🔹 Case Study 3: Annotation-Based Configuration

📘 Case Study Title: Library Management System

pom.xml

```xml
<project xmlns="http://maven.apache.org/POM/4.0.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
https://maven.apache.org/xsd/maven-4.0.0.xsd">
 <modelVersion>4.0.0</modelVersion>
 <groupId>com.example.library</groupId>
 <artifactId>library-annotation-config</artifactId>
 <version>0.0.1-SNAPSHOT</version>
  <dependencies>
<dependency>
<groupId>org.springframework</groupId>
<artifactId>spring-context</artifactId>
<version>5.3.33</version>
</dependency>
</dependencies>
</project>
```

Book.java

```java
package com.example.library;
import java.util.ArrayList;
import java.util.List;
import org.springframework.stereotype.Component;
@Component
public class Book {
    private List<String> books = new ArrayList<>();
    public void addBook(String title) {
        books.add(title);
        System.out.println("Book '" + title + "' added successfully.");
    }
    public void searchBook(String title) {
        if (books.contains(title)) {
                System.out.println("Book found: " + title);
        } else {
                System.out.println("Book not found.");
        }
    }
}
```

Member.java

```java
package com.example.library;
import java.util.ArrayList;
import java.util.List;
import org.springframework.stereotype.Component;
@Component
public class Member {
        private List<String> members = new ArrayList<>();

        public void registerMember(String name) {
                members.add(name);
                System.out.println("Member '" +name+ "' registered successfully.");
        }

        public void viewMembers() {
                System.out.println("Registered Members:");
                for (String member : members) {
                        System.out.println(member);
                }
        }
}
```

Loan.java

```java
package com.example.library;
import org.springframework.stereotype.Component;
@Component
public class Loan {
        public void issueBook(String book, String person) {
                System.out.println("Book '" + book + "' issued to " + person);
        }
        public void returnBook(String book, String person) {
                System.out.println("Book '" + book + "' returned by " + person);
        }
}
```

LibraryService.java

```java
package com.example.library;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;
@Component
public class LibraryService {
        @Autowired
        private Book book;

        @Autowired
```

```
    private Member member;

    @Autowired
    private Loan loan;

    public void library() {
            member.registerMember("Alice");
            member.registerMember("Bob");
            member.viewMembers();

            book.addBook("Java");
            book.addBook("Python");
            book.searchBook("Java");

            loan.issueBook("Java", "Alice");
            loan.returnBook("Java", "Alice");
    }
}
```

MainApp.java

```
package com.example.library;
import org.springframework.context.ApplicationContext;
import org.springframework.context.annotation.AnnotationConfigApplicationContext;
import org.springframework.context.annotation.ComponentScan;
import org.springframework.context.annotation.Configuration;
@Configuration
@ComponentScan("com.example.library")
public class MainApp {
    public static void main(String[] args) {
        ApplicationContext context = new
AnnotationConfigApplicationContext(MainApp.class);
        LibraryService libraryService = context.getBean(LibraryService.class);
        libraryService.library();
    }
}
```