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AI-ENABLED SMART SILK SAREE MANAGEMENT AND VISUAL QUALITY ASSESSMENT SYSTEM

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ABSTRACT

Silk sarees are closely connected with Indian culture, traditional craftsmanship, and the livelihoods of many people involved in textile production and sales. At the same time, running a saree business involves more than displaying products. Sellers must keep track of designs, colours, prices, available quantities, customer details, orders, and sales. When these records are maintained in notebooks or separate spreadsheets, information can become difficult to update and retrieve as the business grows. Checking the visual quality of each saree also takes time and usually depends on the experience of the person inspecting it.

This paper presents a proposed AI-enabled Smart Silk Saree Management System that brings key business activities together in a web-based application. The system is planned to support product registration, inventory control, customer records, order processing, sales information, product search, and image upload. An AI-assisted image-analysis component is included as a supporting feature for examining visible characteristics such as colour, motifs, border patterns, texture-related details, and possible irregularities. The intention is not to replace skilled artisans or professional

inspection, but to provide an additional source of information during product review. The paper describes the problem, objectives, existing approach, proposed architecture, development methodology, modules, database structure, workflow, potential benefits, limitations, and future improvements. Since the system is presented as a proposed design, the outcomes discussed are expected functional outcomes rather than measured experimental results. The work illustrates how web technologies, structured data management, and computer-vision methods could be combined to support the day-to-day management of silk saree products.

KEYWORDS: *Artificial Intelligence; silk saree management; inventory management; computer vision; image analysis; e-commerce; textile quality; web application; database management.*

INTRODUCTION

The Indian textile sector has a long history, and silk sarees form an important part of that tradition. Their appeal often comes from the quality of the fabric, the weaving technique, the colour combination, the border, zari work, and the motifs used in the design. Sarees are purchased for weddings, festivals, religious events, family functions, and other occasions. Behind each finished product is a chain of activities that may include silk production, yarn preparation, dyeing, weaving, design work, inspection, storage, marketing, sale, and delivery.

Managing these activities requires accurate information. A seller may need to know whether a particular colour or design is available, how many pieces remain in stock, what price was quoted, whether a customer has placed an order, and whether that order has been dispatched. If the information is scattered across registers, messages, and spreadsheets, staff may have to check several places before answering a simple question. Re-entering the same information can also create mistakes or outdated

records.

Digital tools can make these tasks easier to organize. A web-based application can keep product, customer, inventory, order, and sales information in one system. Staff can search records, update product details, and review order status without relying entirely on separate manual files. Such a system can be useful for businesses that want a clearer view of their daily operations while retaining their existing knowledge of saree design and quality.

Artificial Intelligence (AI) adds another possible layer of support. A photograph contains visual information about colour, motifs, borders, and some visible surface irregularities. Image-processing and computer-vision techniques can help organize or examine these features. However, a photograph cannot confirm every property of silk, the strength of the threads, the feel of the fabric, or all aspects of weaving quality. For that reason, AI-based image analysis should be treated as an aid to preliminary review rather than as a final authority.

This paper proposes a Smart Silk Saree Management System that combines ordinary business-management functions with AI-assisted image analysis. The main focus is on making information easier to maintain and retrieve, while allowing image-based observations to be reviewed by a human user.

PROBLEM STATEMENT

A silk saree business may handle many products that look similar at first glance but differ in important details. Each product may have its own design, colour, fabric description, border style, zari work, price, quantity, image, and availability status. Maintaining all these details accurately becomes harder as the product catalogue and number of transactions increase.

The main problem addressed in this work is the lack of a single, organized

environment for managing product information and related business activities while also supporting the preliminary visual review of saree images. Manual record keeping may lead to duplicate entries, missing updates, difficulty checking stock, and delays in retrieving customer or order information. Separately stored photographs may be useful for display but may not be examined in a consistent way during quality review. A related concern is that visual quality inspection depends on human observation and can take considerable time when many items need to be checked. Different lighting conditions, camera angles, image resolution, and backgrounds can influence what is visible in a photograph. The proposed system therefore needs to organize the business records and provide image-analysis support without presenting an automated result as a guaranteed quality judgment.

OBJECTIVES AND SCOPE

The primary objective is to propose a web-based platform for managing silk saree products and business records, with an AI-assisted component for image-oriented quality review.

The specific objectives are to: (1) maintain a central catalogue of saree products; (2) record stock quantities and availability; (3) organize customer information; (4) record and track customer orders;

(5) maintain sales and transaction history; (6) allow product images to be uploaded and reviewed; (7) support preliminary analysis of visible image characteristics; (8) provide search and filtering based on available product attributes; and (9) reduce repetitive record-keeping by keeping related information in one place.

The scope covers the proposed design of the application, its major modules, a possible layered architecture, database entities, workflow, and the role of image analysis. The paper refers to common technologies such as Python, HTML, CSS, JavaScript, a

Python web framework, a relational database, and computer-vision techniques. The exact framework, database engine, AI model, and deployment environment would depend on the final implementation.

The system is intended to assist business administration and preliminary visual review. It does not claim to certify that a saree is pure silk, verify the authenticity of zari, measure fabric strength, or replace a trained inspector. Such properties may require physical testing, supplier documentation, or expert assessment beyond what a product photograph can show.

EXISTING SYSTEM AND ITS LIMITATIONS

In a conventional workflow, product details may be written in registers, saved in spreadsheets, or kept in separate files. Customer information and order details may be maintained independently. Photographs may be stored in folders or messaging applications, while stock quantities are updated manually after sales. This arrangement can be manageable for a small catalogue, but the effort involved increases when products and transactions become more numerous.

One limitation is repeated data entry. If a product's price or availability changes, the same detail may need to be updated in more than one place. If one copy is missed, staff may work with inconsistent information. A second limitation is stock tracking: confirming the availability of a particular design may require checking several records or physically inspecting stock.

A further issue is that customer, order, and sales information may not be connected. This makes it harder to follow an order from selection to dispatch or to review earlier transactions. Product images can also remain separate from structured product records, which limits the usefulness of those images for consistent review and searching.

Manual quality inspection remains valuable because experienced people can examine

details that are difficult to represent in a photograph. However, it can be time-consuming, and observations may vary depending on experience and inspection conditions. A digital system can help organize records and make preliminary image review more consistent, but it should not remove the role of human judgment.

PROPOSED SYSTEM

The proposed system brings product management, inventory management, customer records, order processing, sales tracking, product search, and AI-assisted image analysis into a single web-based application. The central idea is straightforward: business information should be stored in an organized form, and the relevant modules should share that information instead of maintaining separate records.

A typical process begins when an administrator signs in and registers a saree. The administrator enters the product name, type, colour, design, fabric information, border and zari details, price, quantity, description, and image. If image analysis is available, the image is processed and the resulting observations are shown for review. The administrator can then confirm the product details and add the item to inventory.

When a customer places an order, the application checks the relevant product and stock information. Order details are stored, and inventory can be updated according to the business rules used by the application. Once the transaction is completed, the sales module records the relevant information. This shared workflow is intended to reduce the need for repeated manual updates and make the status of products and orders easier to understand.

The proposed workflow can be summarized as: product information → registration and image upload → optional AI-assisted analysis → human review → inventory entry → customer order → order processing → stock update → sales record → packaging and delivery. The AI component is one part of the wider system, not a

substitute for the management functions that form its foundation.

SYSTEM ARCHITECTURE

A layered architecture is suitable for separating the interface, application logic, image-analysis process, and database. This separation can make the application easier to maintain because a change in one part does not necessarily require a complete redesign of the other parts.

The presentation layer is the part users see. It may include the login page, dashboard, product forms, inventory screens, customer pages, order views, sales records, search controls, and image-upload interface. A clear layout and consistent labels are important because users should be able to complete routine tasks without unnecessary confusion.

The application layer processes requests from the interface. It validates entered information, applies business rules, handles product updates, checks stock, processes orders, and communicates with the image-analysis component. Validation is particularly important for fields such as quantity, price, customer contact details, and order status.

The AI-analysis layer receives an image and applies the selected image-processing or machine-learning approach. Depending on the model and training data, it may help identify or describe visual features. The output should be presented as supporting information, including uncertainty where possible, rather than as an unquestionable verdict.

The database layer stores user accounts, product details, inventory, customer records, orders, order items, and sales information. A relational database can link these records using identifiers and relationships. In a typical request, a user interacts with the web interface, the application checks permissions and validates the request, the appropriate

module reads or updates the database, and an image-analysis request is sent to the AI component when required.

METHODOLOGY

The proposed development process can be organized into stages. The first stage is requirement analysis. At this point, the developer identifies the information a saree business needs to record and the tasks that users perform most often. Product registration, stock updates, customer records, order tracking, sales history, image upload, and preliminary quality review are treated as core requirements.

The second stage is system design. The main modules and their interactions are planned before implementation. This includes deciding which users can access each function, what information is required in each form, and how order processing affects inventory. Designing these relationships early can reduce confusion during development.

The third stage is database design. Tables may be created for users, products, inventory, customers, orders, order items, and sales. Each table should have a suitable primary key, while related records can be connected through foreign keys. Repeated information should be minimized where possible, and validation rules should help prevent invalid or incomplete records.

The fourth stage is interface and backend development. HTML, CSS, and JavaScript can be used to build the web interface, while Python with a framework such as Flask or Django can handle server-side processing. The backend should check permissions and validate data before performing database operations.

The fifth stage is AI integration. Uploaded images may be resized or normalized to match the input requirements of the selected model. The model and its output format

should be chosen based on the task, available computing resources, and the quantity and quality of labelled images. The final stage is testing and deployment. The application can be tested through ordinary user scenarios, including product creation, editing, stock changes, customer registration, order placement, and image analysis.

AI-ASSISTED SILK SAREE IMAGE ANALYSIS

A saree photograph can contain useful visual clues, including dominant colours, motifs, border patterns, zari appearance, repeated designs, texture-related details, and visible irregularities. Image analysis can help process these clues in a more structured manner. The exact capability depends on the method used: basic image processing may describe colour or contrast, while a trained computer-vision model may be able to classify patterns or flag examples resembling defects found in its training data.

A general image-analysis workflow includes image upload, preprocessing, feature analysis, model processing, presentation of the output, and human review. Preprocessing may include resizing the image, converting it to a consistent format, and normalizing pixel values. These steps can make the input more consistent, but they cannot recover details that were never captured in the original photograph.

Training data is central to reliable AI performance. A model intended to recognize different saree patterns needs examples that represent the variety of colours, weaving styles, borders, zari designs, cameras, backgrounds, and lighting conditions it may encounter. Labels should be created carefully, ideally with input from people who understand textile inspection. A small or unbalanced dataset may cause the model to work well on familiar examples but perform poorly on new products.

The system should also communicate the limits of its output. A photograph may reveal a stain or an obvious broken thread, but it cannot reliably establish every physical property of the fabric. A visual result should therefore be treated as a prompt

for review. When the system flags a possible issue, an administrator or experienced inspector should check the saree before making a final decision.

Explainability is another useful consideration. Where feasible, the application should show which part of the image or which visible characteristic contributed to a flag. This may help users understand the output and identify cases where the model has been misled by shadows, folds, glare, or background objects.

MODULE DESCRIPTION

Administrator module: The administrator oversees access to the application and manages product, inventory, customer, order, sales, and image records. Administrative functions should be protected through authentication and appropriate permissions.

Product management module: Each saree is represented by a product record containing fields such as product ID, name, type, colour, design, fabric information, border details, zari details, price, quantity, image, description, and availability status. The module supports creating, viewing, updating, and deleting records, often referred to as CRUD operations.

Inventory management module: This module records available stock, sold quantity, remaining quantity, availability, and stock movements. When an order is completed or otherwise reaches the appropriate status, the application can update stock according to the business rules. The system should avoid reducing stock twice for the same order and should handle cancellations or returns consistently if those features are included.

Customer management module: The customer module stores the details required for order processing, such as a customer identifier, name, contact information, address, and order history. Access to personal information should be limited to authorized users and to purposes connected with the business.

Order management module: This module records the order identifier, customer, selected products, quantities, prices, and order status. A normal workflow includes order creation, verification, stock checking, confirmation, processing, packaging, and shipping. Clear status values help staff understand what action is needed next.

Sales management module: The sales module maintains completed transaction information, including sale ID, order ID, product ID, quantity, unit price, total amount, and date. Organized sales records can support routine administration and make it easier to review past transactions.

AI image-analysis module: This module accepts a saree image and returns the supported visual analysis output. It may be used during product registration or quality review. The output should remain linked to the correct product record and should be clearly distinguished from a human-confirmed inspection result.

Search and filtering module: Users can search by product name, colour, type, price range, availability, or design. These filters help users find a particular product without browsing the entire catalogue manually.

TECHNOLOGY STACK

Python is a possible choice for backend logic and AI-related processing because it has a broad ecosystem for web development, data handling, and machine learning. A framework such as Flask or Django can be selected depending on the size of the application, the development team's familiarity, and the required features.

HTML defines the structure of the pages, CSS controls the visual presentation and responsive layout, and JavaScript supports interactive elements such as search controls, form feedback, and dynamic page behaviour. The interface should be usable on different screen sizes, especially if staff may access the application from a phone or tablet as well as a desktop computer.

A relational database can store structured records and maintain relationships between products, customers, orders, and sales. The final choice of database should consider expected data volume, hosting arrangements, backup requirements, and the team's experience. Computer-vision or machine-learning libraries may be used for image preprocessing and model inference, but the specific model should be chosen only after the target task and available data are clearly defined.

These technologies are options for the proposed design, not a claim that one fixed stack has already been implemented. Final technology choices should follow a practical assessment of cost, maintainability, security, and available skills.

DATABASE DESIGN AND DATA FLOW

The database is intended to provide a consistent source of information for the application. A User table can store account-related information and roles. A Product table can store descriptive details about each saree. An Inventory table can record stock quantities and changes. A Customer table can store customer details. An Order table can store the overall transaction, while an Order Item table records the individual products and quantities within an order. A Sales table can preserve information about completed transactions.

Separating orders from order items is useful because one order may contain more than one product. Similarly, keeping product information separate from stock movement can make it easier to track changes over time if the implementation requires an inventory history. Primary keys identify records, and foreign keys connect related data. Validation and database constraints can help prevent invalid references or incomplete transactions.

The data flow begins when an administrator or user accesses the web application. Authentication and authorization determine which functions are available. The

relevant module then handles the request. Product, customer, inventory, order, and sales data are read from or written to the database. If image analysis is requested, the image is passed to the AI component and its output is returned to the application for display and review.

Careful transaction handling matters when orders and inventory are updated together. For example, the system should not confirm an order if the required quantity is unavailable. Where possible, related database changes should be handled as a single transaction so that a failure does not leave the order and stock records inconsistent.

SYSTEM IMPLEMENTATION AND WORKFLOW

A normal session begins with user authentication. After signing in, an administrator opens the product section and enters the saree details. The administrator uploads an image and, if the feature is configured, requests AI-assisted analysis. The system displays the available output, and the administrator reviews it along with the product information before saving or approving the record.

The product is then associated with an inventory quantity and availability status. When a customer selects a product and submits an order, the application verifies the product details and checks stock. The order is recorded with its items, quantities, prices, and status. As the order moves through processing, the relevant stock and sales information is updated according to the defined business rules. The order can then proceed to packaging and shipping.

Frontend implementation covers navigation, forms, tables, product displays, search, dashboards, and image upload. Backend implementation covers authentication, validation, product operations, inventory changes, customer management, order processing, sales records, and communication with the AI component. Database implementation includes schema creation, relationships, constraints, and queries.

Image processing may include resizing and normalization before inference.

Testing should cover normal and unusual cases. Examples include entering an invalid price, registering a product without a required field, ordering more units than are available, editing a product after it has been ordered, and uploading an image that is too large or unclear. The system should provide understandable feedback rather than silently accepting incorrect data. Deployment would then depend on the selected hosting environment, configuration, backup process, and maintenance plan.

RESULTS AND DISCUSSION

The proposed design provides a structured way to manage product information and related transactions. A central product catalogue can make it easier to keep descriptions and images together. Linking inventory with order processing can reduce the need for separate stock records, while customer and sales modules can make transaction information easier to retrieve.

Table 1 summarizes the main functional areas and the outcome each is intended to support. These are expected outcomes of the proposed design; they should not be interpreted as measured performance results from a completed experiment.

Module	**Main function**	**Expected outcome**
Authentication	Verify users	Controlled access
Product management	Add, view, update, delete products	Organized product records
Inventory	Maintain stock	Better stock visibility
Customer management	Store customer details	Centralized customer records
Order management	Process orders	Clearer order tracking
Sales management	Record transactions	Structured sales history

AI analysis	Examine product images	Preliminary visual review support
Search	Find products using attributes	Easier product retrieval

The system's usefulness would need to be evaluated through implementation and testing. Relevant measures could include the time required to register a product, the number of stock discrepancies observed during a trial, the success rate of common workflows, and the quality of the AI model on a separate set of labelled images. No numerical performance figures are claimed in this paper because the source material does not provide measured experimental data.

The discussion also highlights the importance of human review. Centralized records can improve organization, but they do not automatically guarantee that every record is accurate. Likewise, AI analysis may help identify visible patterns or irregularities, but its performance depends on the images, training data, and task definition. A practical evaluation should therefore consider both software functionality and the limits of visual inference.

ADVANTAGES AND LIMITATIONS

A central advantage of the proposed system is that it brings several daily activities into one application. Product, inventory, customer, order, and sales information can be managed through connected modules rather than unrelated records. Digital records can also reduce repeated writing and make it easier to search for products or retrieve earlier transactions.

A second potential advantage is improved stock visibility. If inventory updates are connected properly to order processing, staff can more readily see what is available. Keeping product images with structured descriptions can also help organize a catalogue for online display and internal review. AI-assisted analysis may provide an

additional prompt during preliminary quality checks, especially when a business handles many images.

There are important limitations. Image analysis depends on image quality, and poor lighting, blur, low resolution, folds, reflections, or cluttered backgrounds may affect the result. A photograph does not capture every physical property of a saree, and it cannot replace inspection of the actual fabric where tactile or material characteristics matter.

The AI model also requires a diverse, carefully labelled dataset. If the data do not represent different weaving styles, designs, colours, and capture conditions, the model may not work reliably on unfamiliar examples. Human verification remains necessary before making final quality decisions. The overall system also requires secure access, reliable backups, maintenance, and user training to remain useful over time.

SECURITY CONSIDERATIONS

Because the application may store customer contact details and transaction history, security needs to be considered from the beginning. Authentication should ensure that users sign in with valid credentials. Authorization should limit each account to the functions needed for its role, rather than giving every user unrestricted administrative access.

Passwords should be stored using an appropriate secure hashing method rather than plain text. Input validation should be applied to data received from forms and requests. The application should restrict database access to authorized components and avoid exposing sensitive records through error messages or public pages.

Uploaded images and files should be checked for allowed formats and reasonable size limits. The application should also have a plan for database backups, recovery, software updates, and access review. These are design considerations that would need

to be implemented and tested in the deployed system; listing them here does not by itself mean that the proposed application already satisfies them.

FUTURE ENHANCEMENTS

Several extensions could be explored after the core management functions are stable. More advanced computer-vision models may support finer-grained analysis of motifs, borders, and visible defects. Defect detection could be investigated for issues such as stains, broken threads, irregular patterns, or weaving inconsistencies, provided that sufficient high-quality labelled examples are available.

The catalogue could also be extended with intelligent search or recommendations based on colour, design, price, or customer-selected attributes. A mobile-friendly interface or dedicated mobile application could make product updates easier for staff working away from a desktop. Online payment integration may support a more complete e-commerce workflow if required by the business.

Predictive analytics could be explored for stock planning, although reliable forecasts would require historical sales data and careful evaluation. Supply-chain traceability may help preserve information about production stages and product origins. Any such extension should be introduced in response to a clear need and evaluated for usefulness, cost, privacy, and maintainability.

CONCLUSION

This paper has presented a proposed Smart Silk Saree Management System that combines web-based business management with AI-assisted image analysis. The design brings together product registration, inventory control, customer records, order processing, sales tracking, product search, and image upload within a centralized application.

Traditional record-keeping can become difficult when a business manages a growing number of designs, stock items, and customer transactions. A shared database and connected modules can make information easier to maintain and retrieve. The AI component adds a possible way to examine visible image characteristics during preliminary review, but its output must be interpreted carefully.

The system is intended to support, not replace, the knowledge of artisans, sellers, and experienced inspectors. Physical inspection remains important for properties that cannot be established from a photograph. Future development should focus on implementation, functional testing, reliable and diverse image data, explainable output, and secure handling of business records. With these considerations, the proposed design offers a practical starting point for applying digital tools to the management of traditional silk saree products.

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