# Overview of full stack engineering Assignment 1 – fullstack app design – RAILMAN app

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Weightage: 50%

Recently Indian Rails have decided to open up the train booking related information through APIs to the application developers so that useful applications can be developed around those APIs. Already there are certain applications available in the market those focuses on unique passenger requirements at time of rail journeys.

You are part of an upcoming startup that wants to leverage this opportunity to release new food catering services to the Indian rail passengers. Through this attempt you need to complete the feasibility analysis of this effort and recommend the appropriate services that can be made available to the rail passengers. For that purpose, you are supposed to research the existing solutions available in the market and help management to understand the cost and challenges associated with them. Once a decision is made on the way to be followed, then your team has to work identifying the important use cases pertaining to the rail passengers and prepare a thorough documentation explaining the same. While working on this assignment, you may come across many limitations, challenges, risks involved in fulfilling these requirements which you need to capture under the supplementary specification. Also as a part of this exercise, you need to think through the functional and non-functional requirements that needs to be taken into consideration to make this application a successful endeavor.

As a result of this assignment you have to come up with following set of documents

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| Feasibility Study report | Describes the business case, provides executive summary, high-level goals and constraints of the system |
| Use-Case model | Describes the functional requirements. The names of most identified use cases, detailed analysis of the important use cases to be captured |
| Supplementary specification | Describes other non-functional requirements. It’s useful to have some idea of the key non-functional requirements that will have a major impact on the architecture. |

**Evaluation Rubric**

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| Document | Credit | Expectations | Student Checklist |
| Feasibility report | 5% | * Both existing solutions are thoroughly analyzed * Advantages and Limitations of existing platforms are explained * Important features are extracted for proposed online education platform * Various risk associated with features are narrated * Decision with respect to go/no-go is clearly provided | * Method used for analysis and outcomes are captured * Comparison factors are listed down * Feature list written * Risk factors are identified * Mitigations / alternatives to the risks are described * Clear-cut decision with respect to continuation of project |
| Use case model | 10% | * Actors and their goals are explained well * Important use cases are identified * 4-5 use cases are narrated in detailed manner * Use case diagrams are used to summarize the use case modelling | * Various techniques used for identifying actors and their roles are used and described * Usecases are prioritized based on their importance * Fully dressed style is used while narrating the usecases * UML diagrams are used to summarize the model |
| Supplementary Spec | 5% | * FURPS are taken into consideration * Implementation constraints or interfaces involved in are narrated * Other non-functional requirements are captured well | * FURPS factors are discussed at appropriate length * Constraints involved in various forms are identified and explained |

Now you have to continue on the same line and complete the system design for the project. For that purpose, you need to decide upon the architecture suitable for the proposed system, identifying and designing the various components involved in it, also needs to pay attention to the interconnection between these components. The systems behavior in response to the different use cases which are already identified and described textually needs to be captured with the help of the dynamic modelling. If there are certain flows which are complicated, or runs in parallel then drawing them explicitly will simplify the interpretation for the same. The logical representations of the system consisting of important entities involved in the operations and their collaborations with each other will help in static modelling of the system. The physical layout of the system under consideration will also give idea towards the hardware / software specifications and other resources (involving the human beings) to be considered for this effort. Along with that the data requirements of the proposed system are also needs to be identified.

As a result of this exercise you have to come up with following set of artifacts

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| --- | --- |
| Logical Architecture | Describes the large scale organization of software components, subsystems or layers. |
| Static model | Describes the class diagrams which help in designing the definitions of packages, class names, attributes and method signatures of important entities involved in the system. |
| Dynamic model | Such as interaction diagrams, activity diagrams helps in design the logic, the behavior of code or the method bodies. |
| ER model | Captures the data requirements from the business domain, identifies the constraints related to the data items to be stored and also the relationship that exhibits between them. |

**Evaluation Rubric**

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| --- | --- | --- | --- |
| Document | Credit | Expectations | Student Checklist |
| Logical Architecture | 5% | * Layers are identified * Layers responsibilities are detailed out * Package diagrams are used to describe the layering and components involved * Principle of separation of concern is followed | * Clear-cut separation of components is done citing out their responsibilities * Interaction between the components is clearly explained * UML tools are used to draw diagrams |
| Static model | 10% | * Class diagram involving all important concepts and their collaboration * Description of classes along with characteristics | * Appropriate methods are used to identify the classes * Class attributes, data types, access mechanism etc. are clearly mentioned * Collaboration among classes in captured * Relationship between the classes is shown with proper notations * UML tools and diagrams are used |
| Dynamic model | 10% | * Interaction diagrams for all important use cases are shown * Activity diagrams for complex flows are provided * State machine diagrams (if making sense) are shown | * UML tools are used to prepare the interaction diagrams especially the sequence diagrams * Proper notations are used while narrating the use cases with sequence diagrams * Only complex flows are shown with activity diagrams * Appropriate objects are used while drawing the interactions |
| ER model | 5% | * ER model with all the important concepts, entities derived from business domain | * Important entities are identified and described well with help of attributes * Relationship between entities is indicated vividly * Appropriate notations are used |

References:

1. [Feasibility Study](http://www.cs.cornell.edu/courses/cs5150/2015fa/slides/C1-feasibility.pdf)
2. [Usecase template by Cockburn](http://cis.bentley.edu/lwaguespack/CS360_Site/Downloads_files/Use%20Case%20Template%20%28Cockburn%29.pdf)
3. [Requirements by Craig Larman](https://sites.cs.ucsb.edu/~mikec/cs48/project/RequirementsLarman.pdf)
4. [System](http://www.cs.cornell.edu/courses/cs5150/2015fa/slides/C1-feasibility.pdf) [architecture](https://sites.cs.ucsb.edu/~mikec/cs48/project/ArchitectureLarman.pdf)
5. [Applying UML and patterns](https://personal.utdallas.edu/~chung/SP/applying-uml-and-patterns.pdf)
6. [ER model](https://opentextbc.ca/dbdesign01/chapter/chapter-8-entity-relationship-model/)
7. [ER diagrams](https://www.visual-paradigm.com/guide/data-modeling/what-is-entity-relationship-diagram/)

**Notes:**

* This is a take-home assignment to be carried out by each learner group independently.
* This is analysis and design exercise - requiring both the existing solutions to be explored and considered for design of new system.
* You may consult / discuss with other learners peripheral aspects such as the environment but not on solving the specific problems in terms of design or implementation.
* You have to write the appropriate report/s / documents in order to justify the analysis and use case modelling.
* Group together all the final documents needs to be submitted in doc or pdf format only having naming convention like - OFSE\_Assignment1\_<Group\_ID>.zip
* Provide appropriate justification when arriving at the conclusions.
* In case of any further queries, if those are generic once, learners are encouraged to use discussion forums, otherwise they can reach out to me at [ppawar@wilp.bits-pilani.ac.in](mailto:ppawar@wilp.bits-pilani.ac.in).
* Manage your efforts properly as there is no scope to shift the deadlines announced above.