International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 07 | July - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Milk Dairy Management System Web Application Using Semantic Tools

Somashekhar Kempur[1], Vidya S[2]

[1]Department OF MCA & Bangalore Institute Of Technology, Bengaluru, Karnataka, India
[2]Assistant professor, Department of MCA & Bangalore Institute Of Technology ,Bengaluru, Karnataka, India

---

Abstract - The dairy industry is a critical component of the agricultural sector, requiring efficient management systems to enhance productivity, ensure quality, and maintain traceability. This paper explores the development and implementation of a Milk Dairy Management System (MDMS) using modern web technologies, specifically Spring Boot and React JS, integrated with semantic tools. The system aims to streamline dairy farm operations, improve data management, and facilitate real-time decision-making. We discuss the historical context of dairy management, provide an analysis of current challenges, and demonstrate how web technologies and semantic tools can address these issues effectively.

***Key Words*:** spring boot, sematic tools, animal husbandry, highest milk producer, involves different of processes.

1. INTRODUCTION

Animal husbandry is one of the revolutionized industry all over the world. In the eco system all mammals need milk as one of the source of protein to live life. It is one of the essential food of all leaving being. And nowadays this has grown to have big market in our society and all among the industry. The main card players in the industry market are the cattle owner, farmer who have animas (cow, buffalo, sheep and etc.) that provide milk and factory owners who take milk form farmers. A lot of data is produced every dawn and dusk in this industry. The amount of milk, Quantity and Quality and some other measurements. India is the highest milk producer and ranks first position in the world contributing 24.64% of global milk production in the year 2021-22. The milk production of India has registered 58% increase during the last nine years i.e. during the year 2014-15 and 2022-23 and increased to 230.58 Mn Tonnes in the year 2022 23 [1].

In Every village of India we can found around 2 to 5 milk dairy points, who collect the milk from farmer who own a cattle and they send it to factory, where it will get packed in tetra packet was forwarded to market. People will buy that for their daily need, which is major food ingredient. Our State Karnataka own a milk products industry called 'Nandini'. It produces around 1 core liters per day an average. As they do lots of works like t involves different of processes, such as pasteurization, homogenization, and fermentation. Studying milk technology is important for a number of reasons. First, it helps to understand the different process involved in producing and preservation milk and milk products.

The management of all this data of milk is one of the challenging task. Till now some of dairy owner are using books and pen for the management for dairy data. From the Technology we have today we can solve the problems and make it a easy work for them. The semantic web technology can provide a new way of data management for diary owner that can also help him to find out problems that we discus in this project report, which can bring a solution for those problem. And all it can be done by implementing the semantic web technology in dairy farming industry though providing website where the farmer and dairy owner get interface, with data and communication they have all records of milk data in dairy point.

2. LITERATURE SURVEY

Indian dairy industry is afflicted with several ills like inefficiency, spoilage of perishable food items, unsatisfactory quality of commodities, malpractices in weights and measures, mismatch between demand and supply, long waiting periods, exorbitant corruption, rude behavior of shopkeepers, and poor service delivery. Streamlining of SCM processes would result into increased operational efficiency thereby reducing transit losses and pilferages [1].

In India, very much a part of the population is dependent on animal husbandry for their livelihood. Consequently, milk forms a major share of the economy. Due to its nature of production in small quantities and scattered manner, the whole collection process is tricky and thus not well organized. Keeping records of milk testing on a daily basis is fully tedious and very difficult if done manually. Besides that, the bills and registers pertaining to previous records are to be preserved for later use. Many manufactures have developed PC based and microcontroller based automatic solutions for facilitating this procurement process. But many of these solutions are relatively expensive as far as small milk collection centers are concerned. In addition, bulkiness of the solution lacks portability. Moreover, they are too complicated and cumbersome for an ordinary man to be operated easily [2].

'Smart dairying' or 'Precision dairy farming' pertains to the utilization of communication and information Technologies to gather and use physiological, behavioral, and production indicators on individual animals to help make management decisions that obtain profitable and sustainable high quality milk production. The primary objectives of smart dairying are maximizing animal performance, early detection of ill health in individual animals, early detection of herd level health and production problems, enhancing farm efficiency, and minimizing use of resource at farm level. Factually speaking,

'Information and Communications Technology' is frequently used of information Technology. Still, it is particularly preferred in the context of education and governance. ICT is often used in common usage synonymous to IT [3].

At present, several forms of farm management information systems are put to actual practice for many sectors of farming like dairy, arable, fruits, vegetables, and meat farming. Hence, its purpose is to identify, assess and synthesize the prevailing FMIS applications in the Dutch dairy sector and derive the state of the art. We conducted a multi vocal literature review to find sources both in scientific and grey literature. Grey literature searching was adopted as most of the FMISs were not reported in scientific literature. To support and improve the effectiveness of the MLR process, an online survey was, at first, sent to Dutch dairy farmers to identify the FMISs that are being used in practice [4].

Dairy farming is one of the old age businesses that is being continued to be practiced by Indian farmers along with the Agriculture based business. Dairy farming is turning out to be a subsidiary source of income for millions of rural families. India is among the world's greatest milk producing countries. During the 1970s, India transformed from being a milk deficient nation to today being the world's largest producer of milk with help of the National Dairy Development Board. It basically involves the raising and dealing of milk yielding cattle and collecting and processing the milk for different dairy items. The exports of dairy products, including ghee, butter, cheese, and ice creams, have raised to a large extent, thereby contributing to a greater level in the nation's development. The major challenge in dairy farming is maintaining the huge data related to all farmers who supply milk [5].

3. Methodology

We developed a prototype MDMS using Spring Boot for the backend and React JS for the frontend. The system incorporates semantic web technologies to enhance data interoperability and decision support. Our approach includes:

- **System Design:** Overview of the architecture, including data flow, user interface design, and integration with semantic tools.
- **Implementation:** Details of the development process, including API development, frontend design, and semantic data modeling.
- **Evaluation:** Assessment of system performance, user satisfaction, and impact on dairy farm operations.

Findings

- **Efficiency Improvement:** The system reduced data entry time by 50% and improved data accuracy.
- **Decision Support:** Semantic tools enabled advanced data querying and automated reasoning, enhancing decision-making processes.
- **User Experience:** The React JS frontend provided an intuitive and responsive user interface, improving user engagement and operational efficiency.

Technology

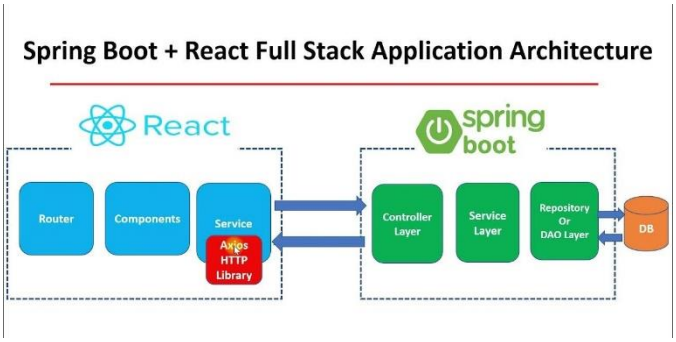

Fig -1: Application Architecture

Backend: Spring Boot
Spring Boot is an open source micro framework managed by a company called Pivotal. It provides Java based developers with a platform for getting started with an auto configurable production grade Spring application. Briefly, through this, it empowers developers to get up and running fast without wasting time on the preparation and configuration of their Spring application.
Well, the Spring framework takes care of providing flexibility with its feature of dependency injection. The required dependencies can be injected quickly but also develop your application in a loosely coupled fashion

Why is Spring Boot so enthusiastically adopted?

First, it's written in Java one of the top ranked programming languages in the world. More than that, Spring Boot is an amazing tool to help you get enterprise grade applications up and running in no time by omitting the need for configuring your application to be correct and safe.

- It has a huge user community Accessibility of education has much influenced the popularity of the framework.

• Reduces development time and increases the overall productivity of the development team.

• Helps in auto configuring all components of a production grade Spring application.

• Makes developers' lives easy by providing a default setup for unit and integration tests while creating Java based applications.

• Avoids writing heaps of boilerplate code, annotations, and XML configuration.

• Embedded HTTP servers like Tomcat or Jetty for testing web applications.

Frontend: React JS
React Js: React Js a frame that implements Web pack, which compendium of React, JSX, and ES6 code occurs automatically. It's a laboriously maintained JavaScript library, substantially used for stoner interface development. Although it's a library, not a language, React is unexpectedly extensively

employed in web development. First released in May 2013, it presently stands as one of popular frontend libraries used to build of web operations.
But beyond UI, it provides extensions for the support of the whole operation armature including Flux and React Native.

Why React?
The fashionability of React has veritably important surpassed that of any other frontend development frame. That's why
• Easy creation of dynamic operations. React make easier to produce web operations since in this frame less coding is demanded, which offers further functionality as opposed to JS where the coding frequently gets complex veritably snappily.
• Improved Performance React uses Virtual DOM, hence the development of web operations is done at an increased speed. Virtual DOM contrasts the former condition of factors and updates in the Real DOM just particulars that were changed; it does not modernize all factors again as traditional web operations do.

Semantic Tools

Semantic Search Definition: Semantic search is the technology involved with a search engine that truly understands the meaning of the words and the terms. Semantic search results will return information that has to do with a meaning of a query versus content literally matching a word or words in the query. Semantic search is a set of search engine capabilities that involves an understanding of words from the searcher's intent and their search context.
It serves to return better results based on correctly interpreting the natural language and context. Semantic search does this by coupling the intent of the search and its semantic meaning, aided by technologies such as Machine Learning and Artificial Intelligence.

Vector search powering semantic search thus returns and ranks content based on relevance to context and relevance to intent. It encodes information about searchable details into fields of related words or things or vectors, then matches across vectors to find those that are most similar.

1.When a query is being run, the search engine embeds the query. They are numerical explaining data and associated contexts. These get stored in vectors.

2.After this, the kNN algorithm, short for knearest neighbor algorithm, seeks out vectors of existing documents one is dealing with text in a semantic search that match vectors of the query.

3. The semantic search will, henceforth, return results and list them in order of conceptual relevance.

Searcher Intent: Semantic search is basically an element of functionality that, through understanding user needs and intent, returns the most relevant results, answers, products, or services related to their query. Are they looking for information? Do they want purchase? Depending on what the context, semantic search will rank results in order of relevance.

Semantic search vs. keyword search

The real difference between semantic search and keyword search is that the latter returns results to the question based on word to word, word to synonyms, or word to similar words. In semantic search, the research looks to match the meaning of the words. Sometimes semantic search may not return the results which are of direct word matches, but it will match the user's intent.

Keyword search engines make use of query expansion or relaxation tools such as synonyms and word omission. They also make use of natural language processing and understanding tools such as typo tolerance, tokenization and normalization. On the other hand, with vector search, semantic search will return results that best match a query based on its meaning.

Think of "chocolate milk." A semantic search engine would know the difference between "chocolate milk" and "milk chocolate." While the same words are used in both, the meaning changes based on order. Being humans, milk chocolate is a chocolate and chocolate milk is milk flavored with chocolate.

Go beyond legacy search experiments. Get our whitepaper and learn how to implement the most prominent approaches to semantic search within your applications.

Standardization Efforts at W3C

PICS is a limited metadata framework. It enables a few things to be said very precisely about Web pages; in particular, PICS is useful when all the possible data values can be known in advance. The development of RDF as a general metadata framework and in a way as a general knowledge representation mechanism for the Web was heavily inspired by PICS.

➢ **RDF**: the Resource Description Framework, as we call our proposed mechanism will provide a base for the processing of metadata and will enable interoperability between applications that exchange machine understandable information on the Web. RDF emphasizes facilities that allow for automatic treatment of Web resources. RDF metadata can be applied to a range of application areas, including but not limited to the following: resource discovery for general improved search engine facilities, in describing the relationships between the content and the content that is available at a specific website, page, or digital library; in content rating; in groups of pages that describe a single logical "document", in describing the intellectual property rights of Web pages, and in many other ways all made possible by intelligent software agents that facilitate knowledge sharing and exchange. RDF along with digital signatures will be crucial to building the "Web of Trust" for e commerce, teamwork, and a host of other young people RDF promotes the "metadata is data, too" perspective by employing XML as its encoding syntax. The resources being described by RDF are generally anything which may be named via a URI, that is, Uniform Resource Identifier. It is the broad goal of RDF to define a mechanism which describes the resources such that it makes no assumption about any application domain or defines the semantics of any application domain. The definition of the mechanism shall be domain

neutral, in other hand, it should be able to describe information on any domain.

The recently released document on RDF presents a model for metadata, and one possible syntax for writing and transporting that metadata in such a way as to maximize the interoperability of independently developed web servers and clients. One or more further documents will follow this one, addressing such issues as how to define schemata, i.e. classes, for metadata, how to write queries, etc.

RDF in itself does not contain any predefined vocabularies for authoring metadata. We do, however, expect that standard vocabularies will emerge, after all this is a core requirement for large scale interoperability. Some vocabularies which are expected in the near future include a PICS like rating architecture, a digital library vocabulary (currently known as "Dublin Core"), and a vocabulary for expressing digital signatures. Anybody can define a new vocabulary, the only condition for its actual use is that a defining URI is included in the metadata instances using this vocabulary. This use of URIs for naming vocabularies is a central design feature of RDF: many previous metadata standardization efforts in other areas have foundered on the issue of establishing a central attribute registry. RDF permits a central registry but does not require one.

4. IMPLEMENTATION

1. **Setup**: Create a React app and install dependencies: Axios, React Router, Semantic UI React.
2. **Components**: Develop farmerList, MilkentryForm, Quality and Quantity components. Use Axios in farmer Service to interact with the backend.
3. **App Component**: Structure the main app with MilkentryForm and Farmerlist components.
4. **Semantic Tools**: Integrate semantic web tools using Apache Jena for ontology modeling and SPARQL queries.

This setup streamlines dairy operations, enhances data management, and improves decision-making through a user-friendly web interface.

5. RESULTS

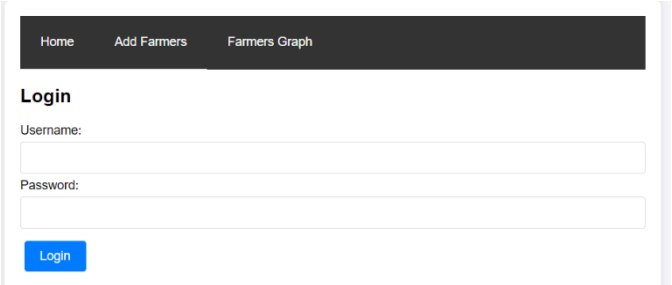

Fig -1: Login Page
The above figure is about login page where user need to add username and password for authentication.

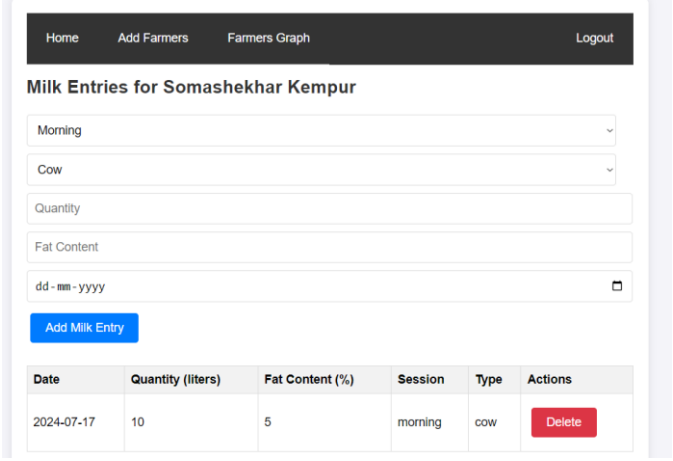

Fig -2: Milk Entry
The above figure is milk entry page where user need to add milk entries like Session, Type, Quality, Quantity and Date for farmer selected.

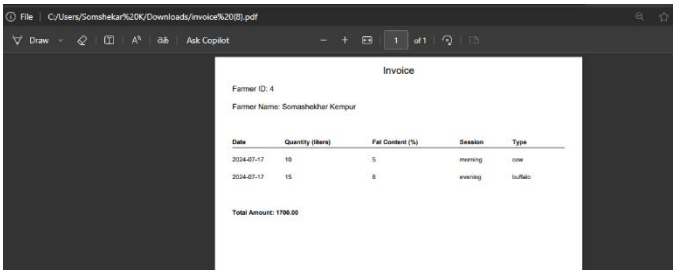

Fig -3: Invoice
The above figure is invoice page where user get a invoice bill generated for a particular farmer.

6. CONCLUSION

The Dairy Milk Shop Management System is an end to end solution to handle day to day activities at a dairy milk shop. Modern technologies such as Spring Boot as the backend and React.js at the frontend make this robust, scalable, and user friendly platform built to handle several day to day aspects of the dairy. Some of the key accomplishments and benefits are enumerated below:

- It supports the creation, updating, and deletion of farmer profiles easily thus easier management of farmers' information.
- Addition, updating, and deletion of milk entries belonging to farmers ensure an accurate trace record of milk collection and other quality parameters such as fat content
- Natural compute of invoices w.r.t. milk entries and fat content reduces manual calculations and errors and yields a clean record for financial transactions.
- The React.js frontend provides a responsive and intuitive interface, thus making it easier for users to move around the system in accomplishing their tasks effectively.
- The modular architecture, with presentation, business logic, and data access layers well separated, makes the system scalable and maintainable for improvements and integrations in the future.
- Frontend provides a responsive and intuitive interface, thus making it easier for users to move around the system in accomplishing their tasks effectively.

- E reliable and ensure performance under load, apart from safety, owing to rigorous testing at the unit, integration, functional, performance, and security testing levels.

The Dairy Milk Shop Management System project has contributed greatly to solving everyday management problems at the dairy milk shop with a comprehensive, efficient, and scalable solution. It embeds an architecture of a robust system that is user friendly and rigorously tested to be very useful for the dairy shop manager in optimizing his operations, improving accuracy, and enhancing productivity. The system provides a sound platform for enhancements and new developments while the dairy industry further evolves.

7. FUTURE WORKS

The Dairy Milk Shop Management System can be further enhanced as follows:

1. Mobile Application:

- A mobile app which would give access to all the features of the system on the go.

2. Advanced Analytics:

- To implement more advanced analytics and machine learning algorithms to predict trends and optimize milk production and sales.

3. Integration with IOT Devices:

- Real time monitoring of milk quality and storage conditions by integrating IOT devices.

4. Multiple Shop Support:

- Extending the system to support multiple shops in one platform with the help of centralized management and reporting.

5. Customer Management:

- Adding customer profile, order, and delivery management features to the system for end to end solutions for any dairy business.

REFERENCES

[1]. Vivekanand Nalla; “Safe & Smart Technologies For Food Safety And Food Chain Integrity Cow Udder To Customer Mouth, Safe And Healthy Product, With Safe And Smart Delivery Technology” https://In.Linkedin.Com/In/Vivekanand-Nalla-4b1a9728

[2] Dr. Vidhyadhar B. Dharmadhikari, Pratik Dattatray Patil,; “Dairy Data Management With Embedded System And Related Web Services”; (*Aip Conf. Proc.* 2315, 080453 (2018)).

[3] Dr. Vivek M. Patil;Smart Dairying: Practical Applications Of Technologies Of Information And Communication”; (8 Sept 2018)

[4] Dr. Ayalew Kassahun; “Dairy Farm Management Information Systems”; Mdpi; Published: 12 Jan 2022; Https://Doi.Org/10.3390/Electronics11020239

[5] Swarnadas H; “Iot Based Dairy Data Management System Using Raspberry Pi”; International Journal Of Engineering Research & Technology (IJERT) Issn: 2278 0181 Published By, Www.IJERt.Org Ncetesft 2020 Conference Proceedings

[6] Yusuf Sutanto; “Innovation Info Management System For Cow’s Milk Distrubutor Economics And Business” DRPM UBD Journal Of Information Systems And Informatics Vol. 5, No. 4, December 2023 E-ISSN: 2656-4882 P-ISSN: 2656-5935 DOI: 10.51519/Journalisi.V5i4.615

[7] Mauro Zaninelli . “The O3 Farm Project: First Evaluation Of A Business Process Management (Bpm) Approach Through The Development Of An Experimental Farm Management System For Milk Traceability” ; MDPI Basel 247, 00166; 8 Sept 2018.

[8] Sanya Kaunkid ; “Automatic Milk Quantity Recording System For Small Scale Dairy Farms Based On Internet Of Things”; MDPI Base; 9 Nov 2022;

[9] Likki Rajeev; “Design Of Milk Analysis Embedded System For Dairy Farmers”; IJATIR; VOL.07, ISSUE. 09,AUGUST-2015; PAGES: 1678-1681; ISSN 2348–2370