Situation before the Library Management System/Background:

There was no concept of Admin/Librarian was present before the LMS system in ATC. There was an employee was allotted whose additional task was to manage the library manually with the help of Excel sheets. They had to manually return, issue book and maintain the records of the defaulters, which makes it difficult to maintain by anyone. We are not able to find records of different types of members who are active or not for learning new stuff. It was very difficult for Management to extract the required information.

The whole procedure was not able to implement it on the large scale in any kind of the organization where no of books and members are large in number.

**Objective:**

As we had already seen the need for the Library Management System in ATC India to expand the learning culture for the Employee and we can save the man-hours by implementing this system. We will be able to fetch important information automatically from it.

**Intern Objective:**

My first day of the Summer Internship 2019, began on 10 May 2019 and my aim/goal was to learn about the working culture of Corporate and its working at large scale. As a thriving student, I was always looking to find solution for a problem with the help of technology and I got this opportunity in ATC India.

I was introduced with this problem by Naveen Gambhir and was told they were looking for this solution for quite a long time. It gave me an immense opportunity to work on this problem and solve it and monitor the project progress at such a bigger level.

**Companies Objective:**

At ATC Sector 64 Office, Management was looking for the solution for the Manually Maintaining Issue and Return Book problem but they were not able to figure about the approach and all the other details needed to create the application.

**Scope of the Project:**

It is an online website. It is build using HTML, CSS, JAVASCRIPT, BOOTSTRAP, JSP – Ajax, MySQL. It allows some amount of traffic currently. It supports local hosting feature also. Next chapters will allow a lot of traffic very easily. The project needed to be totally secure and for it we need to integrate the session management system with individuals Id and Password.

The ID of the Admin/Member/Librarian should be needed to be unique because in ATC particularly more than 500 people are working and some of them are contractual and they have different employee id and it will not be unique all through the project.

**Methodology of the Project:**

The methodology of the project means how we had initiated the project from the starting phase to the ending phase.

We had followed the Waterfall Model in it and the different aspects of the Model are as follows:

* Project Planning
* Requirement Analysis and gathering
* Application Requirement Specification Creation
* Project Implementation
  + Designing
  + Coding
  + Unit Testing
* Project Backup
* Data Backup
* Project Testing and Troubleshooting

1. **Project Planning Through Seminar/Meetings:**

In the initial phase the entire layout of the project was jotted down, so that we are able to find out the project overall working and it’s prerequisite

* 1. **Technology Stack:**
     1. After of it I was allotted the Shubham Saxena Sir, Amit Mohapatro Sir as Mentor to discuss and finalize the Application Requirement Specifications. There was lot to do find the needed technology stack/type was been discussed and we are going to be used in the project.
     2. There is lots of discussion had been taken for technology stack selection for the Library Management System.
     3. The result of this discussion was that we are able to finalize to **Java** because of the huge libraries support and code once and run everywhere benefits.
  2. **UI based discussion:**
     1. In this we had done the thorough discussion about which technology we are going to use like it would be the Desktop based application or Web Based Application.
     2. After of it we had arrived to this solution that we are going to create a prototype of both and then we will be going to take the decision on it.
  3. **Security:**
     1. We had also focused upon the security of the application and for it we had tried to use the database and contain the data on it.
     2. We had also done much discussion upon the structure of the database like data types/default values etc.
     3. After of discussion we had came upon the conclusion to use the MySQL as a primary database with Command line and Express Edition for the
  4. **Portability:**
     1. The system must be able to run on Windows systems.
     2. The system must be able to run on Macintosh systems.
     3. The system must be able to run on UNIX systems.
     4. The code should be readable, well commented, and maintainable.
  5. **Sessions based Logging:**
     1. Through discussion we have came up with an idea about Session Management and how we can utilize the feature in our use so that anyone had login and logout.
     2. It will help to differentiate between the different section of the projects which is divided into Admin, Librarian, Member and Transaction Part.
     3. The technology stack which was decided to be used in the project is Servlets and Ajax as it will be going to prevent the user from illegally logging.
     4. A user will not be able to login and logout without any kind of the login id and password, so it is one of the important features for maintaining data privacy and redundancy.
  6. **Code Reusability:**
     1. It was also one of the factors which were focused during the work to reduce the unwanted code and better readability for other developers.
     2. Techniques of Indentation and Comments were discussed out so that better application can be developed.
     3. So after every week plan we have a Code Reusability Seminars, were we had a detailed discussion about the code of the project.
     4. The **benefits** of this round was that we are able to utilize some repeated code and formulated them into a form of template which can be reused from anywhere in the project.
     5. It had reduced hundreds of lines unnecessary code from the project.
  7. **Robust Nature:**
     1. The project should need to work on any condition like it should not dependent upon the predefine hardware (i.e. RAM, CPU etc.)
     2. We need to find out which will be best technology needed to use to make the application robust in nature and how we will be going to bring down the unnecessary things which might be going to slow the application during running.
     3. It makes the application light weight and we are also able to create the project in less 2.1 MB file size and this is one of the most important achievements of the project planning.
  8. **Database Design:**
     1. It was also focused so that we are able to find what are the

1. **Requirement Analysis:**

W e had already discussed about how we had done the Project Planning and how it is monitored and now we will be going to discuss.

The requirement analysis is basically an important phase where we will be going to discuss about the Application Outcome with our needed requirements both in the Hardware Side and Software Side.

We had divided the Technology Selection Phase into 2 different parts:

* 1. Technology Primary Selected with their Problems.
  2. Technology Finally Selected with their Benefits.

**Technology Primary Selected/ Prototype Time:**

As, an intern I was very focused upon the no of days I have and vastness of the project, so it was very important to create prototype so that we will be able to find how should the application needed to work. So I had create a Prototype in **Java based AWT Application** and that Prototype had really helped us and we are quickly able to find the problems and constraints of the primary technology.

Only Java was not going to solve the needs and demands of the project to make Hardware Free and Robust.

We had come upon the solution to make the application from Desktop Based to Web Based so that we will be going to see the changes through them without any hassle.

**Tools Selected Finally:**

As we had already seen the application with primary technology **Java with AWT** so to make any kind of application hardware independent we need to make it software dependent and it could only be possible with the help of web.

So we had tried to utilize the prototype learning during the final Tools Selection and after of again doing discussion with Mentors we had came upon **Java with JSP and Ajax.**

The prototype had really helped us to make the application more robust and better.

The different technology stacks selected and use in the project are:

* HTML/CSS/Javascript
* Ajax
* Java with JSP

**HTML:**

* HTML (Hypertext Mark-up Language) is the most basic building block of the Web. It defines the meaning and structure of web content. Other technologies besides HTML are generally used to describe a web page's appearance/presentation (CSS) or functionality/behaviour (JavaScript).

**CSS:**

* Cascading Style Sheets is a style sheet language used for describing the presentation of a document written in a mark-up language like HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

**JAVASCRIPT:**

* JavaScript, often abbreviated as JS, is a high-level, interpreted programming language that conforms to the ECMAScript specification. JavaScript has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions.

**MYSQL:**

* MySQL is an open-source relational database management system. It is a structured query language used to create, insert and deleted table according to the needs and its workings.

**AJAX:**

* Ajax is a set of web development techniques using many web technologies on the client side to create asynchronous web applications. With Ajax, web applications can send and retrieve data from a server asynchronously without interfering with the display and behaviour of the existing page

The different tools selected and used in the project are as follows:

* Eclipse IDE: To create the robust application which can manage the overall the project and its intelligent completion feature had also helped in the overall development of the project.
* TOMCAT Sever: As the name says, it is going to create a link between Eclipse IDE and Internet Browser; it can easily handle the small to medium type of application with an overall accuracy of more than 1000 times refreshing.
* MYSQL Server: It had helped in creating the link between the Eclipse IDE and MySQL Command Line Client for easy working.
* MySQL: It is a procedural query language which can be used to create database using in the project.

**Hardware Requirements:**

Hardware is one of the most important requirements which are basically needed to run and develop any software/application over any kind of the system. As this project is totally Web based but still hardware could boost the overall performance and make it more performance efficient.

The basic hardware requirements which are needed to be developed over the projects are as follows:

**Finalizing the Goals of the Application Requirements Specifications:**

1. To create a **Web based** Library Management System which will be going to solve the problem for the Librarian to issue and return the book.
2. The Application was divided between **3** **Modules** like **Librarian, Admin and Transaction** and each of them are independent of each other and Admin is going to be the Head of the Library management System.
3. **MARK TO BE DELETED:** As an MNC, it was very important for me to know the importance of data and how we can make it more secure and robust so for it we had used **flags (Yes/No)** options in Database which will be going to help us in retrieval of data from database.
4. **POP UP Box:** After discussion through Mentors, we came onto the need to develop the pop up box to make the code more efficient and robust to use.
5. **Session Management:** Every individual is going to be assigned with individual ID and Password which will help them to login and logout without any hassle. These functions help us in making the system more secure and robust in nature.
6. The application is also helping us by providing us with the **statistical report** according to the different parameters in the form of bar chart, line chart, box chart and pie chart.
7. It will reduce the manual work by **automating** the whole process from Excel based work to Web Based work.
8. We will be able to fetch the important information from the data which will be going to **speeding up** the overall process.

**Project Implementation:**

Project Implementation is one of the most important part in which we had basically work according to the Application Requirement Specifications.

The project Implementation was basically divided into 2 different approaches called as:

* **Project Timeline**
* **Review based Progress**

**Project Timeline:** In the Project Timeline session we had basically developed the methodology of dividing the project progress into week by week basis, and through it we will be able to monitor the improvement and how much I had accomplished the goal and objective.

As my internship was of about 12 weeks, so I had divided the working of project into twelve different weeks. The Timeline with the task completed is given in the **tabular format** given below.

**Review based Progress:**

As we had already discussed about the Timeline based approach but in the Software Engineering Development, it is very important to show the work after every week so that they can monitor about the project development overall. So for it, after every week we used to have a detailed discussion about the achievement of that week and we discuss about the better approach of solving it. Because of it we are able to quickly able to achieve the above objective with it and us also able to deliver the important changes into it.

Project Implementation for the big project generally takes place in the following manner like given below:

* Designing
* Coding include modules, entities and libraries
* Reiteration of above given cycle
* Testing (Unit testing and Integration Testing)
* System Maintenance:
  + Bug Fixes/Remedies
  + Version Numbers

**Approach towards Solutions:**

1. **Designing Part:**  The system/application was basically divided into 2 parts :
   1. **System Designing**
   2. **Database Designing**

**Database/Table Designing:** During the above mentioned Project Planning Session, we were not able to have the detailed discussion about the database design because of the time constraints. So we had taken care of that problem in the Implementation part.

Database designing is going to play the very important role during the project development because the System Design is totally going to be the dependent on it.

For it we need to define the system requirements and entities needed for the Project Designing Part.

During the Database Designing Part, we had come upon the conclusion to have 4 Modules for the Project like Admin, Librarian, Member and Transaction.

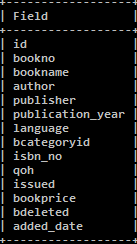
The overall design and layout of the table can be found below which can be further be used to show them the variety of the

**Book Table Structure:**

As the Book table structure is going to show all the fields related to the books. The description of the different field entries are as follows:

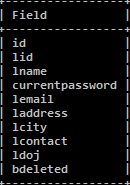
1 **Id**: Primary Key

1. **Bookno**== Auto generated like BOOK01, BOOK02 etc.
2. **Bookname**= Name of Book like Geeta
3. **Author** ==Name of the Author like Krishna
4. **Publisher**== name of the publisher like Geeta House Publications
5. **Publication\_year==** year of the book in which it is was published like 1998
6. **Languages ==**to find the language like Hindi, English, and German etc.
7. **Bcategoryid=** Type of the book like Religious, Horror and Adventure etc
8. **Isbn\_no==** Unique No written at the back of the every book
9. **QOH==** no of books we had purchased in the starting
10. **Issued==** no of books we are going to be issued
11. **Bookprice==** Price of the book in INR format
12. **Bdeleted=** Book removed from the Library or not. Example in YES/No condition.
13. **Added\_date=** When the book was first added into the Library. To keep track of the book added list.

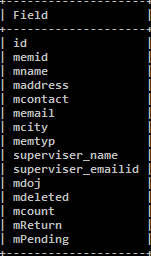


**Librarian Related Table:**

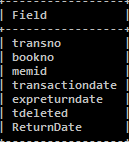
1. **Id =** primary key of table
2. **Lid=** Unique Id of the Librarian irrespective of Employee Id.
3. **Lname=** Name of the person
4. **Currentpassword=**  the login password used for logging the system.
5. **Lemail==** registered email of the person //not necessary to entered



**Member Related Table:**

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**Transaction Related Table:**

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As you can see the outcome of the above Database Designing and how we are able to schedule it.

**System Designing:**

After of it the project was progressed towards the next phase **System** **Designing** was done and we came upon the for two different sections for the Librarian and Admin.

Admin is going to be the Head of Library Management System and in the future the roles and responsibilities of the Admin are going to be increase with lots of powers.

Librarian is basically a person assigned by the Admin who can add/issue and return the books and members in the Library Management System easily.

The whole of the project is going to be conducted into three different parts called as:

1. Admin
2. Librarian
3. Member
4. Transaction
5. Reports

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| **Week 1**  **MNC’s Work Environment Bonding Period**  **(13 May-18 May)** |
| * In this period I was first introduced with the team of ATC and got to meet my mentors and learnt about how Corporate works and plans before Project Commencement. * Got to know about the requirement specification for the Project (Library Management System (Library Management System (Booktique))). * After of it I had tried to find more information through meetings and sessions with my mentors Amit Sir and Shubham Sir. |

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| **Week 2**  **First Milestone**  **System and Database Designing**  **(19 May-25 May)** |
| * Created a dummy prototype with Java Swing and AWT, to find how Java works on the client side without any integration of Server. * Learnt about the JSP configuration through Eclipse IDE and was also introduced with MySQL and Javascript Basics. * Learnt how to do the configuration of Tomcat Server Version 9.0 with Eclipse, to run the project on Google Chrome, Firefox and Microsoft Edge. * Created a Basic Application Requirements Report and Database Table Report, which will be used to check required columns and its data types used during the Project Development. |

**Coding:**

Coding Period basically began from the 3rd week of the project where we had seen the development into 3 corners:

1. Modules
2. Entities
3. Libraries

**Modules:** Modules are the base of the whole system on which whole of the project is built or made. The Library Management System (Booktique) is basically divided into 4 different modules like Admin/Librarians/Members/Transactions.

1. Admin: Admin is going to be any of the HR or Management Head, who can manage the different records and working of the project with each other.
2. Librarian: Librarian is the 2nd highest authority who cans add/edit/update and mark as deleted to anyone book/member. It will be going to work closely with the Team Management to create the system and how we will be going to create the project in it.
3. Members: Member is a separate module who can issue and return any book of his/her choice anytime and anywhere.
4. Transaction: in this section authorities like Admin/Librarian/Members can get themselves aware of the result and progress of the system. All the records related to the issue and return book can be seen through it.
5. Report Generation: It is the module in which an individual can easily monitors the progress with the help of different charts like pie chart, box chart, bar chart etc.

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| **Week 3**  **Second Milestone**  **Coding Week**   1. **May-2 June)** |
| * Created 3 **modules** (Login Page, Home Page and Books Page) in JSP. * The basic layout was decided and need for Bootstrap/Javascript came into existence. * With seminars/meeting we had finalised the structure of MySQL Database **Librarian/Books** and tested it thoroughly. * With the help of MySQL server both the Database and Web based Application and deployed it with the help of the TOMCAT Server on Firefox. |

1. **June-4 June Phase 1 Evaluation**

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| **Week 4**  **Third Milestone**  **(4 June –18 June)** |
| * On the basis of Phase 1 Evaluation, I had added some more required columns to the tables of **Transaction/Member** and updated it into the Application Requirement Specification Report. * Add some cool features like Modal **Box (Pop Up Box)**, Edit and Mark as Delete Option on the Book, Librarian, Member page, so that our project will looks more robust and better UI/UX looking. * Completed the 3 out of 4 modules like Book, Librarian and Members and rectified all the problems from Project Referral to Project. * Version 1.0 is completed and every Unit is tested individually. |

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| **Week 5**  **Fourth Milestone**  **(19 June- 26 June)** |
| * Add the features to download Static Report File(CSV file) through a button in the C: directory automatically of the PC/Laptop which will help them to easily work on the data without any hassle. * Started the work towards the Issuing Book / Return Book Panel so that the author cannot issue more than 2 books in one go. * Fixed the Data Redundancy Issue while adding books in the System and made it easier for the Librarian to update the quantity for the same book of same author but with different ISBN no and Publishing Year. * Version 1.1 Released and brought to it in Unit Testing. |

**27 June -29 June**

**Phase 2 Evaluations /Testing**

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| **Week 6**  **Fifth Milestone**  **(29 June- 6 July)** |
| * Started working upon the Report Generation Panel with the help of Google Charts and JSON and able connected them through the database. * Added more options for dynamic charts like from Bar Charts to Pie Chart to Box Chart. And it will be used to show reports to the Management with more added features. * **Version 1.3 Released and brought to in Integration Testing.** |

**6 July -10 July**

**Project Completion /Testing**

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| **Week 7**  **Sixth Milestone/Testing Phase**  **(6 July- 10)** |
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