of productivity phase.

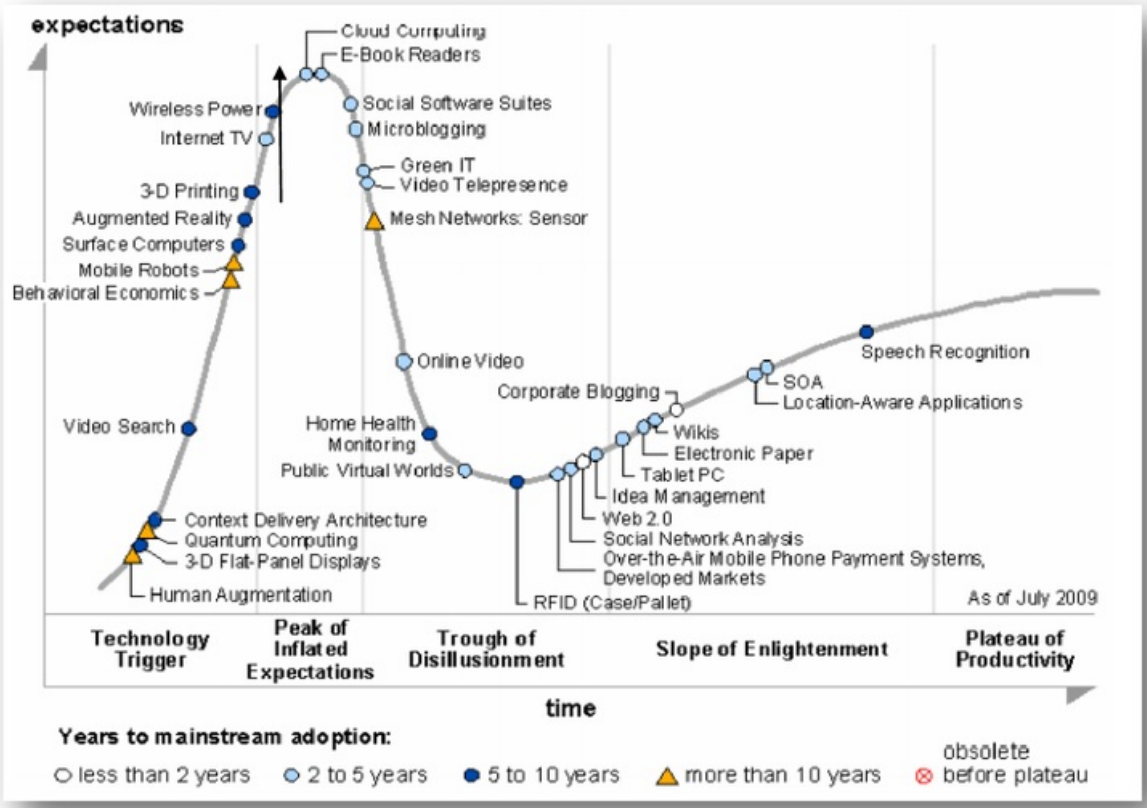


Figure 4 Hype Circle of Emerging technologies, 2009

However the Hype circle of emerging technologies of 2014 shows that cloud computing has been pushed down to the trough of disillusionment and the internet of thing is now at its peak of inflated expectation. Figure 5 below shows that, however this doesn't mean that cloud computing is not still at its prime as it's still a key factor in the IT infrastructure industry

Figure 5 Hype Circle of Emerging technologies, 2014

Cloud is an ever developing paradigm and aims at delivering both hardware and software application services, which are for users to consume on a pay as you go basis. In 2009 when cloud computing was at the peak of the hype cycle there was a lot of expectation from the technology.

2.8 Characteristics of cloud computing categories and services

Services	Characteristics	Type of product	Service providers
PaaS (platform as a service)	Here customers are provided with platforms for development of application which is hosted in the cloud	Programming APIs and frameworks, deployment systems	Google AppEngine, Microsoft Azure, Manjrasoft Aneka
SaaS (Software as a Service)	Customers and users are provided with applications which can be accessible anytime and anywhere around the world	Web applications and services	Clarizen.com (project management), Google Documents, Google mail which is automated.
IaaS (Infrastructure as a Service)	Customers are provided with virtualized hardware and storage where they will be able to build their infrastructure	Virtual machines management infrastructure, storage management.	Gogrid, Amazon EC2, and S3, Nirvanix

Infrastructure as a Service (IaaS) is aimed at delivering IT infrastructure based on physical resources as a service to customers. These resources will have to meet the end users requirements such as their memory capacity, Network, Storage, Operating system, CPU type and power. With all these users are also billed on a pay as per-use system. All these services are managed and maintained in data centres which are owned by vendors. Providing this IaaS solution majorly comes from vendors like Amazon and Amazon EC2 is the largest provider of computing infrastructure and services based on physical hardware virtualisation. Users using Amazon web services can benefit from creating Amazon machine images which can be used as template for multiple instances, Amazon simple storage service (S3) provides users with storage capabilities whereby users can host large amount of data which can be accessible anywhere.

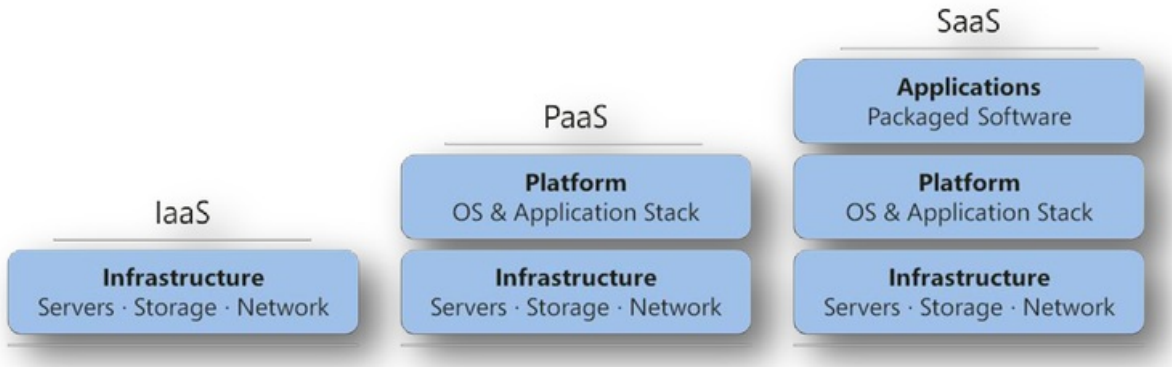


Figure 6 – Cloud computing service model

Platform as a Service (PaaS) provides users with the ability to use their created application which can be run on the cloud which means providing application framework which offers API and then can be used by application developers to program and develop application over the cloud. Google AppEngine and MicrosoftAzure are such solutions which majorly deal with the issuing of APIs. Google AppEngine8 is used for developing scalable web applications which is run on top of data centres and maintained by Google. APIs allows developers to have a huge advantage in developing complex application and also give additional services like Memcache, Datastore etc. The use of Google AppEngine is very significant.

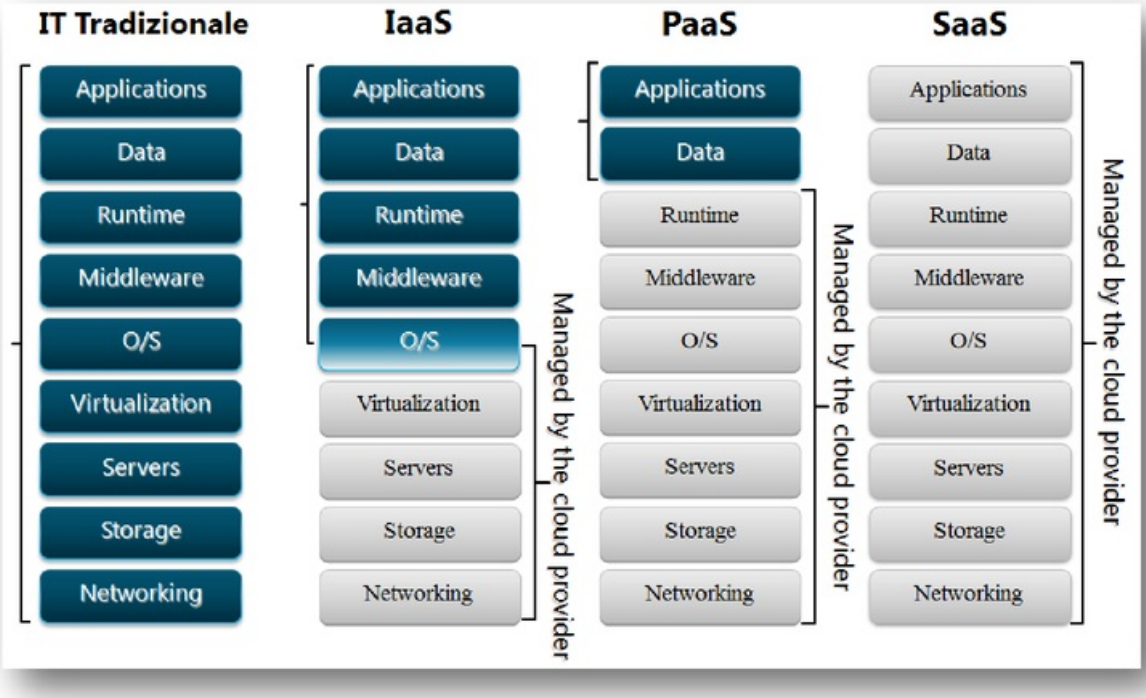


Figure 7 – cloud computing services model 2

Software as a Service- this is the end user point where cloud computing stack are provided for the users such as the hardware, development platforms, application. In this service, users are not allowed to customize the provided services but rather make use of it and have full access to the

application in the cloud. Examples of these services are provided by Google office automation, such as Google mail, Google calendar, Google Documents etc which are all free to the users over the internet. Some other services for commercial use are the SaleForce.com and Clarizen.com which charges users for services like Project Management, Customer Relationship Management etc.

2.9 Three types of Cloud Computing

Cloud services are usually made available through three categories- the **pubic cloud**, **private cloud**, **community cloud;** the combination of public and private cloud is **Hybrid cloud**.

Dynasis (2011) highlighted that public cloud are those computing services which are made available over the internet. It concentrates on the software as a service aspect like Google's Gmail service and SaleForce.com service. The major benefits of public cloud are –

- scalability is high
- cost reduction
- Improves cash flow
- Automatic backup system
- universal accessibility

(Priv.gc.ca) also highlighted about the types of cloud services saying the **public clouds** are offered over the internet and are controlled by the cloud provider examples email service, online photo storage, social networking sites. In **private cloud**, cloud infrastructure is controlled solely for an exact organization and it is controlled and maintained by that organisation. **Community cloud** services the services which can be shared by several organisations and only made available to those specific organisations. **Hybrid cloud** is the combination of two cloud services either public and private or public and community clouds and this is good for resource pooling.

2.10 Privacy Risk and Security Issues of Cloud Services

With the several benefits and import ants of cloud services we also need to focus a bit on the privacy and security concerns. When data is been transported over the internet and it is been stored in different remote locations, then there are issues that need to be addressed. With serving multiple customers at once, it may raise the scale of exposure or possible breaches of confidential files which can be deliberately targeted or accidentally come across. Concerns have been brought up about how cloud computing may lead to "function creep" (priv.gc.ca) which means the uses of data by cloud providers are easily being collected and the consent of these data's are not obtained.

Security issues the need to separate data when dealing with providers who serve multiple users, potential secondary users of the data are the sort of areas organisation should always have in mind before committing or considering cloud providers and also when reviewing and negotiating with a cloud provider. The organisation needs to make sure that transferring this sensitive information to the provider, the provider should be highly accountable for its protection; it needs to ensure that this personal information is handled properly and protected by the provider.

2.11 Research on JustEat and other Location services

JustEat is an online location service website which is like an intermediary between independent food restaurant and customers. It has its headquarters in the UK but operates in over 13 other countries around the world such as Denmark, Italy, France, Mexico, Canada, Brazil, Norway, Spain, Switzerland etc. This service allows customers to search in their local area restaurants that they could place and order with online and it could either be picked up by the customer or delivered to the customer. (Wikipedia, 2015-09-08)

2.12 Brief history of JustEat

(Wikipedia) Jesper Buch was the person who found just Eat in 2000 in Denmark and after launched the service in August 2001. Jesper Buch moved the business to London and lunched it in March from there to Netherlands in July 2007, and Ireland in April 2008. January 2011 saw Just Eat have a joint venture with India and in February the group raised £30million from their investment. Since then just eat have been growing in venture and collaborations, raising huge amount of cash in the UKs economy.

Just Eat plc

Type	Public limited company
Traded as	LSE: JE.
Industry	Online food ordering
Founded	2001
Headquarters	London, United Kingdom
Key people	John Hughes, (Chairman) David Buttress (CEO)
Revenue	£157.0 million (2014)
Operating income	£19.0 million (2014)
Net income	£51.8 million (2014)
Website	Just-Eat.com

2.13 Investments

Receiving their first series A in July 2009 for investment funding, index ventures and venrex capital invested just eat company with £10million. This enabled just eat to have a massive expansion into other available markets and also developed the business further. Another investment was made by two US capitalist Greylock and Redpoint who invested about £30million into just eat, and this US invested has previously invested in LinkedIn, Facebook and Wonga and with another investment saw Vitruvian Partners and the other existing investors further invested £40million into JustEat Holding LTD.

Figure 8 – JustEat

2.14 Sponsorship Deals

May 2014, it was announced that Derby county football club would use JustEat for the 2014-15 season for their primary shit and the sponsorship deal was for three years and also July 2015 Oud-Heverlee Leuven have a deal as well for JustEat to become their primary shirt for the season of 2015-16 and this deal is for a year and can be renewed anytime.

2.15 JustEat Story

- world's leading online and mobile takeaway ordering service founded in 2001
- over 15 countries worldwide

- aim at the quickest way to order and delivery of your food
- using the mobile app takeaway customers can now search different restaurants and pay by cash or card or on delivery

2.16 Purpose

- high customer care
- empowering customers to love their take away experience
- give customers variety of choices of restaurant to pick from
- with high standard and still maintaining the 9 million customer review
- making sure that takeaway is fuss free and a relaxing experience

2.17 Research on Hungry House

2.18 Brief history on Hungry House

(Wikipedia hungry house) Shane Lake and tony Charles are co-founders of hungry house in 2003 and later lunched its online platform in 2006. The co-founders went to BBC1 investment show called Dragons Den in 2007, and came out with an offer of £100,000 investment from investors. This deal from the Investors from the Den collapsed with just £150,000 investment coming out of it from different angles, but with the initial investment it helped the business to expand increasing its restaurant partners from 150 in 2007 to 2,500 in 2010 just three years apart.

FiguFigure 9 - Hungry House

A merger was announced in February 2013 whereby it merged with a Berlin based online food ordering network called Delivery Hero. This global online food ordering network operates over 16 markets worldwide and with 60,000 restaurant partners on their chain.

2.19 How it works

- it has an online platform accessible via iPhone and Android apps
- using your postcode delivery can be made to your house
- read customer reviews and browser through different lots of menu
- online payment can be made via credit/debit card or cash when delivered to you
- there are no additional fees to be paid when customers order takeaway through hungry house rather restaurants pay commission on every order been made

2.20 Research on Gym industry

A report by (Ray 2015), highlighted that with the biggest names in the Gym industry such as Fitness first, LA fitness, Sport Direct, Anytime Fitness – are all set out to bring key improvements to the sort of services they offer to customers during 2015, so with this reinvention Ray Algar had to write a report on the state of the UK fitness Industry.

From the predictions of 2015, Ray found out that the so called middle sector where Gyms monthly charges are falling in-between £21 - £49 is where the most well-known Gym industry operates. This sector has been under high pressure since the Low-cost Gyms surfaced, where by this sector offers like £5 a month payment or little or no commitment to members and this sector is fast growing.

Virgin Active and David Llody which are new brands and have new technologies for better and faster fitness feedback whose focus of engaging with the user, helps in transforming the sector from the historic weakness to something very interactive and relevant to members, Fitness First success was acquired using this approach with better qualified trainers and more interaction with the users and the wider community. For other major brands out there, this means they have to move from just been merely providers of facilities to being involved in the health and wellbeing of their members which in return gives them the huge bonus in improved customer retention. Ray Algar also highlighted that in 2015 the winner will be the customers, whereby those customers who want the very low cost monthly fees can make use of this new technology and further have various choices to choose from. And those customers who pay and expect less from their facilities and personal services will see improvements and in some cases transform beyond recognition and he expressed that 2015 will be a better for the fitness club experience.

Chapter 3

3.1 Design, Tools and Methodologies

Tools and Methodologies

Various tools and methodologies have been reviewed and studied in other to pick the best one for the development of JustGym location base website application.

Some software approaches and various methodologies have been studied in order for this application to proceed such as RAD, Waterfall, and Prototyping. All these methodologies aims at the satisfaction of clients using interactive design which aims at gaining relevant feedback from client about the application at an early stage before the final stage of the software. (Scott A, 2002).

This project is a customer based project which aims at customers having huge impact in the development of the system whereby the review given from the users are highly important and motivational to the developers of the system who are determined to make the system work (Somerville, 2001).

3.2 Models to be considered

Waterfall

incremental

Spiral Development

Rapid Application Development

Agile Software Development

Prototyping

Three of these models will be reviewed in order to give a better understanding of which of them will be suitable for the development of the application

1) **Waterfall**
2) **Prototyping**
3) **Agile software development**

3.3 Waterfall model

Defined as a sequential development approach whereby the development stages are seen as a flowing progressive downwards movement which in context looks like a waterfall and this model have different stages such as – Requirement analysis, design, implementation, testing, integration and maintenance. (Winston R, 1970)

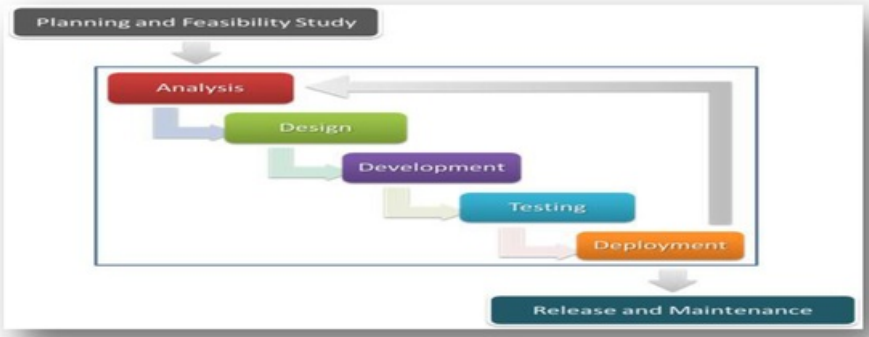


Figure 10 – Waterfall model

Principle of waterfall model –

- The project requirements are divided into different phases with certain overlaps and slash-back which are approved between the phases.
- Solid control is always maintained throughout the life circle of the application or project whereby the approval, written documentation, reviews, and signoff documents by the client or users occur at the end of most phases before the start of the next phase
- The importance of target dates, budgets, time scheduling, planning and structure and implementation of the system are always done at once

It has been criticised that waterfall model have been pointed for the large scale projects and also have the potential of over budget to running over the estimated time required and all this leads to failure of delivering the project on time and hence it's said to be huge for design upfront approach.

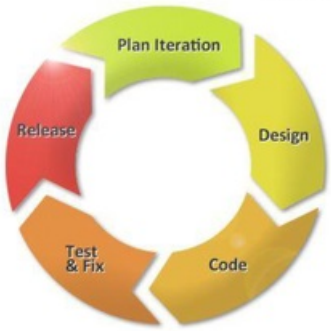
3.4 Prototyping model

This model is not based on cycle of plans rather is an approach to gather series of activities which from this activities a prototype of the program is created. This gives an insight of how the end product of the application will look like and this is very helpful and useful to the small and medium software developments application. Penna (no date)

Prototype principles:

- The involvement of the users and client is active throughout the development process whereby evaluations and analysis are given and this increases the chances of the final stage of the implantation being accepted
- It can manage selected part of a big traditional development methodology
- Risk of project breakdown is at its minimum because when the project are broken into smaller segments this helps in providing full attention to that specific segments
- The interactive process is high because drafts of what the application will look like is presented so making modification easier before the final project is finalised

3.5 Agile software Development model



This is a software development which deals with group of methods that are based on iterative development and incremental development, whereby the requirements and solution pass through teamwork between cross functional and self-organizing teams. This software development is used for adaptive planning, evolutionary, development and supports a rapid and flexible response to change. Its theoretical framework helps in promoting for seen tight iterations throughout the development cycle. In 2001 agile manifesto was introduced, and since then the principle, tools values, methods, culture have changed the background of the Morden ways of software engineering and the business-related software development. Since the manifesto was published in 2001, the early application of the agile methods were extreme programming in 1996, Scrum in 1995, Dynamic System development method and feature driven development in 1997. All these development methods are now referred to as the agile methodologies (Wikipedia.org)

Agile 12 principle manifesto:

- The best communication link tends to be face to face
- Requirements are added whenever in the development stage
- Working software is the principle measure of progress
- Customers are happy by having a useful software
- Maintaining a constant pace is highly regarded in the development stage
- Cooperation between business people and developers occurs daily
- A working software must be handed weekly rather than monthly
- Trusted individual who are motivated are given the project to create
- Self-managed teams
- High adaptation
- High attention and good design is necessary
- Simplicity which means making use of the time in doing work not done

Conclusion

With minimum amount of time given in the project development, waterfall method will be time consuming and too big to use in the software development and also with the user not being fully involved and interactive with the development of the system hence waterfall will not be suitable for the modelling part. On the other hand prototyping will be well suitable for the software development as the client and users involvement are high throughout the development of the software hence it will be the chosen methodology for this project.

Advantages of Prototyping

- Quicker feedback from either the client or user for fast correction if needed
- Involvement of the user or client is high
- Any conflicting or difficult functions are identified and quick implantation and validation of the requirement
- Detection of errors are seen at an earlier stage

Disadvantages of Prototyping

- Diversion from the original plan can occur once the system becomes complex
- If the application is incomplete when the system is designed the application can be discarded

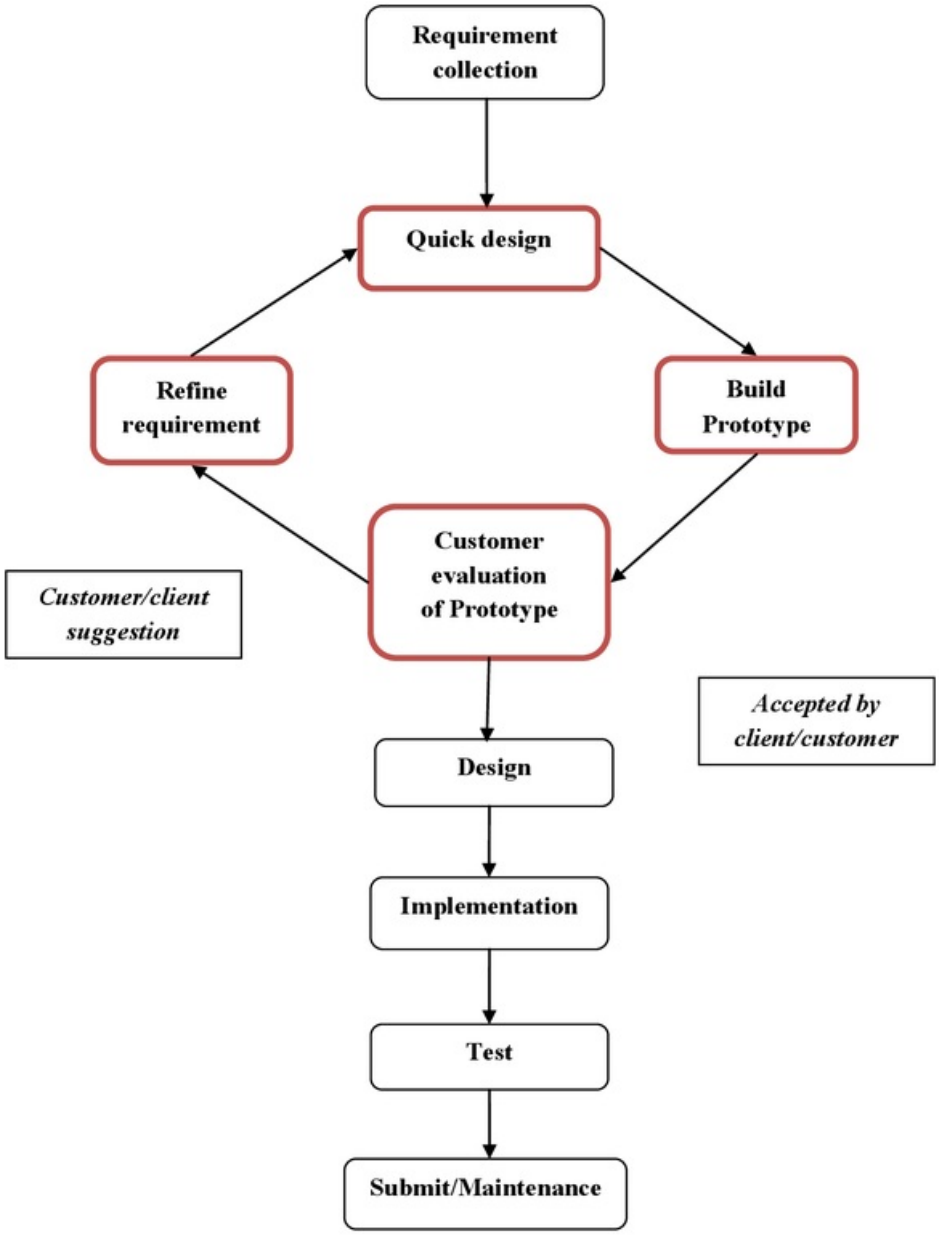
Reason for choosing prototype Model

When the system interacts with the client or users then the use of prototype model can be implemented. Web interface and online system have huge amount of interactions with the end user

and therefore prototype model is well suited for this online service application. Prototype model certifies and keeps track of the end – user's involvements by taking on feedback given and incorporating it in the prototype which will be shown at the end result of the full system. A very good model for its designing aspects in the human computer interface system.

Below is the prototype model design diagram which shows the various stages for the software development. R.Nair (2008)

3.6 Design of the Prototype Model



3.7 Prototyping Life circle

Stages of Prototyping life cycle	Activity
Requirement collection	This stage determines the bacis information or requirement which includes input and output information needed.
Quick design	designing of a system Prototype
Build Prototype	To construct interfaces Prototype
Customer/client evaluation of Prototype	Customer/client eveualate on Prototype and gives feed back
Refine requirements	Using client/customer feedback to modify the requirements
Design	After customer/client has given comfirmation this stage is to design interfaces
Implement	To implement the codes and the system
Test	Full testing of the system is carried out at this stage
Submit/mantenance	Subbmission of a fully working system with guidelines for the necessary mantenance

3.8 Tools to be used during development of JustEat Service system

This project will need some necessary tools in other to design and implement the responsive website for JustGym service and this software's includes Joomla, WAMP server and Adobe Photoshop.

Joomla – is one of the most popular open source software used for creating and designing responsive websites as it's a content management system with loads of its templates and modules out there Joomla has become one of the favourite software's to be used to create website without the hassle of coding and programming.

Features of Joomla

- *Usability features*
- *Accessibility features*
- *Open source*
- *Template features*
- *Mobile Ready*

WAMP Server – this local server contains (Windows, Apache, MYSQL and PHP) which are very significant for the development of the back end of a system whereby giving you access to the database structure. It is also useful for viewing the website online. This WAMP package runs locally on your windows platform. By running this, a web developer can test Webpages on a web browser without using a domain or internet connection. PHP and MYSQL are very important in

creating dynamic Webpages. With the use of this application, JustGym website can be tested on a browser to see how the final feel of the website is before publishing it online.

Database – MYSQL database in the WAMP application have the ability to store and retrieve information locally and also this will be relevant in information storage for JustGym website.

Conclusion

After reviewing the different methodologies which will be used to create JustGym Application prototyping, is the chosen methodology. However Joomla will be so helpful in developing and building the website and also with WAMP server, running it will help in showing how the website will look on the browser before been published showing the different interactions.

Chapter 4

Analysis and Requirement for JustGym

Current situations and Problems

Some problems have been identified around the area of the local gym industries which have been analysed and as a result must be stated and dealt with accordingly.

Lack of customers – in the Fitness industry customers tend to find it difficult to locate other services around them. This makes it difficult for gym owners and other services owners to have a reduction in sales and in profit margins.

Lack of awareness – television adverts, radio adverts, flyers and good customer reviews help in boosting the awareness of a product. So advertising this application in good sectors will help the local gym owners and also new customers around the area to locate different services around them and also it will gain reputation in the community

Lack of service location finder – customers new in an area would want to know where different services are located and based and how quick they can get to them. This is where service location finder comes in play. This puts all services into one place and also features like how far the distance is from your current position. Also it will have some quick information about the services they provide. This is what JustGym have incorporated.

Low customer satisfaction – customers are hardly satisfied with the way some gym owners run their organisation. Hence a report was made by (Ray Algar 2012) for UK low-cost gym sector, whereby he outlined the different Gyms which provides customers satisfaction and also low cost effective ways of gaining your money's worth. He also pin pointed the difference between the high end bands and the low cost gym sectors. One of the differences is the low cost gym sectors do not get customers into the lengthy contract rather they deal on a pay as you go system,

4.1 Solutions

The related solution to all these problems laid out above comes down to have an application where all relevant information can be accessed. This is where JustGym comes into play. JustGym Application will gather all gym and relevant gym information in one place, showing customers the required information they need. This application will be useful to users who are new in an area showing what to know and the sort of services different gyms in their area offer. By locating a gym you can see how far the distance is from you and how to get the direction to the Gym. It also has a user friendly base system which can access via a computer or on the Smartphone. The application is designed to give customers quick and easy information without the hassle of calling different Gyms

in other to get the required information they desire. This will help local gym owners in the area to be seen by new and old customers. This will help them gain more customers and be able to serve customers better.

4.2 Requirement for JustGym

(en.wikipedia.org 2015) outlined necessary requirements which could be used in developing JustGym Application.

Questionnaires – a professional questionnaire was passed out to gym members and personal trainers (See Appendix)

Interviews – interview questions were used to acquire relevant information, ideas from gym owners personal trainers and gym users. (See Appendix)

Observations – questionnaires, interview questions have been received and a proper verification check will be conducted in other to get a clear understanding on how JustGym application will help the community

Some other requirements will also be carried out after the above requirements have been obtained, such as Functional requirement, user requirement, Non- functional requirement and system requirement etc. and they will be used for JustGym.

Functional requirement – this is the key aspect of the website application such as the user login, the Service finder, the map locator, add and remove services etc., these are the major factors that make the website work.

System requirement – this deals on the efficiency of the system and how it will cope with the day to day demand by the user. It also has to be able to give better performance at any time of the day.

User requirement – having access to the internet is crucial, this means having an online network such as LAN or Wireless broadband or Smartphone via mobile data and also an up to date internet browser like Google chrome or Firefox

Non – Functional requirement – the requirement deals with the whole concept of the application and other functions which are not key factors to the website but are still needed. Such as the amount of Webpages

4.3 Functionalities of similar systems

BOS Inc (no date) explained the usefulness and features which make a website attractive and interactive to users. These features such as the Accessibility, change of colour, advertisement, usability, easy flow of navigation and consistency are all useful features to have a good functionality measure in your website. With the incorporation of these features in JustGym application, it will give users a lovely experience when they use the website.

Functionalities	Summary
Page loading speed	Depending of internet connection speed this will help the web pages load faster also with the size of the pages that could matter
Usability	How easy it was for user to find what services they were looking for to achieve their aims and goals

Accessibility	Website accessibility should be available anytime and anywhere
Consistency	Layout and design of the website should be consistent throughout
Change of colour	Users should be given choices to change colour when necessary.
Advertisement	Using social media icon to update users of coming and upcoming event.
Good navigation	Easy flow from one page to another
Service finder	Easy flow of finding services and using the map locator to check distance of services.

4.4 Risk Assessment

The risk assessments are Likely and unlikely events which can affect the completion of the project.

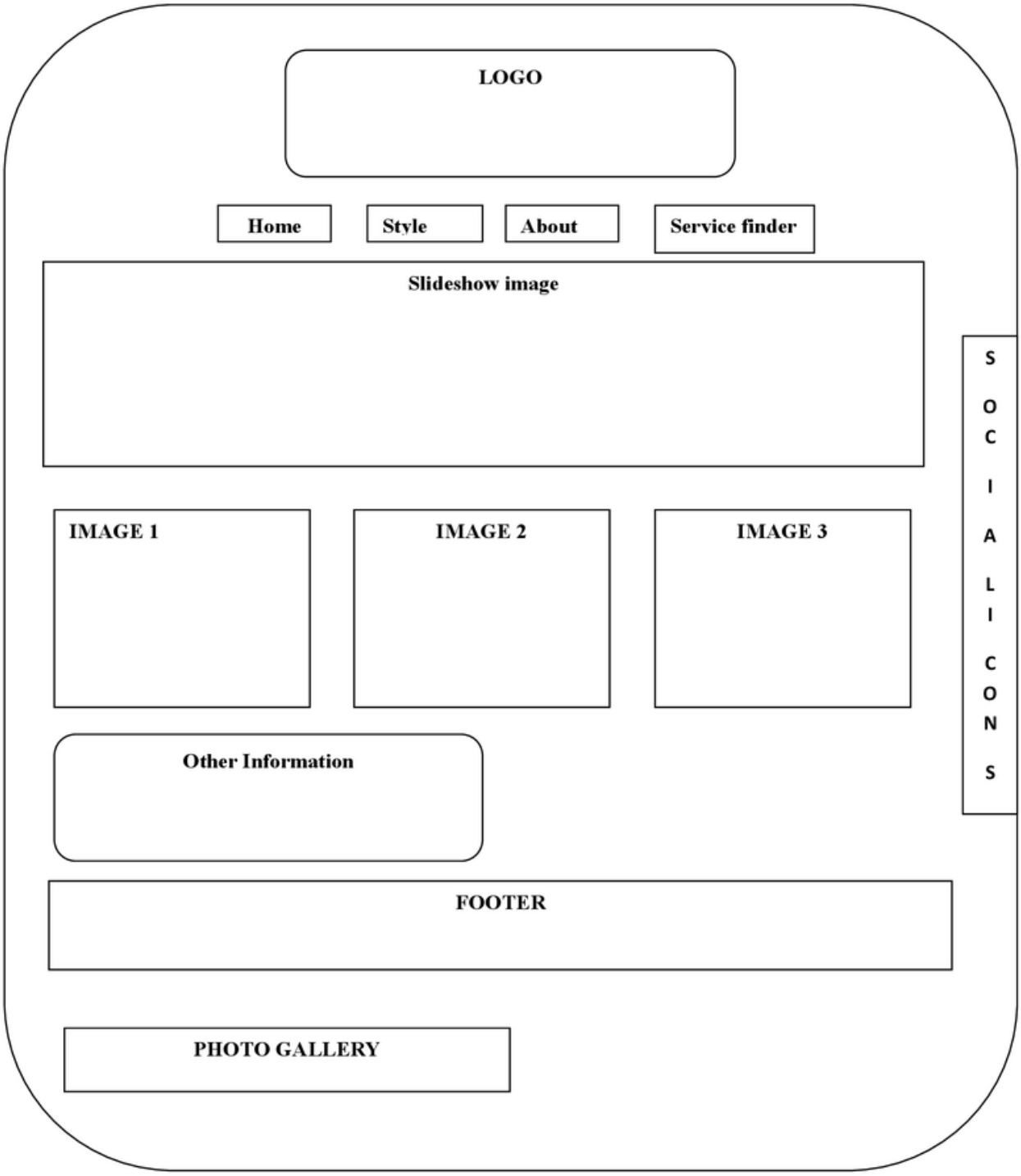
Asset	Project Risk	Severity	Risk Effect	Risk mitigation
Hardware crash	Computer breakdown	High	Delay in completion of the project	Backup files regularly
Software	Crashes	High	Delay in completion of the project	Backup files regularly
Individual asset	Medical issues	Low	Delay in completion of the project in the specified time	Have regular Rest when needed
Application malfunction	Software not compactable	High	Delay in completion of the project	Test the software before application development begins
Feedback	Insufficient information	Medium	Delay in the completion of the research	Regular feedback

Chapter 5

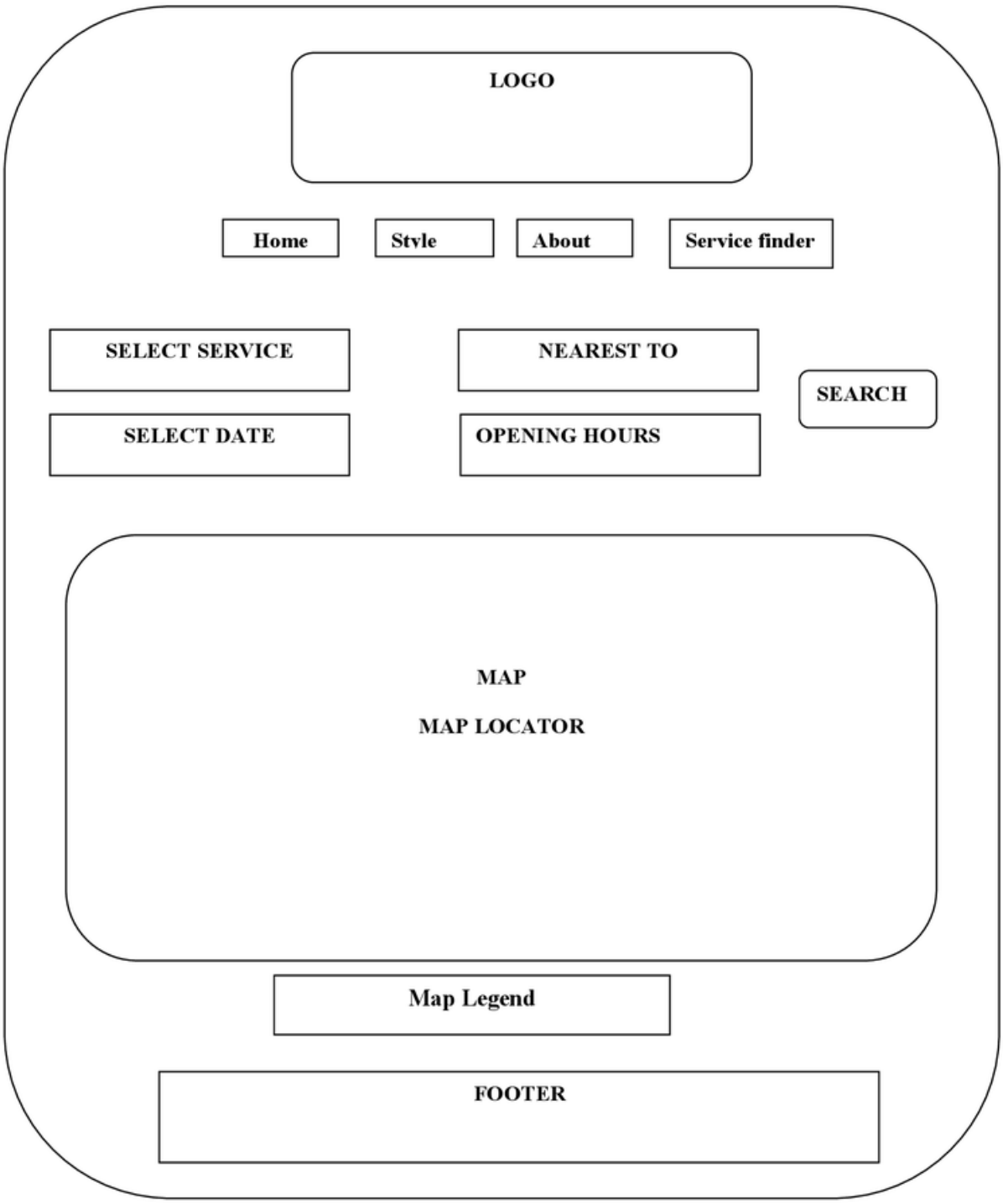
Implementation

5.1 Story Board Design

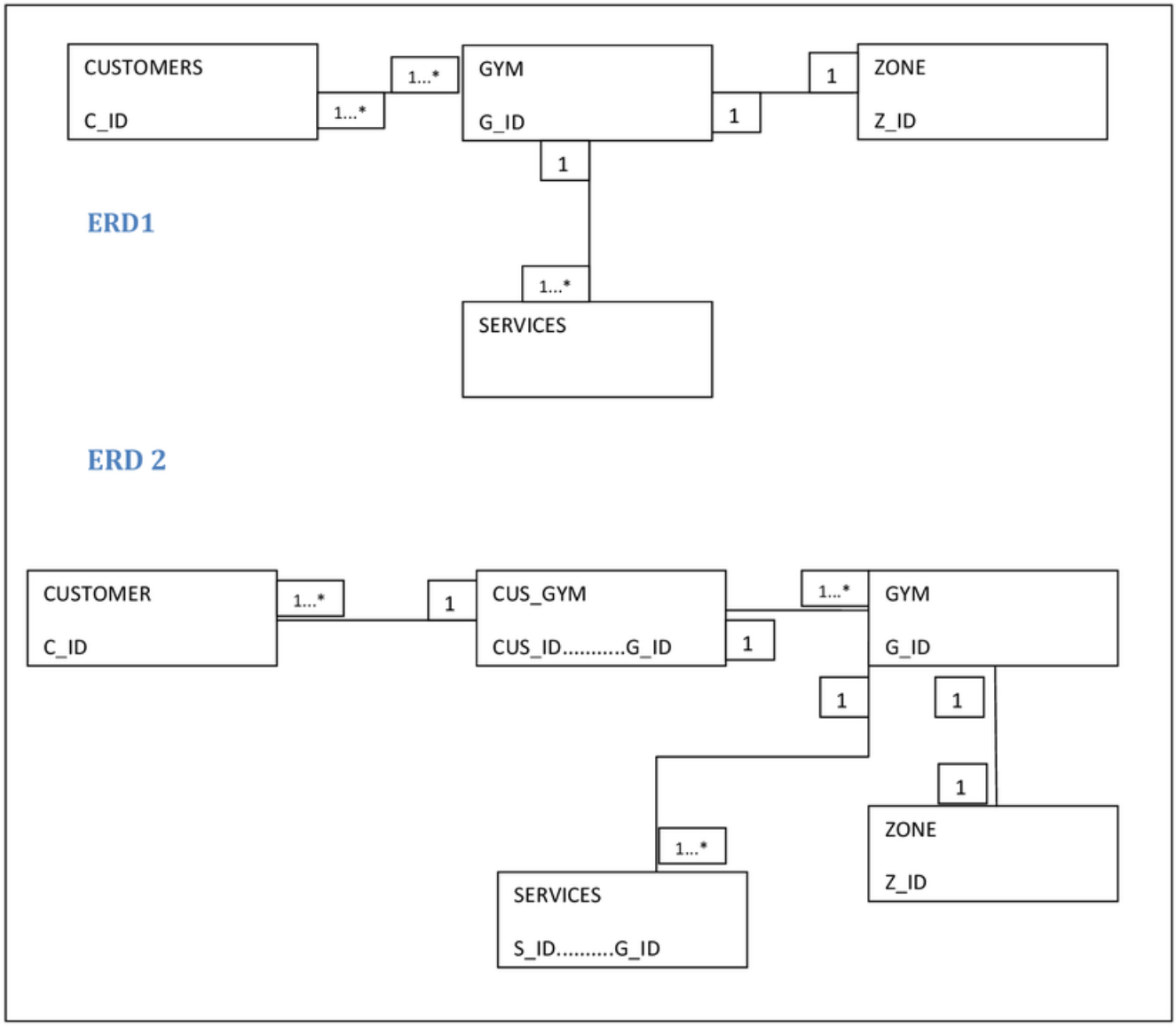
HOME PAGE



SERVICE FINDER PAGE

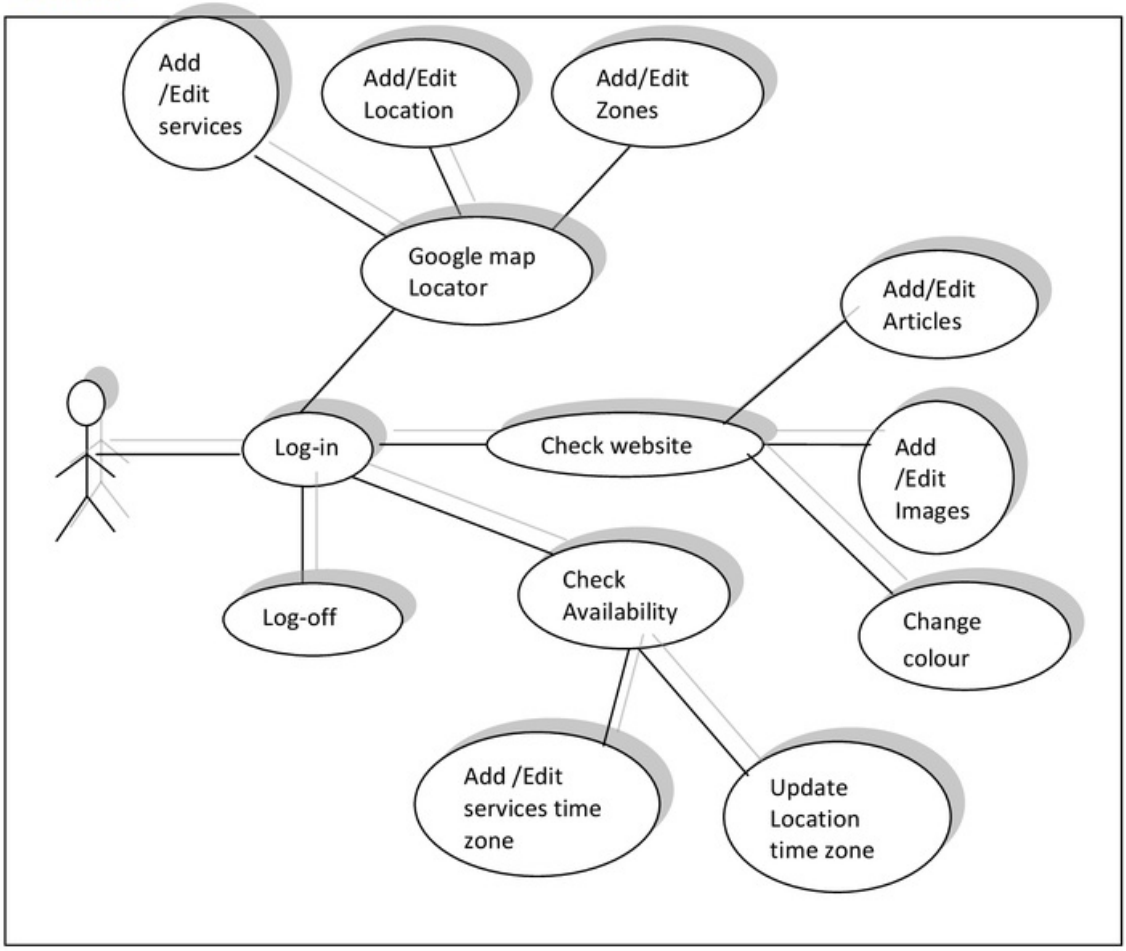


5.2 ERD1 AND ERD2

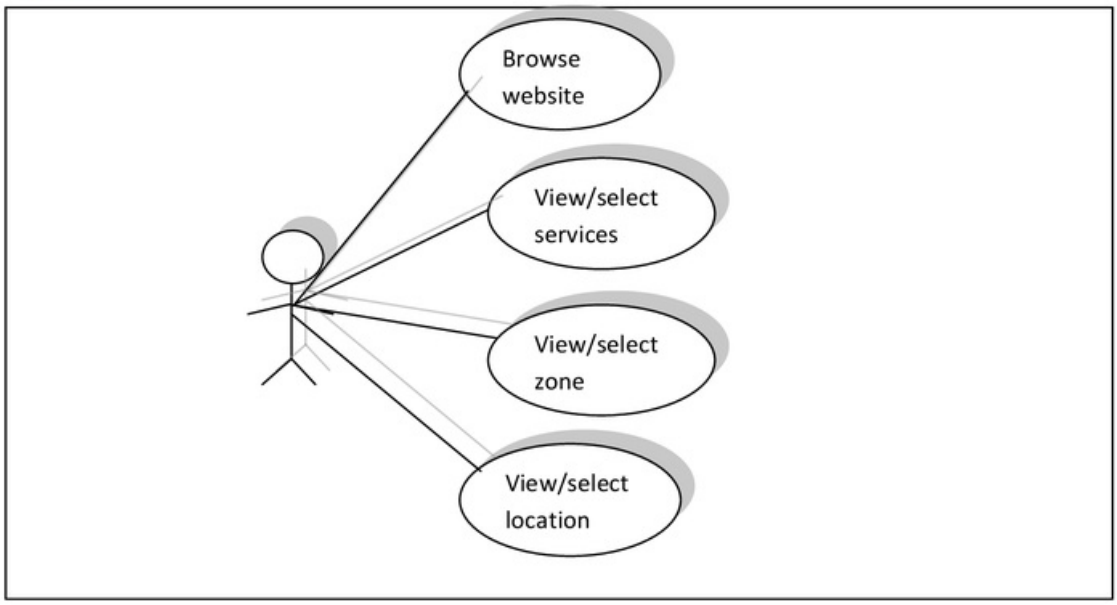


5.3 Use case diagram

Admin



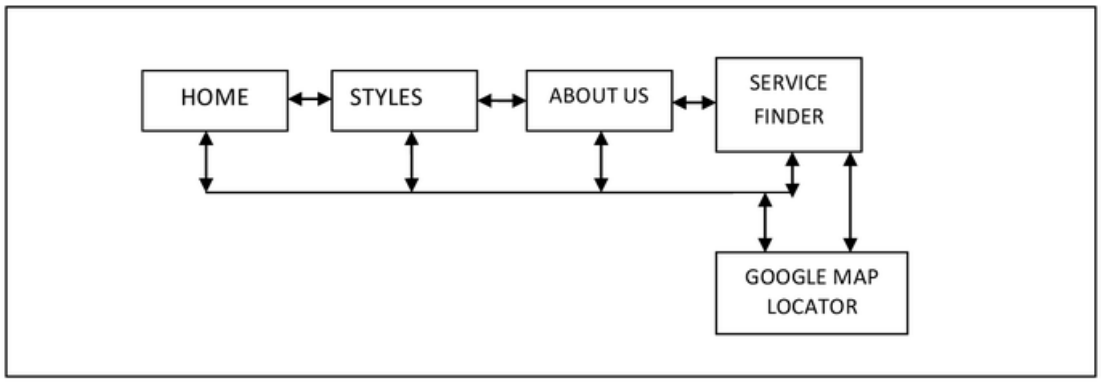
Users



Admin and User use case diagram explanation

Admin	User
Admin can log in VIEW GOOGLE MAP LOCATOR Add and edit services Add and edit location Add and edit zone	User can browse website View MAP LOCATOR View/select required services
Check website Add and edit articles Add and edit images Change colour of the website	View/select zone View/ select location Change website colour
Check availability Add and edit service time zone	
Update location time zone	

5.4 Navigational link



Chapter 6

Test plan and validation

6.1 Test Plan

Carrying out a test plan is mandatory for the prototype system in order to ensure that the newly developed system is reliable and meets all the functional requirements and the user's expectation. (Safaet Hossain 2012). Below is the test plan which was carried out:-

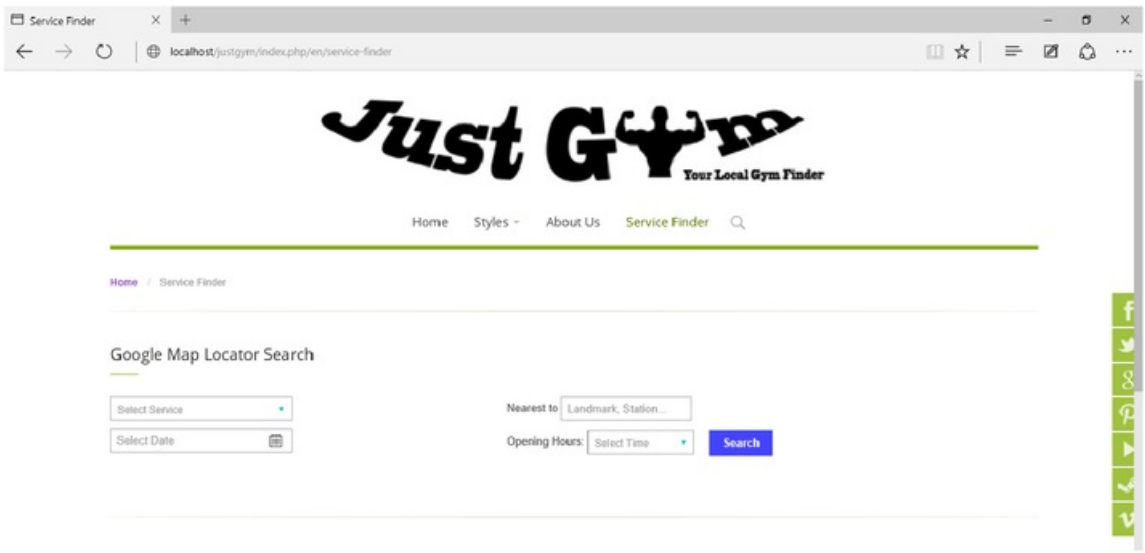
Requirement	Function	Action
Software	To run WAMP serve on the system for local hosting	Available
Hardware device (windows laptop)	To install the necessary software needed.	Available
Testing and verification	Carry out testing on the prototype system	Carried out
Detailed outcome (documented)	Noted and observed the output of the application	Documented

6.2 System testing table

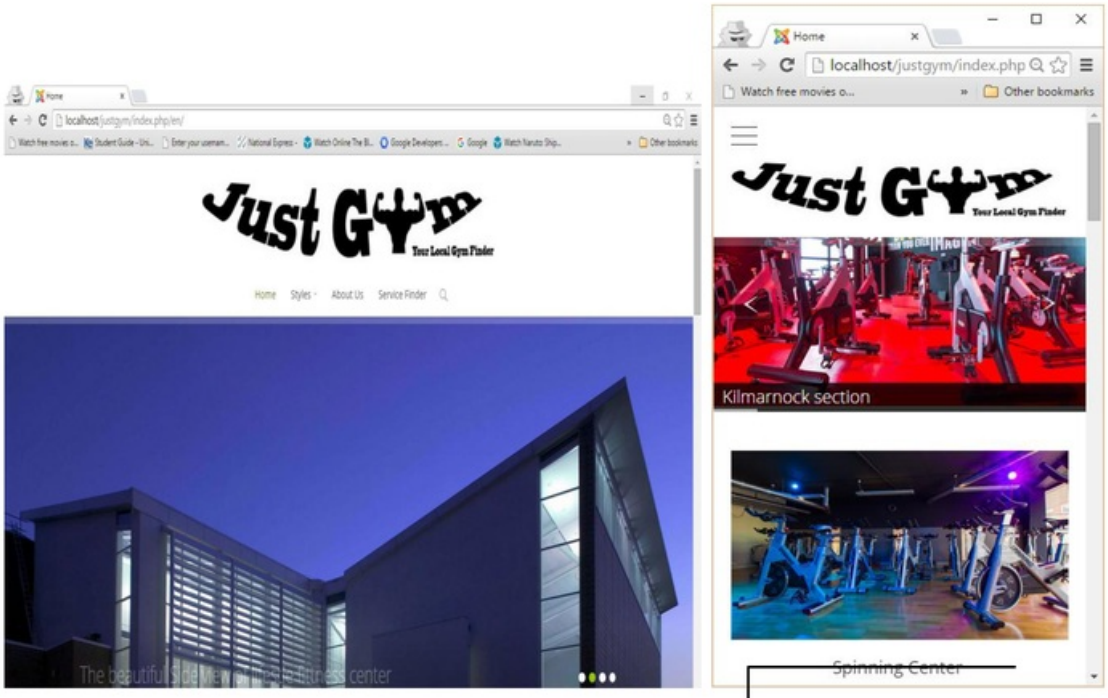
Test Number	Data	Expected result	Result
1	Installation of Joomla	Installed successfully	Passed with no Errors
2	Connecting to WAMP server	Connected successfully to the local host	Passed with no Errors
3	Page Navigation linking	Linked properly and consistent	Passed with no Errors
4	Google Locator module	The module displays the services in the area specified	Passed with no Errors
5	View services/zone/location/time	The availability of services will be displayed with necessary information	Passed with no Errors
6	Admin page	Shows all information's about services/zone/location.	Passed with no errors
7	Accessibility	System accessible at any time from a remote location	Failed. Only from local host. But still trying to push it remotely
8	Social icons	Can be accessible via social media	Passed with no Errors

6.3 Testing system on different browsers such as Internet explorer, Google Chrome, Firefox Mozilla

Internet explorer

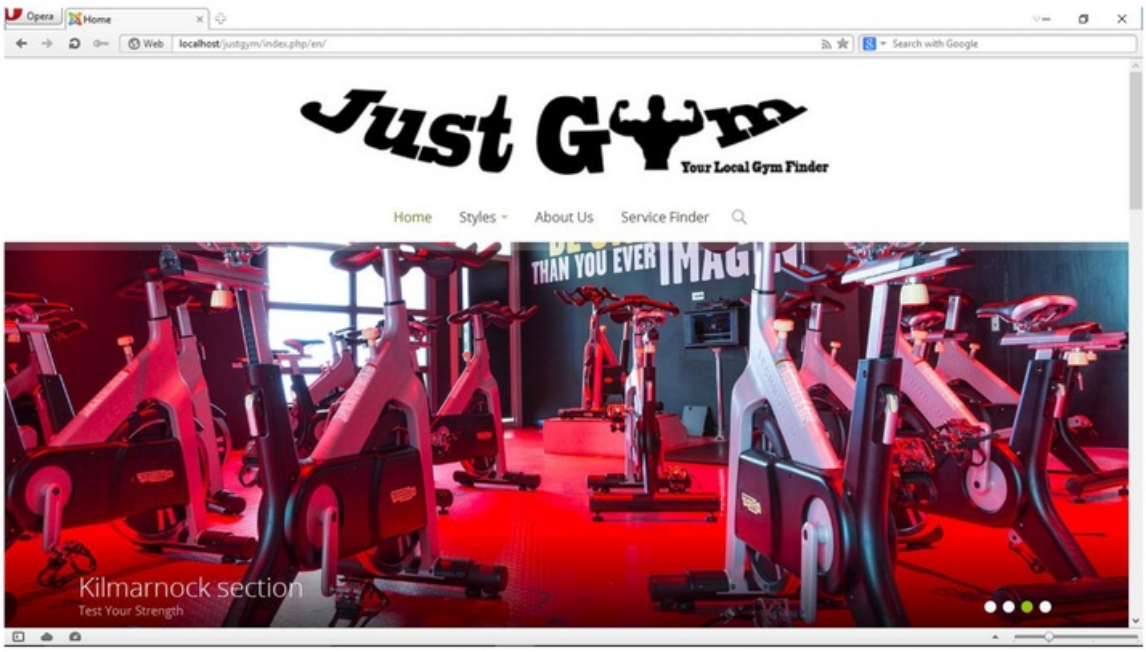


Google chrome

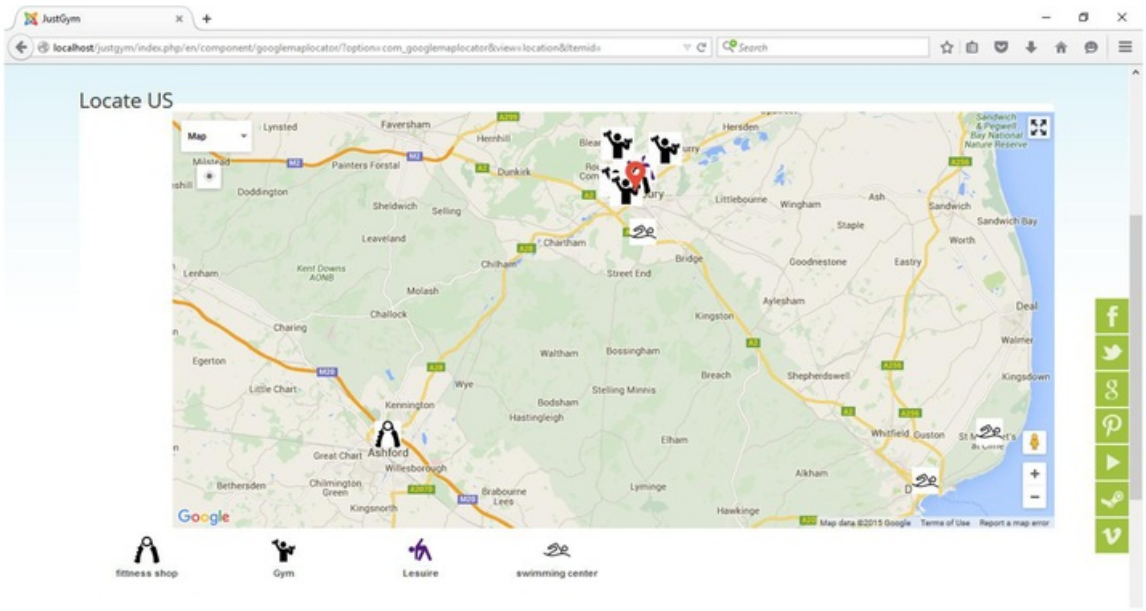


The application is configured to be mobile ready or Smartphone ready

Opera



Firefox Mozilla



6.4 verification and validation

Verification – this stage is to check and make sure that the system that has been created is working perfectly fine. Since the prototype methodology was used, it has to go in line with the verification stage. This is useful because it helps in showing the correct implementation of the application before progressing into the next stage.

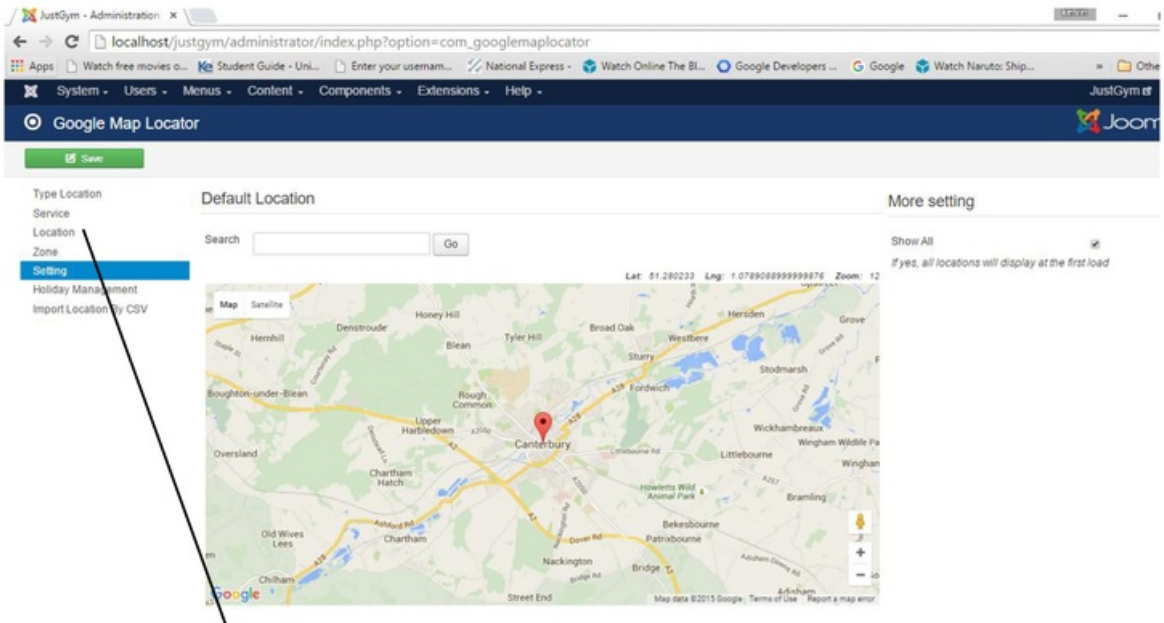
Validation- this application depends on users and clients expectation formats i.e. it has to meet both the users and the client's expectations. The validation stage is the necessary feedback gotten from users from either live testing or questionnaire on a regular basis which should meet the required

solution to solve local services problems. Validation stage contains the coding techniques, new algorithm, design of the system and user-interface. The clients and users expectations must be achieved. This helps in evaluating the new system properly.

Screenshot of the database backend

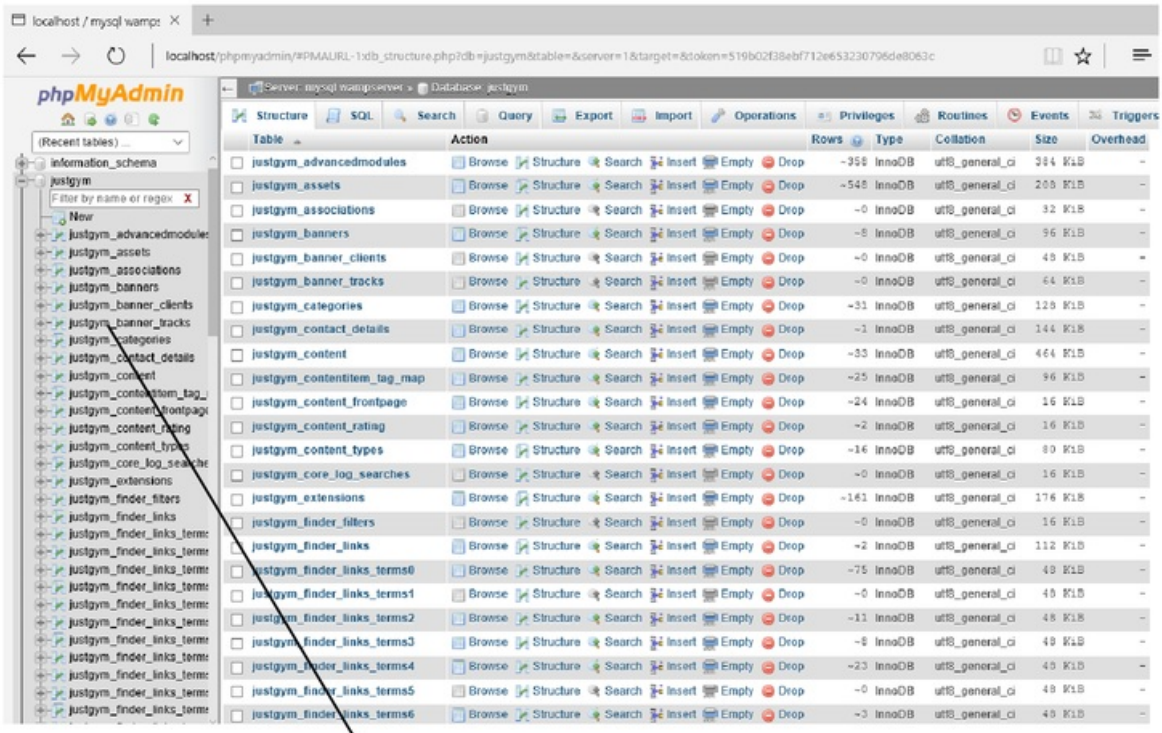
Admin login

Google map locator

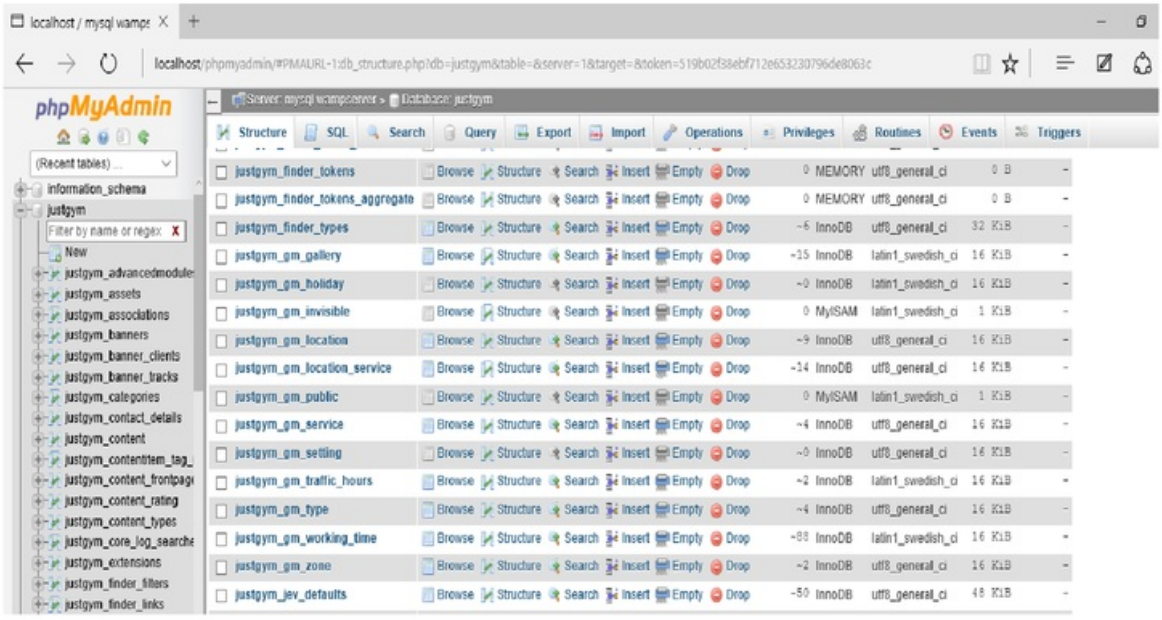


This is where the admin adds different services to the application and makes any necessary adjustments

Database backend



The list of tables and attributes in the database, using my WAMP server helps in this sort of storage



Chapter 7

Evaluation and conclusion

Evaluation

System evaluation against the outlined specification

Thorough and intensive research was conducted on this project in order to produce and provide meaningful ideas on how big data on social network can be used in delivering of fast and easy information services. Big data has been a useful key for companies in data management and also the possibility to analyse very large and diverse data sets. Big data was also seen as a key for growth of smaller companies. It also outlined other companies such as Google, Facebook and Amazon as companies who render this sort of services to other smaller companies. Research on how big data is used to carry out different services have been done and incorporated in the development of JustEat application.

Big data was concentrated on as it was a vase topic on its own with different sectors to cover. Section one was a research on the objectives of big data and how information technologies can benefit from the profit of using big data. It outlined the important objectives of using big data such as: - time reduction, cost reduction, whereby the cost reduction highlighted the saving of cost from the traditional relational database, hence using Hadoop cluster was cheaper and also more reliable and easily managed. The time reduction section also pin pointed that with using Hadoop cluster data sets are put into parallel computing making analysing of data faster. It also said its major objective is the ability to interact with customers in real time which is done by using analytics and data derived from customer experience. JustGym took Upton this research in creating an application which is cost effective and time effective whereby information and services are rendered to customers on a quick and easy base solution technique.

Organisations found out that big data development is more important when you employ it to develop new products and services which are all based around using data's. Companies who have employed this development like LinkedIn for usage of big data and data scientists to develop different Varity of products and features for different customers. By doing this, the new development attracted millions of customers. The other company in competition with LinkedIn is Google which is the major service for core searching mechanism.

Big data stack sector is a high specialized feature in big data technology. The above Figure 1 on big data stack shows how the components interlink and operates. And it also shows how the component revolves round the large unstructured and semi structured data. This gives it the edge to create a holistic solution that is fine tuned for the high performance processing power and storage. The big

data stack flows are the storage, platform infrastructure, data, application code, services and function, business view, presentation. And all these played a good part in the JustGym application.

Cloud services go hand in hand with big data. The massive distribution of computer resources on a huge scale makes it compactable with big data. Storage of services has become ever so easy and ever so important with the use of the cloud in storing this services and products. Clouds promised to power the next generation data centres by making them a virtual service, such as hardware, databases, and user-interface, application logic, which means, users will be able to access and set up applications from anywhere around the world on demand at a very competitive cost which will also be depending on the users quality of service (Qos) Buyya et al. (2008). This will help IT services and companies to free up the low level duty setting up basic hardware servers and software infrastructure. This will enable them to concentrate more on creating business value for their services.

Since this research was carried out, it helped me to know how important it is big data and cloud services are in the development of services which are important to users and customers. This helped JustGym to achieve most of its important functionalities and some of them are user interactivity, database usage which can be used for storage or a means for storing massive information on cloud, admin page for the management of the application. The problems which were highlighted on the aims and objectives section have been achieved and have been able to eliminate the problem of slow information retrieval.

There were necessary requirements gathered from the Gym organisations around the area in order to give a better view of how users want information's to be stored and retrieved. These requirements were like the interview questionnaires conducted and also the observation techniques. All these requirements have added an incredible importance to the development of the application.

Various techniques and methods were looked into and reviews on which was the suitable one to use to develop JustGym application. These tools were Joomla which is a content management system, WAMP server and image editing application Photoshop. Three different methodologies were mentioned and three were discussed on which one to use to develop JustGym application. These methods were waterfall, prototyping, agile methodology. After the final review on all of these methodologies prototyping was chosen as the better option for me to use for the development of the application. This is because it keeps track of the work flow and the end users, with the provided feedback from the user it helps with the better development of the application. It is a perfect methodology to use when it comes to systems which interact with the user. UML languages such as use case diagram and activity diagrams, also ERD1&2 diagrams were designed in other to show the activity in the database. Test plan was also carried out in order to make sure the system is working correctly and accordingly to the users expectations

Some problems were encountered when developing the application, and some of them were basic configurations and settings. But the major problem was encountered during the installation of the different modules and plug-in, the theme used was not compactable with the program I was developing so in order for me to overcome this problem I had to purchase a premium theme whereby support from the theme developers where used and this solved the problem. Also I was not able to find necessary plugins to integrate with cloud services but after some researches I found out that publishing the website first online and making it accessible anywhere over the internet will overcome the issue. The application is a growing development and with time, and more services and data on the system it will make it to be useful to have a cloud base service such as Amazon Ec2 offer or Google.

Conclusion

With the era of big data at hand, better analysis of large volume of data are becoming highly important for faster advances in many fields such as scientific and business disciplines and this helps in making smaller enterprises improve in their profitable state and be more successful in their field of environment. This project has outlined and looked at various big data benefits and also companies who offer them. This project has also looked at the challenges such as the privacy issues and also the lack structured data in some organisations who still use the traditional database for storing of their data. It also looked at the various new developments in the new big data and how big data is the key for cost reduction and time reduction when incorporated.

This project discussed of the big data stack which includes storage, platform infrastructure, data, application code and service function, business view and presentation and consumption showing how all these stack integrates and flow with each other.

The other section of the project talked about cloud computing which has a very high potentiality to provide infrastructure capabilities and services which is required for harnessing any business potential. Its characteristics come in 3 types which are platform as a services- This are the platform rented to businesses, software as a service are those software's given to customers for example Google mail and other sort of web application. Infrastructure as a service is services provided to customers for storage or virtualization of machine. This helps customers build their own machines, if they desire. The three types of cloud computing come handy as well, whereby they are made into categories such as the public cloud which is mainly for public and controlled by the cloud providers, private cloud is solely controlled by those who have access to the services and hybrid is the combination of the services and this helps organisation for resources pooling.

Furthermore research was carried out on JustEat and Hungry house organisation which are the most popular online services that provide customers with food services on their door step. The benefit of having such services are for high customer experience in the enjoying take away service, making take away food fuss free and a relaxing experience, high customer care and the choice of different food

restaurant to pick from. JustGym emulated this sort of service so that customers can get their desired services without any fuss and a very quick way of getting information.

This project has met its aims and objectives whereby providing this service that works and making sure all the required information and requirement gathering was accomplished. I have learnt a lot on how big data works and the usefulness of big data and cloud services with how the both work in partnership to achieve a certain goal with providing organisation and customers with data and services

Future Plans

This project was a given task in the field of cloud computing and it is so huge that only important sector could be covered and in the application side of the project there would be certain features i would have loved to incorporate such as :-

- Customers been able to book for appointment via the application
- Have an incorporated cloud service and incorporated more data.
- Gym organisation signing agreement or contract whereby every customer who uses the application to book a service, the application owners will get commission
- Customers can have an account with the system log in and out and also with the ability to view system and view necessary progress.
- The system should be upgraded to incorporate some cloud services maybe with the use of java application to configure some settings.
- More interactions online. And more animation services. System can book a personal trainer directly from the gym itself.

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Appendix A – interview Questionnaire

Interview/ Questionnaires

Please tick the appropriate boxes

Miss Kirstie Maslin

Interview 1

Question 1 – How long have you been a gym member for?

- 1-3 months
- 4-6 months
- 7-12 months
- 1 year and over

Question 2- How likely is it you would recommend this gym to a friend or colleague?

0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	◉	○	○	○	○	○

Question 3- What do you like most about the gym?

The quantity of facilities is brilliant because there is enough of each machine I never have to wait around to use machines.

Question 4– what do you think could be improved in the gym?

I think the parking aspect of the gym is not very useful as there is not enough spaces.

Question 5- Can you rate your satisfactory level for the overall gym layout:

- Very dissatisfied
- Dissatisfied
- Neutral
- Satisfied
- Very Satisfied

Question 5- How did you find us?

- Social media
- Search engine site
- Word of mouth
- Newspaper

Question 6- Was it easy to find?

- Yes
- No

Question 7- How far away do you live to the gym (in miles)?

- 0-2 miles
- 2-4 miles
- 4-6 miles

Question 8- Are you new to the area?

- Yes
  If so how long have you been in the area for? 2 months

- No

Question 9- Do you feel it was a welcoming environment?

- Yes
- No

Question 10- Did you require any help to find the gym?

- Yes
- No

Question 11- How do you make your way to the gym?

- Walking
- Train
- Bus
- Bicycle

Interview 2

Skype interview – Mrs Ayo Adeyemi

Question1 – how would you provide your customers with a better service?

Answer – by having a website that enables customers see our services in one place

Question2 – would that be a good idea?

Answer – It would be a good idea because customers in a new area can be able to see different services easier and faster

Question3 – how would you be able to advertise this system?

Answer – by making sure we put logos and signs of the system in our Gyms and on our social pages

Question4 – Do you think this required system will meet your expectation?

Answer – It will meet the expectation once the desired system is implemented.

Question5 – Will the users of the system find it friendly to use?

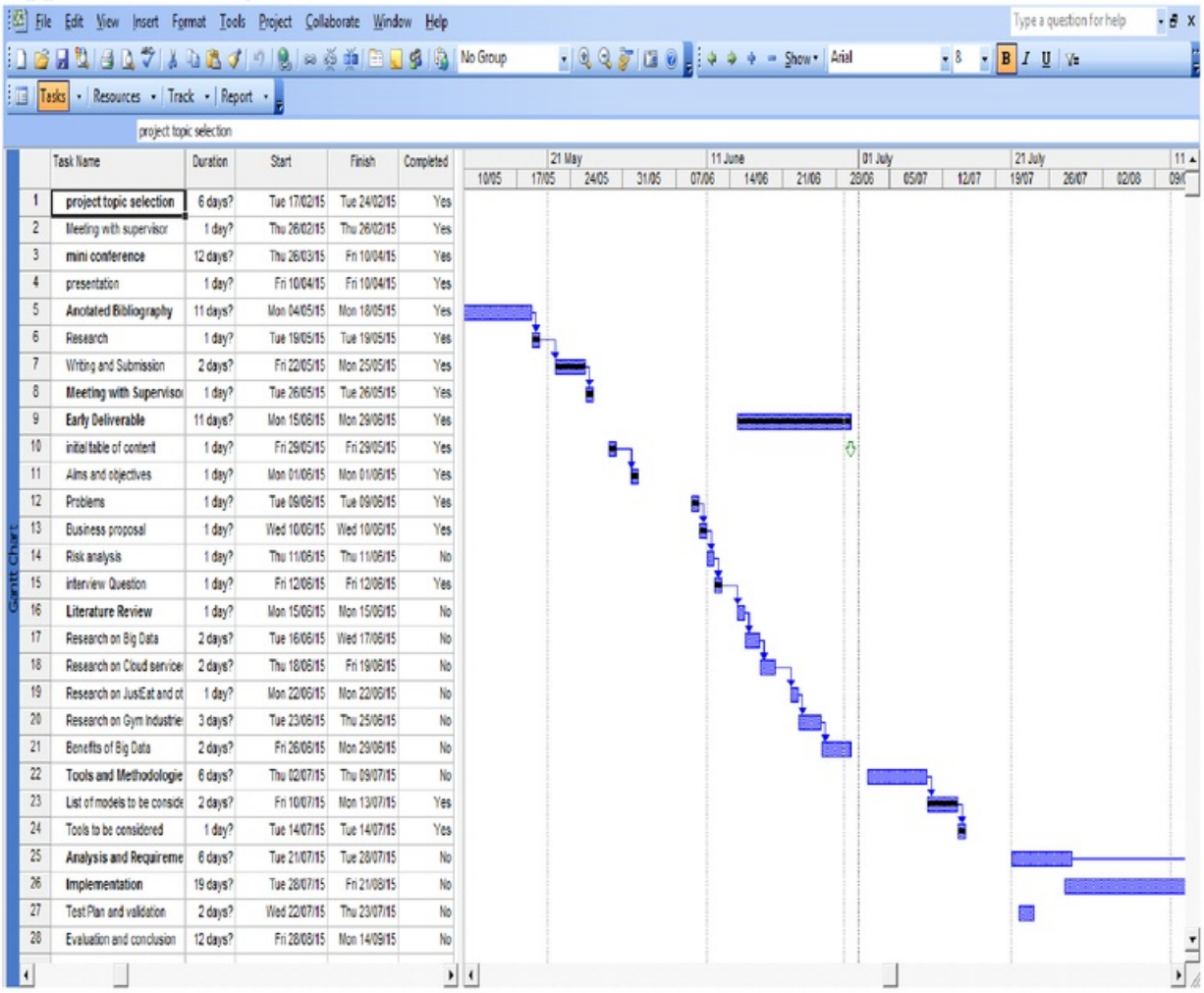
Answer – if the system will be interactive yes the will be easy to use.

Question6 – What could be your final comment for the gym?

Answer – to make sure the system is up to standard and meets user's expectations.

Thank you for all your opinion towards these questionnaires

Appendix B - Project Plan



	Task Name	Duration	Start	Finish	Completed
1	project topic selection	6 days?	Tue 17/02/15	Tue 24/02/15	Yes
2	Meeting with supervisor	1 day?	Thu 26/02/15	Thu 26/02/15	Yes
3	mini conference	12 days?	Thu 26/03/15	Fri 10/04/15	Yes
4	presentation	1 day?	Fri 10/04/15	Fri 10/04/15	Yes
5	Anotated Bibliography	11 days?	Mon 04/05/15	Mon 18/05/15	Yes
6	Research	1 day?	Tue 19/05/15	Tue 19/05/15	Yes
7	Writing and Submission	2 days?	Fri 22/05/15	Mon 25/05/15	Yes
8	Meeting with Supervisor	1 day?	Tue 26/05/15	Tue 26/05/15	Yes
9	Early Deliverable	11 days?	Mon 15/06/15	Mon 29/06/15	Yes
10	initial table of content	1 day?	Fri 29/05/15	Fri 29/05/15	Yes
11	Aims and objectives	1 day?	Mon 01/06/15	Mon 01/06/15	Yes
12	Problems	1 day?	Tue 09/06/15	Tue 09/06/15	Yes
13	Business proposal	1 day?	Wed 10/06/15	Wed 10/06/15	Yes
14	Risk analysis	1 day?	Thu 11/06/15	Thu 11/06/15	No
15	interview Question	1 day?	Fri 12/06/15	Fri 12/06/15	Yes
16	Literature Review	1 day?	Mon 15/06/15	Mon 15/06/15	No
17	Research on Big Data	2 days?	Tue 16/06/15	Wed 17/06/15	No
18	Research on Cloud service	2 days?	Thu 18/06/15	Fri 19/06/15	No
19	Research on JustEat and ot	1 day?	Mon 22/06/15	Mon 22/06/15	No
20	Research on Gym Industrie	3 days?	Tue 23/06/15	Thu 25/06/15	No
21	Benefits of Big Data	2 days?	Fri 26/06/15	Mon 29/06/15	No
22	Tools and Methodologie	6 days?	Thu 02/07/15	Thu 09/07/15	No
23	List of models to be conside	2 days?	Fri 10/07/15	Mon 13/07/15	Yes
24	Tools to be considered	1 day?	Tue 14/07/15	Tue 14/07/15	Yes
25	Analysis and Requireme	6 days?	Tue 21/07/15	Tue 28/07/15	No
26	Implementation	19 days?	Tue 28/07/15	Fri 21/08/15	No
27	Test Plan and validation	2 days?	Wed 22/07/15	Thu 23/07/15	No
28	Evaluation and conclusion	12 days?	Fri 28/08/15	Mon 14/09/15	No

Appendix c

Log Note and Minutes of Meeting

Discussuion	Time & date/ week	Venue
Emailed superviousr (Prof Frank Wang)for the first time, discussed about taking up the topic on big data cloud in social network	01/03/15	Via student email Office - Room S115A Cornwallis South University of Kent Canterbury

Discusssion	Time & date/ week	Venue
Sent an email asking for guidance in the introduction and bsuiness proposal that we discussed on our last meeting. Also asking for explanastion on the aims and objectives.	13/03/15	Via student email – f.z.wang@kent.ac.uk

Discusssion	Time & date/ week	Venue
Asked more help for aims and objectives. Sent an email also read about what impact it is big dad is in an organsation	18/03/15	Via student email – f.z.wang@kent.ac.uk

Discusssion	Time & date/ week	Venue
Meeting was accepted and we discussed of various thing big data is used for and how to structure the project.	19/03/15	Office - Room S115A Cornwallis South University of Kent Canterbury

Discusssion	Time & date/ week	Venue
Prepared presentation slides and sent it to prof Wang to go through before submission. He made some corrections and added some more information like the 4vs relating to cloud computing	22/03/15	Via student email – f.z.wang@kent.ac.uk

Discusssion	Time & date/ week	Venue
Presentation day	09/4/15	Marlow
Discusssion	Time & date/ week	Venue
Emailed prof Wang for more materials n the topic	23/04/15	Via student email – f.z.wang@kent.ac.uk

Discusssion	Time & date/ week	Venue
Meeting with supervisor, showed him work done and more ideas on the work yet to be done	30/04/15	Office - Room S115A Cornwallis South University of Kent Canterbury

Discusssion	Time & date/ week	Venue
Darft structure of table of content was made and also some more structure on how the front pagr of the application will look like.	16/06/15	Via student email – f.z.wang@kent.ac.uk And also meeting Room S115A

Discusssion	Time & date/ week	Venue
Early deliverables was prepared and submitted on time via university moodle page.	29/06/15	Via universiy moodle

Discusssion	Time & date/ week	Venue
Early research aspect of the work done which was the introduction the research on big data and the benefit of big data. The early draft of the application using dreamwearver. Contacted prof for meeting	10/07/15	Via student email – f.z.wang@kent.ac.uk

Discusssion	Time & date/ week	Venue
Meeting with Prof Frank showing both the development on the application side of the project and also the research going on the literature review	15/07/15	Office - Room S115A Cornwallis South University of Kent Canterbury

Discusssion	Time & date/ week	Venue
Meeting with supervisor	26/08/15	Office - Room S115A Cornwallis South University of Kent Canterbury

Discusssion	Time & date/ week	Venue
Meeting with supervisor on business proposal and also	05/09/15	Office - Room S115A Cornwallis South

refining the aim and objectives and to show improvment on application and what the application how it will benfit the community		University of Kent Canterbury

Discusssion	Time & date/ week	Venue
Emailed Prof frank to set appointment for second marker to know my topic and give him a demo	18/09/15	Via student email – f.z.wang@kent.ac.uk

Discusssion	Time & date/ week	Venue
Meeting was confirmed to be at medway campus at 5.30pm the Thursday coming	22/09/15	Via student email – f.z.wang@kent.ac.uk

Discusssion	Time & date/ week	Venue
Meeting with both supervisor and second marker. Correction was given from the second marker and they have been taken and put into consideration. Also was able to make him understand the concept of my application.	24/09/15	Medway campus kent Meday way building m327a

References

1. D. DeWitt and M. Stonebraker, "Mapreduce: A major step backwards," The Database Column, vol. 1, 2008 Available at - http://www.dcs.bbk.ac.uk/~dell/teaching/cc/paper/dbc08/dewitt_mr_db.pdf (Accessed: 8th April 2015).

2. Abouzeid, K. Bajda-Pawlikowski, D. Abadi, A. Silberschatz, and A. Rasin, "Hadoopdb: an architectural hybrid of mapreduce and dbms technologies for analytical workloads," Proceedings of the VLDB Endowment, 2009, Available at - http://www.vldb.org/pvldb/2/vldb09-861.pdf (Accessed: 11th April 2015).

3. X. Zhou, J. Lu, C. Li, and X. Du, "Big data challenge in the management perspective," Communications of the CCF, vol. 8, pp. 16–20, 2012. Available at - http://ijircce.com/upload/2015/tides/6_CIT-426.pdf (Accessed: 15th April 2015).

4. Babu, P.S.Nagendra, R.V.Ramana Kumar, and K.Phaneendra Kumar. 'International Journal of Innovative Research in Computer and Communication Engineering'. Big Data Analytics: Issues and Challenges volume 3.issue 4 (2015). Available at: http://ijircce.com/upload/2015/tides/6_CIT-426.pdf (Accessed: 8th May 2015)

5. Jonha Revesencio. (2010). 5 Big Ways Companies Could Use Big Data to Grow Business. *Smart data collective*. 1 (1), 1. Available at: www.smartdatacollective.com (Accessed: 15th May 2015)

6. Blueoceanmi.com, 'Hadoop Consulting, Telemetry System, Machine Learning'. N.p, 2015. Web. 5 Oct. 2015. Available at: www.blueoceanmi.com (Accessed: 20th May 2015)

7. Available at: www.slideshare.net no data (Accessed: 26th May 2015)

8. Davenport, Thomas H. Davenport, and Jill Dyché. *Big Data in Big Companies*. 1st ed. International Institute for Analytics, 2013. Available at: http://www.sas.com/content/dam/SAS/en_us/doc/whitepaper2/bigdata-bigcompanies-106461.pdf (Accessed: 8th June 2015)

9. Ji, Changqing et al. 'Big Data Processing In Cloud Computing Environments'. *2012 12th International Symposium on Pervasive Systems, Algorithms and Networks* (2012): n. pag. Web. Available at: http://www.researchgate.net/publication/235933401_Big_Data_Processing_in_Cloud_Computing_Environments (Accessed: 10th June 2015)

10. Yan, Liang, Chunming Rong, and Gansen Zhao. *Strengthen Cloud Computing Security With Federal Identity Management Using Hierarchical Identity-Based Cryptography*. 1st ed. South China Normal University, China: N.p, 2015. (Accessed: 15th June 2015).

11. Armbrust, M., Fox, A., et al.: Above the Clouds: A Berkeley View of Cloud Computing. Technical Report No. UCB/EECS-2009-28, University of California at Berkley, USA 2009 Available at: https://www.eecs.berkeley.edu/Pubs/TechRpts/2009/EECS-2009-28.pdf (Accessed: 20th June 2015)

12. Maheshwari, Ketan et al. *Evaluating Cloud Computing Techniques For Smart Power Grid Design Using Parallel Scripting*. 1st ed. Department of Computer Science Cornell University, Ithaca, NY 14853 †GE Energy Management, Schenectady, NY 12345 MCS Division, Argonne National Laboratory Argonne, IL 60439, 2015. Print. Available at: http://swift-lang.org/papers/pdfs/Swift_PowerGrid_2013.pdf (Accessed: 1st September 2015)

13. www.idc.com, 'Worldwide Cloud IT Infrastructure Spending Forecast To Grow 26% Year Over Year In 2015, Driven By Public Cloud Datacenter Expansion, According To IDC'. N.p 2015. Available at: http://www.idc.com/getdoc.jsp?containerId=prUS25732415 (Accessed: 8th June 2015)

14. Buyya, Rajkumar, Suraj Pandey, and Christian Vecchiola. 'Cloudbus Toolkit for Market-Oriented Cloud Computing'. *Cloud Computing* (2009): 24-44. Available at: http://link.springer.com/chapter/10.1007/978-3-642-10665-1_4 (Accessed: 8th June 2015)

15. Amazon.com. 'Amazon.Com: Online Shopping For Electronics, Apparel, Computers, Books, Dvds & More'. N.p, 2015. Available at: http://www.amazon.com/ (Accessed: 20th July 2015)
16. Salesforce.com. 'Salesforce.Com: The Customer Success Platform To Grow Your Business'. N.p, 2015. Available at: http://www.salesforce.com/ (Accessed: 25th July 2015)

17. Facebook. 'Facebook - Log In or Sign Up'. N.p. 2015.Available at: http://www.facebook.com/ (Accessed: 8th September 2015)

18. Myspace. 'Featured Content On Myspace'. N.P. 2015. Available at: http://www.myspace.com/ (Accessed: 12th September 2015)

19. Bigpoint.net, N.p, 2015.Available at: http://www.bigpoint.net/ (Accessed: 8th September 2015)

20. Digest.dx3canada.com. 'Gartner Hype Cycle 2014 Report Puts Wearables, Big Data In Their Place | Dx3 Digest'. N.P. 2014. Available at: http://digest.dx3canada.com/2014/08/13/gartner-hype-cycle-2014-report-puts-wearables-big-data-in-their-place/ (Accessed: 9th September 2015)

21. Mauro, Andrea. 'Iaas vs. Paas vs. Saas - Vinfrastructure Blog'. *Vinfrastructure.it*. N.p, 2015. Available at: http://vinfrastructure.it/2013/07/iaas-vs-paas-vs-saas/ (Accessed: 8th August 2015)

22. *Introduction to Cloud Computing*. 1st ed. Canada: N.p. Available at: https://www.priv.gc.ca/resource/fs-fi/02_05_d_51_cc_e.pdf (Accessed: 17th August 2015)
23. *Cloud Computing: Public, Private, Hybrid*. 1st ed. Dynasis paper. Available at: http://www.dynasis.com/wp-content/uploads/2011/08/DynaSis_Types_of_Cloud_Computing.pdf (Accessed: 5th July 2015)
24. Tech.just-eat.com. 'Engineering At JUST EAT | JUST EAT Technology'. N.p. Available at: http://tech.just-eat.com/engineering-at-just-eat/ (Accessed: 20th June 2015)
25. Available at: http://www.just-eat.com/our-story/ (Accessed: 20th June 2015)
26. Available at: https://en.wikipedia.org/wiki/Just_Eat (Accessed: 20th June 2015)
27. JUST EAT: Takeaway Industry Worth £9 Billion To UK Economy. N.p, 2015. Available at: http://qsrmedia.co.uk/research/news/just-eat-takeaway-industry-worth-%C2%A39-billion-uk-economy (Accessed: 8th July 2015)
28. Available at: https://en.wikipedia.org/wiki/Hungryhouse (Accessed: 8 July 2015)
29. Oxygen-consulting.co.uk. 'Tranforming the UK Gym Experience, Predicts New Report | Oxygen Consulting'. N.p, 2015. Available at: http://www.oxygen-consulting.co.uk/major-fitness-brands-set-to-transform-gym-experience-says-industry-report (Accessed: 8th September 2015)
30. Nair, R (2008). Software Life cycle Models [online]. Available at: http://rajeevprabhakaran.Wordpress.com/2008/11/20/software-life-cycle-models/ (Accessed: 15th August 2015).
31. Wilson, D. et al (1992). *Prototyping and the Software Development Cycle* Firelily Designs [Online] Available at: http://dianewilson.us/opinions/cycle.html (Accessed: 15th August 2015).
32. Scott, A. (2002). *Agile Modelling: Effective Practices, for extreme Programming and the Unified Process*. New York: John Wiley & Sons, Inc. Available at: http://msoo.pbworks.com/f/Scott+W.+Ambler+-+Agile+Modeling.pdf (Accessed: 15th August 2015).
33. Dr Winston W. Royce (1970). *Managing the development of larger software systems* [online] Available at: http://www.cs.umd.edu/class/spring2003/cmsc838p/Process/waterfall.pdf (Accessed: 17th August 2015)

34. Definition of Software Development Methodology [Online] Available at: http://en.wikipedia.org/wiki/Software_development_methodology [online] (Accessed: 20th September 2015).

35. What is agile software Development [Online] Available at: http://en.wikipedia.org/wiki/Agile_software_development (Accessed: 22nd September 2014).

36. Requirement specification Available at: http://en.wikipedia.org/wiki/Requirements_specification (Accessed: 18th September 2014).

37. Bobcattexas.com, 'Website Functionality. Bobcat Open Systems'. N.p 2014. Available at: http://www.bobcattexas.com/functionality.shtml (Accessed: 29th August 2015)

38. Md. Safaet Hossain, (2012), "Performance evaluation web testing for ecommerce web sites," Informatics, Electronics & Vision (ICIEV), 2012 International Conference on, pp.842, 846, [Online] DOI: 10.1109/ICIEV.2012.6317531 (Accessed 10th September 2015).

39. SearchCloudStorage, 'What Is Cloud Storage? - Definition from Whatis.Com'. N.p, 2015. Available at: http://searchcloudstorage.techtarget.com/definition/cloud-storage (Accessed 10th September 2015).

40. Ederle, Karl. 'Big Data, Social Networks Drive Talent Management Cloud | WIRED'. *WIRED*. N.p, 2015. Web. 6 Apr. 2015.
Available at: http://www.wired.com/2012/04/talent-management/ (Accessed 10th September 2015).

41. SearchCloudStorage. 'What Is Cloud Storage? - Definition from Whatis.Com'. N.p, 2015. Web. 6 Apr. 2015.
Available at: http://searchcloudstorage.techtarget.com/definition/cloud-storage (Accessed 10th September 2015)

42. Graham Corfield. 'JustEat's Top Tips for Takeaways - Real Business'. *Realbusiness.co.uk*. N.p, 2014. Web. 5 Apr. 2015.
Available at: http://realbusiness.co.uk/article/26473-just-eats-top-tips-for-takeaways (Accessed 10th September 2015).

43. 'Using Android Emulator on CI'. *Tech Blog* 2015. Web. 6 Apr. 2015.
Available at: http://tech.just-eat.com/blog/page/2/ (Accessed 10th September 2015).