Cloud-Powered Retail Management Study: Elevating Business Operations with Cloud based POS Solutions over In-house POS

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Abstract: Cloud computing has emerged as a game changer in the retail industry, allowing firms to run their operations in a flexible, scalable, and cost-effective manner. This article examines cloud-powered retail management in depth, focusing on the shift from traditional on-premises systems to cloud-based solutions. It delves into the various cloud computing service models, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), emphasizing their importance in improving retail operations. The concept of hybrid cloud POS is introduced as a strong tool for businesses wishing to optimize their IT infrastructure by combining public and private cloud resources. The article also covers the benefits of cloud-based POS systems in expediting sales, inventory management, and customer relations.
Keywords: Cloud computing, POS Systems, Cloud POS, Cloud Models & Services

I. INTRODUCTION

As a result of technology advancements and altering consumer tastes, the retail business is undergoing considerable changes. One of the most crucial factors in this change has been the usage of cloud computing, which has altered the way firms run their operations and communicate with customers. This article investigates the concept of cloud computing and its role in modern retail management. It also discusses the traditional retail management process and the challenges it faces in the digital age, necessitating the employment of cloud-based solutions. The content also highlights the advantages of cloud-based POS systems and their impact on retail operations. To move retail organizations forward, the emphasis is on cloud solutions.

Cloud computing refers to the delivery of various services, including computing power, storage, databases, networking, software, and more, over the internet. Instead of owning and managing physical hardware and software resources, organizations can access and use these services on-demand from cloud service providers. [4]Here are some key aspects and components of cloud computing:

Service Models: In the context of cloud computing, service models refer to the many methods by which cloud services are made available to customers. These models specify the amount of responsibility and control users have over the underlying infrastructure as well as the kinds of services they can consume. Cloud computing has three main service models:

Infrastructure as a Service (IaaS): In the IaaS concept, cloud service providers provide online access to virtualized computing resources. These resources typically include networking, storage, and virtual machines (VMs).Users have extensive control over the operating systems, programs, and parameters

inside their virtual machines (VMs).Users who desire more freedom and control over managing and customizing their virtualized environments may consider IaaS. It is frequently used for operations like hosting web applications, managing scalable workloads, and operating development and testing environments.

Platform as a Service (PaaS): PaaS offers a platform with tools and services that developers can use to build and deploy applications. It abstracts the underlying infrastructure, allowing developers to focus on coding. Software as a Service (SaaS): SaaS delivers software applications over the internet. Users can access these applications through a web browser without needing to install or maintain them locally.

Models of Deployment: Third-party cloud providers, such as Amazon Web Services (AWS), Microsoft Azure, or Google Cloud Platform (GCP), host and deliver services on the public cloud. [5]They are available to anyone who has access to the internet. Private clouds dedicate resources to a single organization, and the cloud architecture can be hosted on-premises or by a third-party provider. Private clouds provide more control and security. The term "hybrid cloud" refers to the combination of public and private cloud resources. Companies can employ public cloud services for scalability and flexibility while storing sensitive data and important tasks in a private cloud.

Benefits of Cloud: Scalability, cost-efficiency, flexibility, and accessibility are just a few of the benefits of cloud computing. Organizations may simply scale up or down their resources to meet shifting demands, minimizing the need for costly upfront hardware investments. Pay-as-you-go pricing strategies aid in cost control by charging only for resources consumed. [6]The flexibility of the cloud allows for the rapid deployment of apps and services, while access from anywhere with an internet connection promotes collaboration and remote work. Furthermore, cloud providers invest in robust security and compliance procedures that typically outperform what many organizations can achieve on their own, improving data protection and regulatory compliance. Overall, cloud computing enables firms to more effectively innovate, compete, and adapt to changing market conditions. Cloud computing has revolutionized the way businesses and individuals use and manage their IT resources, offering flexibility, scalability, and cost-efficiency. It has become an integral part of modern technology infrastructure for organizations of all sizes and industries.

II. LITERATURE REVIEW

Point of Sale (POS) systems have witnessed a remarkable transformation since their inception in the early 20th century as mechanical cash registers [1]. The evolution from mechanical to electronic registers in the late 20th century marked a significant shift in transactional technology [1]. In contemporary times, modern POS systems have transcended conventional boundaries by integrating sophisticated features like touchscreen interfaces, cloud connectivity, and mobile solutions [1]. These advancements have revolutionized the landscape of sales and transaction management for businesses across various industries.The literature review conducted in this study (Ref. 2) delves deeply into the domain of intelligent POS systems, analyzing previous research endeavors and developmental initiatives [2]. It meticulously assesses the strengths and limitations of traditional POS systems, emphasizing the growing need for a new breed of smart POS solutions that are not only compact and mobile but also cost-effective [2]. Within this review, there is a comprehensive exploration of the extensive functionalities and capabilities intrinsic to smart POS systems [2]. These encompass a wide array of aspects, ranging from efficient inventory control to sophisticated sales analysis and robust customer relationship management tools.In the retail sector particularly, there has been a pronounced surge in the adoption of intelligent POS

systems in recent times (Ref. 3) [3]. These innovative solutions are purposefully designed to augment the overall customer experience by streamlining and expediting transactions, thereby enhancing customer satisfaction and loyalty [3].The most recent phase of development in this trajectory introduces Hybrid POS applications, which come equipped with intelligent functionalities and seamless connectivity [3]. These Hybrid POS systems represent the latest evolution in the POS domain, aiming to amalgamate the best features of different POS technologies to offer businesses enhanced operational efficiency and improved customer service [3].Overall, the evolution from mechanical cash registers to modern, intelligent POS systems signifies a profound shift in how businesses manage their sales processes [1]. These advancements not only optimize operational efficiency but also significantly contribute to elevating the customer experience in the retail and broader commercial landscape [1].

III. RESAECRH METHODOLOGY

a. RESEARCH DESIGN:

This study follows a descriptive and analytical approach, aiming to investigate the transition from in-house POS systems to cloud-based solutions in the retail sector. It integrates both Field Observation and Site Visits to comprehensively understand the impact of this transition.

Objective: To gain firsthand insights into the existing in-house POS systems and server infrastructure used by retail businesses & identify the Problems & Provide the cloud based recommendation

Procedure:

- Site Selection: Selection of a diverse set of retail stores representing different sizes and operational scales.
- Preparation: Prior scheduling and coordination with store managers or IT personnel for the visit.
- Observation: Detailed observation of the in-house server setup, including hardware, network configuration, software installations, and data storage methods.
- Documentation: Taking notes, photographs (if permitted), and diagrams to capture the server architecture and configurations.

Data Collection during Site Visits:

- Technical Configuration: Understanding the hardware specifications (servers, networking equipment) and software systems in use (POS software, database systems).
- Infrastructure Layout: Documenting the physical layout of servers, networking setups, and any redundancy measures in place.
- Security Measures: Identifying security protocols, backup systems, and disaster recovery plans implemented by the stores.

Ethical Considerations during Site Visits:

- Permission: Obtaining permission from store authorities prior to documentation or photography.
- Confidentiality: Ensuring confidentiality of any sensitive information observed during the visits.
- Integration with Overall Research Methodology:
- The field observations and insights gained during these site visits will complement the qualitative and quantitative data collected through surveys and interviews.
- This hands-on understanding of the in-house server setups will provide a practical context to the challenges and limitations mentioned in the literature review and interviews.

Limitations of Site Visits:

- The information gathered might be limited by the willingness of store managers to disclose details about their server infrastructure.
- Time constraints during store visits might limit the depth of analysis of server setups.

IV. EXISTING SYSTEM

a. Traditional Retail Management Process

Traditional retail establishments, sometimes known as brick-and-mortar businesses, have actual premises where customers may explore and buy products or services. [1][2]Here's an overview of how traditional retail stores work:

Store Layout and Merchandising: To create an engaging shopping experience, traditional retailers meticulously design the layout and visual presentation of their stores. Products are placed on shelves, racks, or display cases, which are frequently organized into categories or themes. Customers are attracted and certain items are promoted via visual merchandising strategies.

Inventory Management: Retailers keep a stock of merchandise on hand to meet client demand. To guarantee that products remain in stock, inventory levels are maintained and reorder points are established. This includes keeping track of product amounts, refilling shelves, and effectively controlling stock levels.

Point of Sale (POS) Systems: Retail stores utilize POS systems to expedite transactions. These systems are used by cashiers and sales staff to ring up items, calculate prices, receive payments (cash, credit cards, etc.), and issue receipts. POS systems also aid in the tracking of sales data and inventory management.

Customer service is an essential component of conventional retail. Sales assistants aid clients in locating products, answering inquiries, making recommendations, and giving a personalized shopping experience. Excellent customer service can lead to repeat business and loyal customers.
Visual Merchandising: Effective visual merchandising involves arranging products in an appealing and logical manner. Retailers use techniques like window displays, signage, lighting, and product placement to draw attention to specific items and create an engaging shopping atmosphere.
Promotions and Marketing: Traditional retailers often run marketing and promotional campaigns to attract customers. These may include advertising in newspapers, on radio or television, and through various in-store promotions such as sales, discounts, and loyalty programs.

Inventory Replenishment: Retailers regularly restock their inventory to ensure that popular products are always available to customers. This involves working with suppliers, wholesalers, and distributors to maintain a steady supply chain.

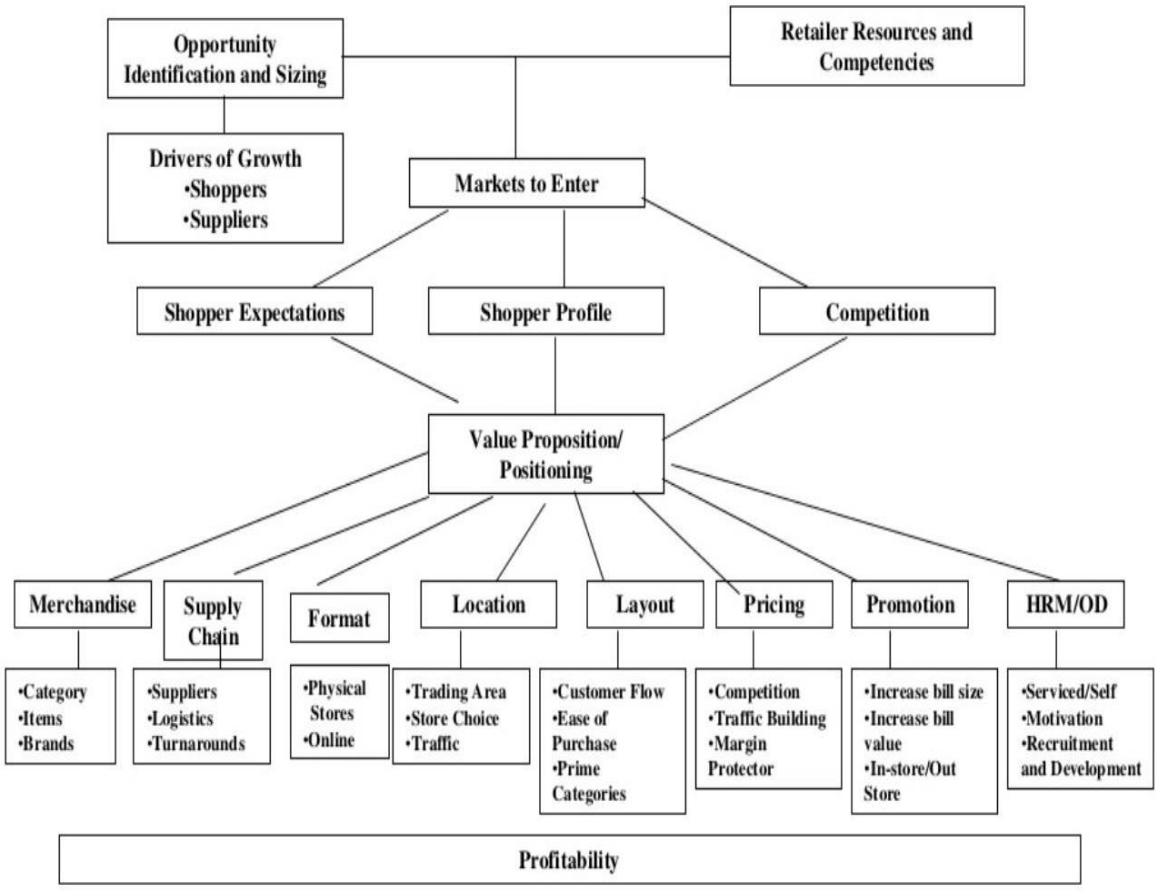
Store Operations: Store managers oversee day-to-day operations, including staff scheduling, inventory management, and ensuring compliance with company policies and procedures. They are responsible for store profitability and customer satisfaction.

Loss Prevention: Retailers implement loss prevention measures to reduce theft and fraud. This may include security cameras, anti-shoplifting devices, and training staff to be vigilant.

Payment Processing: Traditional retail stores accept various forms of payment, including cash, credit cards, debit cards, and mobile payment options. Payment processing systems securely handle transactions and provide customers with receipts.

Returns and Exchanges: Retailers have return and exchange policies to address customer concerns. These policies outline the conditions under which customers can return or exchange products and the associated processes.

Store Maintenance: Retailers maintain the physical condition of their stores, including cleanliness, organization, and repairs. A well-maintained store creates a positive impression on customers.
Traditional retail establishments face competition from e-commerce and internet purchasing, yet they remain an important part of the retail business. Successful brick-and-mortar stores frequently prioritize providing outstanding in-person shopping experiences, selling distinctive products, and adapting to changing consumer preferences and technological advances.



Retail Management Process
Ref : www.slideshare.net/jags009/chapter-6-retail-mgt

b. POS -RETAIL MANAGEMENT PROCESS

POS : Most of the retail stores implement POS for running the business ,A Point of Sale (POS) system is a critical component of retail and hospitality businesses. It's used to facilitate transactions, record sales data, and manage various aspects of the business; most of the stores have on-premises Client Server Architecture to run the POS systems

POS systems accept the payments, keep track of sales and customers.[3]It is basically referred for cash registration at a store. This is a point where customers pay money to retailers on counter all the transactions are recorded and invoice is produced in return, some retail shops rely on cashier machines to record money transactions such as goods sold and cash earned. In today's modern era retailers are implementing new technologies to run the business efficiently.

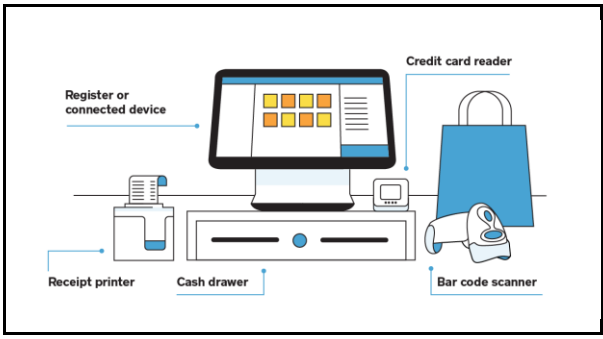


Fig 1 : POS Hardware & Software

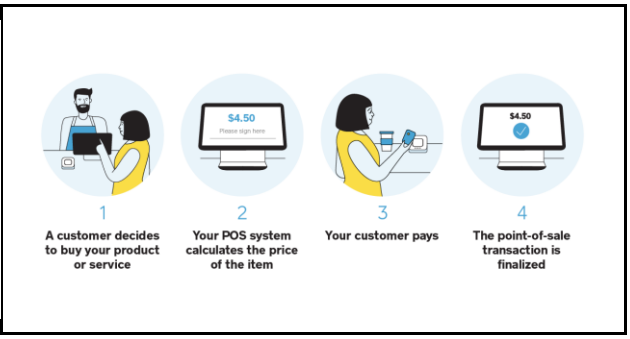


Fig 2 : Working of POS

c. ON-PREMISES / IN-HOUSE POINT OF SALE (POS) SYSTEM / SERVER BASED POS

Data is often saved and maintained on a local server within the business's physical location in an in-house or on-premises Point of Sale (POS) system. The first step is to create a new database on the local server. The database is intended to hold a variety of vital POS system information, including product descriptions, price, inventory levels, transaction history, customer profiles, and personnel records.[7]The entire POS system data is stored on the local server & accessed from the local server. The complete work relies on Local Server of the store, it is the only source of Backup for the data.

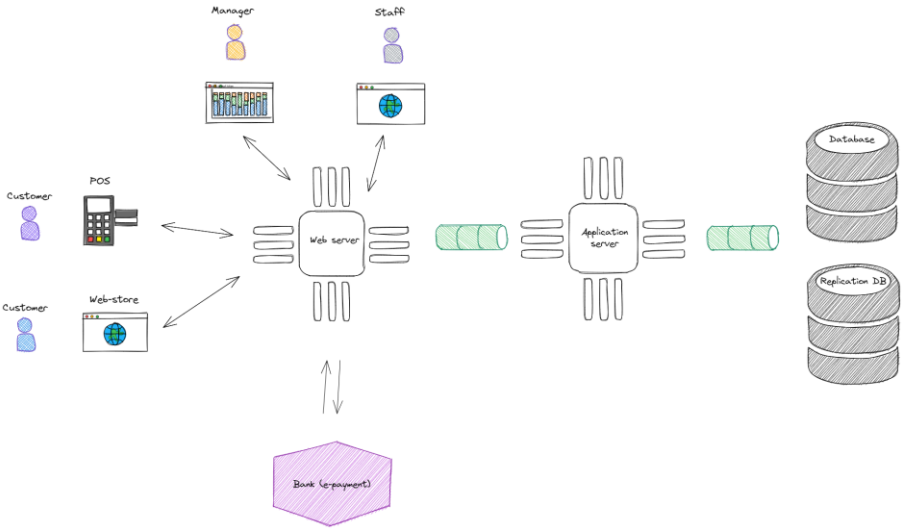
POS Software such as Retailware solutions comes with various functionalities such as Sales & Purchases management of the store, Scheme Management, Customer loyalty card, Barcode for correct billing, logistics & warehouse management, Role based access and multi user login, Re-order level & Re-order stock Management. Summary reports for Analysis, Mobile App Facilities, Supply Chain Management, GST Management, Billing & Inventory, Stock Management, Sales Return, Whatsapp Business Account Integration, Tally Integration (Export / Import Data), Reporting Analysis.

An in-house client-server POS system is a strong and dependable solution for firms that value control and security over their transactional processes. The POS software is installed and hosted locally within the business premises in this configuration. Several client devices, including as cash registers and tablets,

communicate with a central server, which oversees the entire transaction process. This design enables real-time connectivity, quick data processing, and secures payment information management.

In-house client-server POS systems allow firms to modify the software to their own requirements, assuring a personalized approach to sales, inventory management, and reporting. Furthermore, this architecture reduces reliance on external internet connections, lowering downtime risks and enabling continued sales activities even when internet connectivity is unavailable.

POS systems are installed in local systems and local servers they can be accessed in local organizations to retain security and it also provides better integration with all the h/w devices in-house. They rely on LAN & use Client-Server Architecture. On-premises POS are purchased by the stores on License basis. They are preferred for more cash outlay and incur one-time cost investment for installation; training & they are user friendly.



On-premises Data Management on local servers

While in-house local servers provide advantages in terms of control and security, they have certain limitations when utilized for retail data management they encounter few challenges in terms of below concepts

Problems Encountered in on-premises / in-house point of sale (POS) system / server based POS

Costs: Setting up and maintaining a local server in-house might be costly. Businesses must invest in server hardware, software licenses, and IT people to administer and maintain their systems on a continuous basis. This can be a substantial financial burden, especially for small enterprises.

Limited Scalability: Because in-house servers have limited capacity, scaling up to accommodate increasing data and transaction volumes might be difficult. Extending the server architecture frequently incurs additional expenses and complexities.

Overhead for Server Maintenance: Businesses are responsible for server maintenance, which includes software updates, security patches, and hardware repairs. This can waste time and resources while diverting attention away from vital business activity.

Vulnerabilities to Data protection: While in-house servers provide control over data protection, they also represent vulnerabilities if not adequately secured. To protect sensitive consumer and financial data, businesses must deploy comprehensive security measures such as firewalls, encryption, and access controls.

Limited Accessibility: Internal servers are only available at the company's physical location. This restricts remote access to data, which makes it difficult to oversee operations or retrieve vital information while off-site.

Downtimes: Hardware failures, power outages, and other technical problems might cause downtime on internal servers, which is a concern. Operations within a company may be disrupted, and missed sales opportunities may result.

Data Backups and Disaster Recovery: It's crucial to provide regular, secure data backups and to put a thorough disaster recovery plan into action. When these factors are neglected, data loss may occur during unforeseeable occurrences like natural catastrophes or cyber-attacks.

Complexity of IT Management: IT knowledge is necessary to manage an internal server. It may be difficult for small firms without dedicated IT professionals to maintain and successfully troubleshoot server-related issues.

Limited Mobility: Because in-house servers rely on a fixed physical infrastructure, they are not ideal for companies with mobile or distant sales operations.

Lack of Redundancy: With internal servers, achieving redundancy and high availability can be difficult and expensive. It frequently takes large expenditures in redundant hardware and backup solutions to ensure data continuity and minimal downtime.

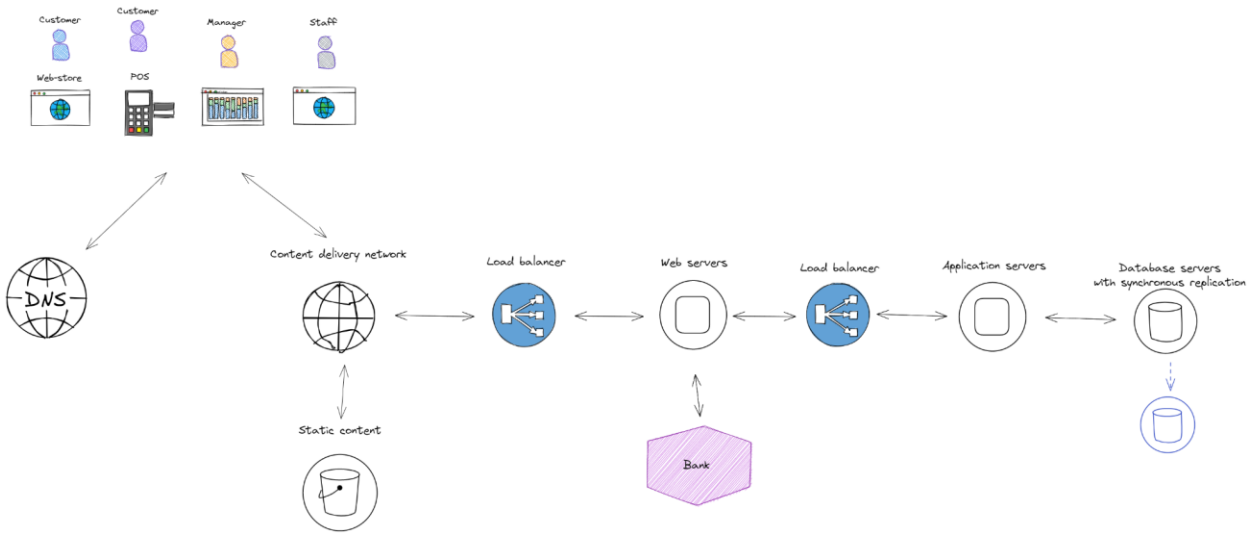
Software Compatibility: Making sure the POS software and the server's operating system are compatible can be problematic. It's possible that either component will need careful testing and modifications after updates or changes.
In summary, while in-house local servers offer control and data security benefits, they also present challenges related to cost, scalability, maintenance, accessibility, and data resilience. Businesses need to carefully weigh these limitations against their specific needs and resources when deciding on their data management infrastructure.

V. PROPOSED CLOUD BASED SOLUTIONS

Cloud services [8] [9] have transformed the retail industry by offering flexible deployment models to cater to diverse needs. Public clouds provide retailers with scalable and cost-effective solutions for tasks such as web hosting and customer analytics, enabling them to adapt quickly to market demands. Private clouds, on the other hand, empower retailers with enhanced control and data security, making them ideal for handling sensitive customer information and complying with strict regulations. Hybrid clouds

combine the best of both worlds, allowing retailers to leverage the cost-efficiency of public clouds for seasonal peaks in demand while maintaining the security of private clouds for core operations. These cloud deployment models enable retailers to optimize their IT infrastructure, streamline operations, and provide agile customer experiences in a dynamic marketplace.[10] The below diagram represents the cloud working in various deployment models

Cloud Based Architecture



HYBRID POS (CLOUD BASED POS)

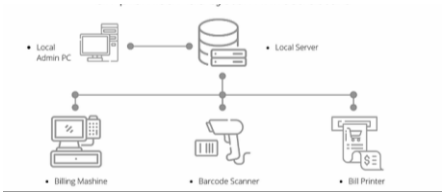
A Cloud-Based Point of Sale (POS) [8] system is a cutting-edge retail management solution that uses the cloud to streamline operations and sales. It overcomes all the limitations of maintaining the data in-house local server. Retailers who use cloud-based POS systems can use their POS system from any location that has an internet connection, in contrast to traditional local server-based POS systems, which run totally in the cloud. Businesses with various sites or those wishing to offer remote management may find this flexibility to be very beneficial.

A cloud point of sale (POS), [11] which can be either cloud-based or cloud-hosted, is an improved version of the conventional POS system. In the first case, the point-of-sale (POS) system is designed specifically for a cloud environment and runs on a subscription-based business model known as Software as a Service (SaaS).In the second case, the Point of Sale system was initially installed on-site and is frequently custom-developed. However, all crucial business information is safely kept on distant servers that are normally handled by either an internal IT team or an external vendor. In either scenario, employees benefit from having seamless access to important data via a range of devices, including PCs, cellphones, laptops, and more, encouraging increased mobility and flexibility.

Real-time inventory management, sales analytics, and remote administration of store operations are all features of cloud-based point of sale systems. They give companies the flexibility to quickly scale up or down to meet shifting demand, which makes them economical and adaptable. Data is more secure than on the local server.

Square, Shopify, Lightspeed, and Vend [12] are well-known suppliers of cloud-based POS solutions; they provide a variety of features catered to different retail industries. These solutions make it easier for retailers to focus on providing excellent customer experiences and expanding their businesses by streamlining operations like sales processing, inventory keeping, customer management, and reporting.

In the first instance, In-house POS the data is stored on a server that is housed inside the company's walls. Only computers or other devices that are directly linked to the server are able to access such data. The cloud POS system allows you simple data access on any device and is portable. Data is kept on distant servers (in the cloud). Users frequently compare these POS systems in an effort to locate the ideal option without drawbacks. It is referred to as a hybrid POS and already exists.

Features	In- house POS	Cloud Based POS
Access	Data can be accessed by the clients & devices connected to the server through the network	Data can be accessed from the cloud through internet on any device
Data Storage	Data is stored in the premises databases & servers	Data is stored in the Cloud server
vulnerability	Data is more open for attacks through malware or due to any damages caused to the local server	Data is stored on multiple servers & has regular backups & it is more secure compared to in -house POS
Cost -maintenance	Upfront cost are high & low maintenance cost	Low upfront cost but the subscription costs relies on the data & service
Updates	Updates are carried out manually over period of times	Regular updates happen automatically
Architecture		

Benefits of Cloud –based POS

Cloud-based POS [10] offers numerous advantages over traditional in-house POS server solutions, making them a popular alternative for modern retailers. First and first, scalability is critical. Businesses can smoothly expand and react to fluctuating demands with cloud solutions, eliminating the need for

substantial investments in hardware upgrades. Whether it's adding new locations or diversifying product offerings, the cloud gives businesses the flexibility they need to meet changing market demands.

Another strong advantage is cost-effectiveness. When opposed to the significant expenditures associated with maintaining physical servers, cloud solutions can demand lesser upfront costs. Cloud service providers' subscription-based or pay-as-you-go pricing models further cut operational expenses, allowing organizations to spend resources more effectively. Furthermore, the cloud's availability provides retailers with remote management possibilities. The ability to access retail data and management tools in real time from any location with an internet connection improves decision-making, inventory management, and sales tracking, allowing firms to remain competitive in today's fast-paced retail industry.

Additionally, [9] cloud retail management systems place a premium on automatic updates and data security. Service providers update their solutions on a regular basis, ensuring access to the most recent features, security patches, and compliance standards. This reduces the need for time-consuming manual updates and helps to keep system downtime to a minimum. Cloud companies invest heavily in comprehensive security measures, often exceeding the capabilities of many individual firms. The risk of data loss due to hardware failures or unforeseen occurrences is considerably reduced when data is housed in secure data centers and thorough backup and disaster recovery strategies are in place. Finally, the inherent compatibility and ease of integration of cloud systems with other business applications and services streamline internal processes and foster collaboration between departments and external partners, improving overall operational efficiency and competitiveness in the retail landscape.

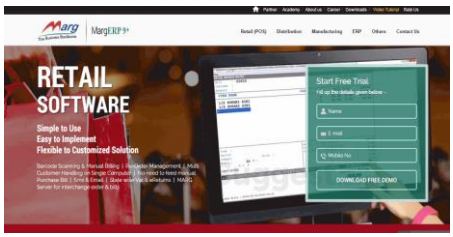
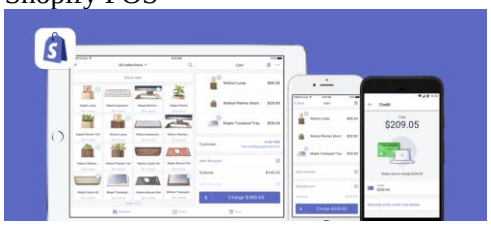
The key features offered by most of the Cloud based POS companies

Inventory Management, Accounting and Financial Management, Sales and Distribution Management, Purchase and Procurement Management, Production and Manufacturing, Point-of-Sale (POS) and Retail Management, GST (Goods and Services Tax) Compliance, Payroll and HR Management, E-commerce Integration, Barcode Integration, Mobile Applications, Cloud-Based Services, Customer Relationship Management (CRM), Supplier Relationship Management (SRM), Multi-Location Support, Multi-Currency Support, Data Security and Backup, Customizable Reports and Dashboards, Bill of Materials (BOM) Management, Quality Control, Employee Attendance and Leave Management, Financial Reporting and Analysis, Vendor Management, Service and Maintenance Management, Document Management and Printing, Data Import and Export, Consulting and Support Services These features are designed to help businesses manage their operations, finances, inventory, and sales efficiently while ensuring compliance with taxation and regulatory requirements in India.

Specifications: *Deployment*: on-premises, Supports*:* Desktop & Mobile Platform for Windows, Android & Mac OS

Few Companies offering Cloud POS /Hybrid POS

Marg ERP Ltd	MARG Retail Software is designed to handle all the needs of the individual shop or retail chain in a very efficient, effective and accurate way. Retail Billing Software is feature rich software with highly flexible

	configurations.
Square 	Popular with small and medium-sized retailers. It provides a range of hardware options, including point-of-sale terminals, tablets, and mobile card readers. Features: inventory management, sales reporting, and contactless payments.
Shopify POS 	Retailers who have both physical stores and online sales channels can use Shopify's cloud-based POS system. It effortlessly interacts with the e-commerce platform of Shopify, enabling centralized inventory management, multi-channel selling, and customized receipts.
	Lightspeed provides cloud-based point of sale (POS) solutions made for different kinds of shops, like restaurants and e-commerce companies. It offers a full range of capabilities, such as customer profiles, inventory monitoring, and sales reporting, for both front-of-house and back-office operations.

CONCLUSION

Cloud-powered retail management has established itself as an essential component of the contemporary retail environment. Retailers can benefit from cloud computing's unmatched scalability, cost-effectiveness, flexibility, and accessibility. Retailers may better respond to shifting market conditions, improve customer experiences, and spur corporate growth by implementing cloud-based POS systems, whether in a hybrid or pure cloud environment. Traditional retail management procedures have their advantages, but they cannot compete with cloud technology's agility and creativity. Adopting cloud

solutions will be essential for the retail sector's continued evolution if it is to remain competitive and satisfy the constantly changing demands of modern consumers.

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