Farm Management Information System

Chapter 05

Standards and Design Constraints

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5.1 Compliance with the Standards:

Standards are important as they allow the combination of products from different vendors. Without standards only hardware and software from the same vendor could be used together. A standard user interface can be beneficial for efficiency. As our project is an information management system for farms, we need to follow specific standards as well.

5.1.1 Software Standards

The management system we intend to develop is mainly a web-based system and we are willing to create the user interface following some guidelines. Software standards we are looking forward to following are

1. ***Common Gateway Interface (CGI):*** This is a specification that allows web services to execute external programs or user requests.
2. ***ECMAScript:*** This specification ensures the interoperability across different web browsers. JavaScript is an implementation of this specification.
3. ***Hyper Text Transfer Protocol (HTTP):*** This protocol is used for transmitting hypermedia documents. This protocol is designed to establish connection between web browser and web servers.
4. ***Unicode:*** We might need to use Bengali language to make it more user friendly. In this case, to use Bengali characters we will need Unicode for character encoding.
5. ***Unified Modeling Language (UML):*** It is a general-purpose modeling language in software engineering. It provides standard ways to visualize the design of a system.
6. ***Material:*** This is a guideline for user interface design. We will use this guideline specifications for our user interface design.

5.2 Design Constraints:

Constraints are conditions in the form of limitations that must be met while designing the system. For development of a Farm Management Information System, there exist some constrains.

1. ***Social constraints:***
    a. System must not be cause unemployment.
2. ***Ethical constraints:***
    a. System design must respect patents and intellectual rights.
    b. System design must provide information security and privacy for the owners.
3. ***Sustainability:***
    a. System makes it easier to manage workers and workloads.
    b. System design improves record-keeping.
    c. System must have an easy-to-use graphical interface.

d. System must be extensible. So that it supports future updates and upgrades.
e. System must be easy to learn.
f. System must be easily maintainable.

5.4 Complex Engineering Problem:

Introduction to our project:

Our project is titled “Farm Management Information System”. The objective of our project is to build a management system for farms so that the operational and management activities of farms become easier.

Reasons that our project is a complex engineering problem:

For a problem to become a complex engineering problem it must satisfy P1 and some or all of P2 to P7 from the Complex Problem Solving table and some or all of the Engineering Activities table.

Our project fulfills compulsory as well as other additional criteria to be considered as a complex engineering problem. The rationale with proper visual representation is given below.

5.4.1 Complex Problem Solving

Complex Problem Solving							
P1							
Depth of Knowledge							
✓							
Knowledge Profile							
K1	K2	K3	K4	K5	K6	K7	K8
Natural Sciences	Mathematics	Engineering Fundamentals	Specialist Knowledge	Engineering Design	Engineering Practice	Comprehensior	Research Literature
		✓	✓	✓	✓	✓	✓

Table 01

P1 (Depth of Knowledge): Our project requires in-depth engineering knowledge in several domains for successful completion. For P1 to be satisfied, K3, K4, K5, K6, and K8 must be satisfied from the Knowledge Profile table.

K3 (Engineering Fundamentals): To make our project we will need knowledge of some theoretical engineering fundamentals.

Networking: For reliable, accurate, and fast data transactions, we will need knowledge of Networking.

Database: We will need databases for storing information. Both OLTP and OLAP types of databases are going to be required. So, in-depth knowledge of databases will also be required.

System Analysis and Design: To develop our project in a proper orderly step-by-step process we will need in-depth knowledge of system analysis and design.

Web Technologies: Clear knowledge of web technologies will be needed.

Data Structure and Algorithm: Knowledge of data structure and algorithm is going to be required to make the system efficient and reliable.

K4 (Specialist Knowledge): To implement our system, we will be using different tools and technologies. We will require specialist knowledge of tools and technologies such as MongoDB for database, React.js for front-end development, Node.js for backend development, Firestore (firebase as a whole), Material UI for design guidelines, git for version controlling and collaboration.

K5 (Engineering Design): before the implementation, our project will go through the design phase. We will have to design architecture for our system along with different UML diagrams. For structure diagrams, we will design class diagrams, component diagrams, deployment diagrams. For behavioral diagrams, we will design use-case diagrams, sequence diagrams, activity diagrams, etc.

K6 (Engineering Practice): Different engineering practices will be required for the project work. As it is a team project, we will need collaboration technologies such as GitHub. For project management, we will use Jira software. For documentation, we will use latex. For UI design free version of Figma will be used along with MS Visio for diagram design.

Other analytical tasks such as SWOT analysis, cost analysis, benchmark study, algorithm analysis, etc. are also necessary for our project.

K7 (Comprehension): Our project is related to farming which is an essential part of our culture and economy. If the digitalization of the farming sector can improve overall efficiency and profit, then a large number of people who are gradually walking away from farming due to rapid urbanization might feel interested in getting involved in this sector. This way farming will be able to make more contribution to our economy and we will have food sufficiency in our country.

K8 (Research Literature): our project involves studying technical papers and journals related to building Farm Management Information Systems. There are various pieces of literature describing different aspects and problems with proposed solutions regarding Farm Management Information Systems. Analysis of current systems and suggestions to improve these systems are also available in the works of literature. Studying technical papers helps improve both qualities and functionalities for our project.

Complex Problem Solving					
P2	P3	P4	P5	P6	P7
Range of Conflicting Requirements	Depth of Analysis	Familiarity of Issues	Extent of Applicable Codes	Extent of Stakeholder Involvement	Interdependence
			✓	✓	✓

P5 (Extent of Applicable Codes): As we are building a Farm Information Management System, there are some standards and guideline we will have to follow. There are software engineering standards and agricultural standards to follow for our project.

Software engineering standards:

ISO/IEC software engineering standards

https://www.iso.org/obp/ui/#iso:std:iso-iec:tr:19759:ed-2:v2:en

Agricultural standards:

ISO standards for agriculture

https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100412.pdf

P6 (Extent of Stakeholder Involvement): Farm Management Information Systems have different stakeholders. Individuals and entities such as farm owner, government, farm employee, administrator, suppliers etc. Here farm owner is main stakeholder and a direct end user.

P7 (Interdependence): Our project is divided into different parts and these parts are interdependent. Software development goes through different phases. Our first part is to explore current systems. Based on the study we need to think of anything new we might add to the existing systems to make it better. Next task is to determine what purpose our system should serve and what functionalities should be included in the system. From this part we will be able to set our objectives. Then in the next part we will have to do various diagram designs for our projects. These diagrams will be used as blueprints and guideline for our implementation phase. In our implementation phase we will build our system using various tools and techniques. Finally, we will test our system to check if it meets all the required criteria.

5.4.2 Engineering Activities

Engineering Activities				
A1	**A2**	**A3**	**A4**	**A5**
Range of Resources	**Level of Interaction**	**Innovation**	**Consequences for Society and Environment**	**Familiarity**
✓			✓	

A1 (Range of Resources): Our project needs resources from different sectors. Firstly, we need research papers to keep us well informed regarding various aspects of Farm Management Information Systems. A lot number of online resources such as articles, standards and guidelines, tutorials are also required. We have our mentor and course teacher to always guide us in the right direction. We will need some field experience related to how a farm function. In this case, farm owners and farm employees can also provide us with necessary information.

A4 (Consequence for Society and Environment): A Farm Management Information System can reduce the cost and increase productivity. It makes farm management easier. An improved farming sector will contribute more to the country's economy. We will have food sufficiency. We will be able to export foods and agricultural products. This will create job opportunities as well. More people will be involved in farming. So, a successful implementation of this project might have a huge positive impact on our socioeconomic standards.

5.5 Summary:

A basic web-based Farm Management Information System includes some common and widely used software standards. Design constrains varies depending on if it is a commercial or a project-based work. For a commercial variant, some more constraints such as economical constraints would be added. Design and implementation of a fully functional Farm Management Information System is a complex engineering problem. It has been shown with well established points. A Farm Management Information System is a system where engineering knowledge can be applied very significantly.