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Cloud Computing for Supply Chain Management and Warehouse Automation: A Case Study of Azure Cloud

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Abstract—In recent times, organizations are examining the art training situation to improve the operation efficiency and the cost of warehouse retail distribution and supply chain management. Microsoft Azure emerges as an expressive technology that leads optimization by giving infrastructure, software, and platform resolutions for the whole warehouse retail distribution and supply chain management. Using Microsoft Azure as a cloud computing tool in retail warehouse distribution and supply manacle management contributes to active and monetary benefits. At the same time, potential limitations and risks should be considered by the retail warehouse distribution and the supply chain administration investors. In this research summary of the cloud figuring tool, both public and hybrid in supply chain administration and retail, warehouse distribution is addressed. A brief introduction to the use of Microsoft Azure technology is provided. This is followed by the application of cloud computing to warehouse retail distribution and supply chain management activities. At the same time, the negative and positive aspects of familiarizing this Microsoft Azure technology in the modern supply chain and retail distribution are debated. Also, the circumstance for the third-party logistics services suppliers has indicated respect for automation and cyber security solutions in a cloud environment. Lastly, the upcoming research practices and following technological trends are offered as the conclusion.

Keywords—Hybrid Cloud, cloud computing, supply chain organization, cyber security, Warehouse, Automation, and supplier relations

I. INTRODUCTION

According to information technology consulting corporations, Microsoft's Azure in cloud computing arises as a rapid increase in technology that many organizations are ready to assume to progress the efficiency of the companies [1]. Investment in current technologies, for instance, cloud figuring, is rapidly growing at eighteen percent annually. At the same time, it is estimated to reach at least eighty percent of information technology by 2025. The use of Microsoft Azure is evolving per year in various companies. The investigations indicate that seventy-two percent of the participating organizations had already substantially implemented cloud technologies, especially Microsoft Azure. At the same time, some organization is still piloting all project on their works and analyzing both benefits and challenges of the technology [2]. The application of Microsoft Azure in supply chain management and retail warehouse distribution have been performing in which it has led to a large-scale transformation in traditional warehouse retail distribution and supply chain management, leading such organizations to innovate more dynamic retail distribution.

The research indicated various activities that the Microsoft Azure providers incorporate, including

forecasting, planning sourcing and procurement, spare parts maintenance, and logistics, considered the first move in the cloud [3]. Involving Microsoft Azure's cloud-based technology in warehouse retail distribution and supply chain management has contributed many advantages such as simplified operations, capital investment, time visibility, and scalability. However, before applying veil computing technology in supply chain management and retail distribution, limitations and risks such as confidential material and weak data awareness should be considered. Many companies are utilizing cloud computing from the private to the public stage, enabling an organization to benefit from the competitive advantage of implementing cloud interaction.

II. METHODOLOGY

This research depends on secondary, for instance, reference materials, research papers, and conference proceedings, such as all forms of reliable statistics that determine this paper's determination [4]. Thus, this paper has an overview and a summary of the use of Microsoft Azure as cloud computing in supply chain organization and retail warehouse distribution and the relationship between the use of Microsoft Azure and supply chain performance. In addition to the case study, the researchers interviewed cloud providers on their views on supply chain

transparency and its related risk in cloud computing [5-7]. From the analysis of participants' responses to the case study and interviews, their collected some transparency structures that could be useful in comparing cloud providers based on the data they published on their websites. The results discussion, conclusions, and recommendation.

A. Cloud Computing

When mentioning cloud computing, it is essential to indicate both software that cloud benefactors can give to their customers and hardware. Cloud computing is an information technology service model that can provide computing services either by hardware or software and deliver information on demand to customers independently [8]. Customers can access cloud-based applications via web browsers, whereas data and software are kept in the servers' locations. Cloud figuring can be characterized into four types: isolated cloud totaling, open cloud computing, hybrid cloud totaling, and community [9]. The advantage of public computing against supply chain management is that organizations are not concerned about system maintenance or construction.

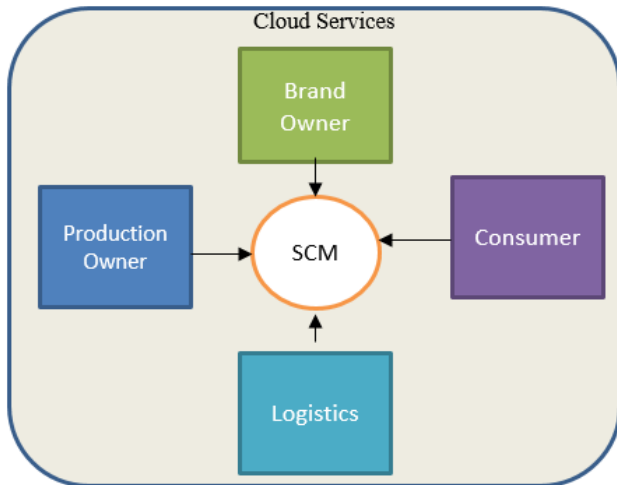


Fig 1: Warehouse Management System with Cloud

Public cloud computing in the distribution of retail warehouses is designed for open usage by the public. Public cloud computing can be operated and managed by companies and several partners; public cloud exists outside of the locations of the cloud providers. Using public cloud computing, users can achieve a cheaper setup application since third-party providers cover

the cost [10]. While private cloud computing is on the premises of the cloud arrangement where operators of diverse business components retrieve it within the institute, the importance of using private cloud computing to develop privacy from the internal computing sources operating within the company [11]. Therefore, the need for higher security levels and lower risk has been perfect since it limits the number of users. Several customers have preferred private cloud computing over public cloud computing because of its flexibility and security.

Hybrid cloud computing is the grouping of public cloud and isolated cloud. In a hybrid cloud, there is two different cloud structure, whereas the remaining exclusive units are combined by the consistent technology that permits application and data to be portable. In hybrid cloud computing, the organization can sustain its isolated cloud and scale out the public; if the local volume is well utilized or in-the-house arrangements cannot support the workload, then an external system can provide alternative support [12]. Hybrid cloud figuring can stabilize the risks and benefits between public and private cloud computing and manage the cost of infrastructure in supply chain organizations and retail warehouse distribution.

Cloud computing is only designed for companies with common goals, such as security necessities and regulatory obedience [13]. Communal cloud computing can be accomplished by more or a single party of the community or a combination of both. Community cloud computing can be hosted either externally or internally.

Retailers can use Microsoft Azure to accept or recover any file planned for distribution with various entities, such as forms, pictures, and videotape, among other organizer kinds, or usage in a cloud presentation. Microsoft Azure packing can even accommodate the categories of facts usually defined as Big Data, like underdone data from systematic tools or records from attendants [14]. Even holdups from record attendants and other campaigns, as well as computer-generated challenging energies for extra to simulated apparatuses, can be positioned in splotch storing. Enables improved provision of a devolved industry traversing numerous places can transfer

information technology economics from conservation to allow for novelty. A solitary combined suite, eliminating the necessity to mix different schemes, enables improved teamwork with dealers, consumers, and networks. The use of Microsoft Azure in warehouse retail distribution and supply chain management consists of three unlike prototypes, which include organization as a provision, software as an amenity, and stage as services in which each of sieving various requirements of the Microsoft users.

B. Improved Data Security in the Warehouse

The Retailers obtain a nonstop flow of clients each time, and statistics are produced continuously. Cloud figuring is vibrant to accomplish such a massive volume of facts made by transactions, standard facts, and so on [10]. Furthermore, such business-delicate information must be cautiously controlled. A critical reason for corporate disappointment is the cost of private corporate statistics, individually recognizable information via system penetration, outbreaks of the most mutual attacks on supercomputers and the system/attendant, and ransomware contaminating structures and negotiations statistics. Information safety is a single significant issue to be talked about. Some retailers uphold their transactions facts, account intelligence, and purchaser response, among others, on the resident attendants [15]. While it is suggested that keeping facts on the cloud helps protect the information through advanced firewalls, encryption, occasion classification, internal firewalls, and external security.

C. Improved Buyer Experience

In the logistics world, the Vendors only partially use the client and transaction information that they gather. The cloud amenities supplier uses dynamic computing capitals and arithmetical representations to examine facts [16]. With its massive file, vendors can influence the points from the linked strategies to explore the ordering conduct, styles, and connections with the product to advance a reasonable superiority in policymaking. Utilizing client information analytics aimed at analytical acquisitions, retailers can forecast their clients' purchasing performance and what goods they purchase each time. If they

buy reduced produces, what is the variety of the products they purchase? These figures are kept on the cloud, and by consuming analytics, merchants grow their promotion or selling approaches to appeal to additional consumers [17]. The practice of statistics analytics has increased, with the cloud being safe, dependable, and inexpensive for information storage and dispensation.

Infrastructure as a service administration through cloud computing presented essential changes in cooperative relations, beliefs, and message positions. The consequences presented extraordinary results for huge administrations using cloud figuring amid harmonious concerns and interpersonal results [18]. Logistics directors from great establishments supposed that administrations utilizing cloud computing produced higher interpersonal results. Infrastructure as a provision is a platform where businesses can display their products in the method of attendants, storing, universe, and hardware at remuneration per usage provision. These services are ideal the Microsoft azure suppliers them in the paper of a virtual machine to raw storage or physical firewalls, networks, and load balances [19]. Many users buy these models as outsourced services instead of software and networking equipment servers to monitor the organization. A perfect example is amazon cloud AWS and Microsoft Azure.

D. Platform as a service

Microsoft Azure provides a host for computing settings, typically operating system programming language and database, where the users deploy and develop the application. Customers can lease virtual attendants to create and organize the current application. In some circumstances, the storage and figure properties are gauged routinely to acquire presentation requests. For instance, cloud customers do not have to distribute resources physically [20]. Software as service(SaaS) mode cloud providers operate and install presentation software in the mist, and customers use the software on many customers' tools via the thin client interface. For instance, program interface and computing resources are accessed by various customers using one of the models. Technology, cloud figuring is typical for allowing universal, practical, on-request system admission to a public pond of configurable adding

assets submissions that can be quickly provided and unconstrained through negligible administration energy or amenity supplier interface. Prominently, it energetically poises to encounter the present request, whether the market outcomes from the performance of a supply-rigorous presentation by a sole operator or the unexpected arrival of numerous customers demanding entrance to a unified mutual source.

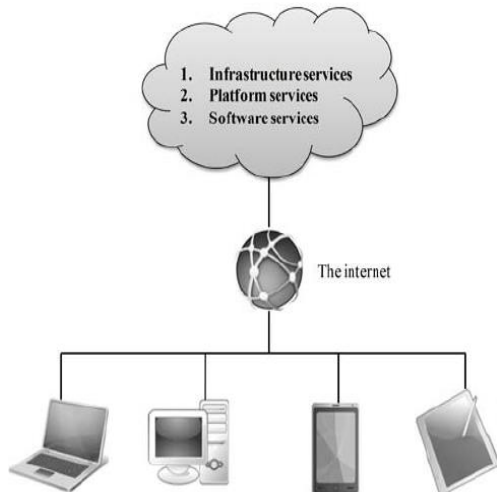


Fig 2: Software as a Service

Likewise, cloud assets can be free once request starts to reduce [21]. Taking a cloud organization implies that researchers should not concern with having or acquisition of the abilities to shape, achieve, and uphold a central and climbable situation. In its place, they can depend on unceasing contact with a data epicenter acquired by a third party. Instead of participating frankly to protect the essential hardware for an organization accomplished of supportive calculating science, investigators can, in its place, recompense for admission to the cloud totaling only as the necessity rises. Microsoft Azure's contact with massive ranges of achieved assets is an extra convincing cloud feature for scholars [22]. Cloud computing stages uphold the organization besides amenities on which claims are operated, such as functioning schemes and record facilities. Since all hardware is inattentive by the cloud podium, there is no addiction to any exact portion of hardware. So, sellers can relate covers and improve workings without unfavorably affecting management.

III. CLOUD-INFLUENCE IN SUPPLY CHAIN ACTIVITIES

The presentation of the Microsoft azure notion in supply sequence organization and retail warehouse distribution generates and innovates new fields that can be linked to two parties by delivering related information and cloud facilities. Planning and forecasting. Microsoft Azure platforms are helping an organization to advance their services by organizing the sequence associates. Such as supplier retailers and distributors, who play a vital role in demand forecasting. Microsoft azure gathers sales through the internet, performs simple analytics, and executes an accurate statistical demand forecast to various supply participants. The gathering of information through the internet leads to a significant decrease in the bullwhip effect in the supply chain [23], which contributes to the distortion of critical information in various stages of supply chain management. Therefore, enabling all the partners involved in supply to be conscious of the actual claim instability so that they can manage the situation. Microsoft Azure provides a solution for the order planning and demand combine and prediction implementation submissions to one solitary multi-party podium. The customer makes an order; supplies send the information to the public cloud making the data available simultaneously to all supply chains.

A. Sourcing and procurement

Sourcing includes receipt, attainment, and examination of received resources, identifying the obtaining process, and choosing suitable dealers. In this section, Microsoft, the azure platform, can operate a database with various suppliers' data. Microsoft Provides a significant boost for companies dealing with many supply materials. Organizations can choose their supplies depending on the appropriate materials provided according to time limits and specifications [24]. Cloud computing enables stores and organizations to develop contracts, mutually enlightening contract management.

B. Logistics

Microsoft Azure is useful for inventory, transportation, and warehouse management. The use of Microsoft Azure for logistics tracking various supply sequence associates. Procedures such as scheduling fleet management, command

handling, conveyance course preparation, and worldwide compliance can be transferred to a cloud computing base[25]. A sole integrated cloud platform has more advantages to the transport sector because it limits pipeline inventory and the hand logistics sector [26]. Cloud services are essential for supply companies for itineraries. Cloud computing provides solutions to warehousing management due to many different customers at the same tie in one system.

C. Service and utility management

Reverse logistics should be final in supply chain management; reverse logistics should be considered since it increases profits. Microsoft Azure as cloud computing provides an opportunity for organizations to integrate advancing logistics (see Fig 3) through converse logistics in the warehouse retail distribution and supply chain management [27]. For instance, radio occurrence identification is an intelligence knowledge container used to pathway inventory location and later transmit information to the cloud application. Moreover, the inventory route can be observable to all supply chain management, from customers to manufacturers and vice versa. The returns processing, warranty proof, spare parts record, and technician report are the only progressions presented efficiently in a sole cloud-based stage.

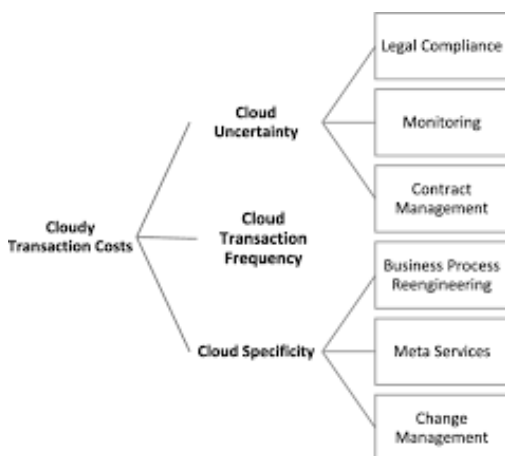


Fig 3: Manufacturing Automation Flow

Many organizations reflect the manufacturing technique as their extensive supply chain stage. Cloud computing may be proven unsuitable for manufacturing because of its complex essential procedure that requires a high level of degree

customization that the cloud-based cannot offer [28].

IV. CLOUD COMPUTING IN THIRD-PARTY LOGISTICS SERVICES

After debating primarily about the potential for cloud-computing suggestions in supply chain organization and retail warehouse distribution, precisely the issues that technology contributes to companies. The reflectiveness of inventory and shipments either inside the company s boundaries among the source chain and retail warehouse stakeholders[29]. Cloud multiplying as a public, hybrid, or private cloud assembly can provide internal or external reflectiveness, which enhances with consequences and benefits as discussed below (Fig 4).

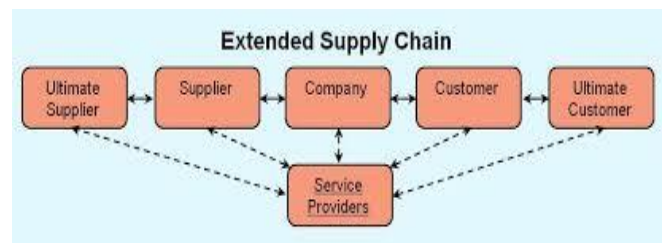


Fig 4: Extended Supply Chain in the Cloud era[29]

V. CLOUD MULTIPLYING ON SCM AND WAREHOUSE RETAIL DISTRIBUTION

Changing an ancient source chain in an organization should determine the mechanical needs for shifting the source chain to the cloud and transforming the supply chain to Microsoft Azure, as cloud computing can be implemented by employing a cloud life cycle, a development lifecycle with numerous steps that make it possible for the transformation process to be evaluated and developed regularly. Nevertheless, before the transformational process, organizations should consider all the functional aspects that can make them create an overview of Microsoft Azure's execution in the supply chain management process[30]. Queries about the modifications, the advantages, and the challenges that are likely to be encountered when using Microsoft Azure should be considered before an organization takes any vital decision when moving to cloud computing. The subtopics below address the positive impacts of Microsoft Azure as cloud computing and the challenges likely to be

encountered when employing cloud-based technologies. Further, the positive aspects of cloud adaptation are defined below.

A. Cost Efficiency

Microsoft Azure as a cloud computing system can be employed effectively because it has numerous financial advantages for organizations using the technology. Cloud facilities do not need any venture for software or device control possession. Thus, Microsoft Azure is more beneficial than regular in-house Enterprise Resource Planning structures provided by public clouds[31]. As a result, supply chain management capital cost can be shifted to operational expenditure, improving organizational cash flow. Thus, organizations must only pay activation and usage fees to install Microsoft Azure systems. This ensures that a company will save more resources by minimizing maintenance costs and ensuring minimal upgrade costs.

B. Simplification.

Microsoft Azure, as a cloud computing system, simplifies the organization. The system ensures that each part of the supply series is easily accessible via the same podium[32]. Moreover, the system eliminates compatibility issues to simplify the connection process and enhance information sharing among participants in a specific supply chain. Thus, the organization benefits from a collaborative community that improves security by allowing participants to set security[33]. The system minimizes the response time when making decisions between two or more participants. Cloud-founded services provide information regulation via one centralized storage structure to ensure a smooth flow of information in the supply chain.

C. Flexibility

The cloud computing system provides flexibility from demand projection to transportation or warehouse management. The demand prediction process, Warehouse, and transport management involve numerous applications in the supply chain, which can be boosted in one cloud-founded platform. Furthermore, Microsoft Azure ensures that

participants can access such a stage from various organizational environments through a standard device despite the different geographical locations[34]. Management of Microsoft Azure is location-independent; hence can be accessed from other geographical areas. The extensive network availability alerts the entire supply chain, making the company swiftly enter a fresh market with new products and services.

D. Visibility

Implementing Microsoft Azure in an organization offers timely linking with numerous supply chain partners. Thus, an organization can monitor the supply chain occurrences when they occur and deal with possible issues or deviations from the main goals [35]. Visibility is critical because it ensures that organizations can organize their activities and oversee various customers while providing the customer network has a clear view of the entire supply chain process. The organization also benefits from real-time inventory visibility to improve logistic trailing [36]. Microsoft Azure acts as a simulated warehouse for specific goods, such as those in the pipeline, enabling the firm to meet strategic order decisions. Moreover, it becomes easy for the organization to reroute the inventory as guided by the actual product location.

VI. RISK AND LIMITATIONS

Microsoft Azure, being a cloud-based technology, faces the problem of information safety and confidentiality. Data in the cloud should only be retrieved by accredited bodies such as trusted supply chain participants [37]. Nevertheless, cloud figuring structures as software items cannot continuously be responsible for discretion and privacy due to the rise in cyber security issues such as hacking[38]. Moreover, the advanced modern technology makes it possible for competitors to access crucial data from other organizations, threatening the entire supply chain process.

A. Outdated Mindset

Information and data distribution with public entities results in an immediate change in the ancient methods of thinking and working, which is vital in an organization's culture. Research shows that most organizations must disclose information concerning their production

procedures or supply chain processes[39]. If competitors access such information, the organization can lose its competitive advantage. Implementing Microsoft Azure in supply chain management implies that a new change is introduced in the organization, which modifies the entire supply chain process[40]. Therefore, the organization must train its employees about the new technology to ensure a successful transition process. Thus, more adequate resources are needed to speed up the transition process.

B. Flexible Availability

The users of Microsoft Azure as a cloud computing technology raises issues about the impacts of a possible crash down due to the user system's workload, which will interfere with the entire supply chain process. Such cases can be fatal to the organization resulting in a massive loss due to any delays caused by the malfunction[41, 42]. Additionally, the system can be negatively affected by poor network connectivity in different geographical locations leading to inconveniences in the supply chain process.

C. Customization Free Solutioning

Cloud computing technology cannot be easily customized according to the needs of the supply chain process since it usually provides a standardized service. Therefore, it may be difficult for the organization to solve specific supply chain errors [43]. For instance, since the production process is a composite primary process in the supply chain process with numerous customized methods depending on the product type, there should be a high level of cloud computing customization to make the process effective[44]. Thus, the absence of specialization lowers the market response and can negatively affect the company's competitive advantage.

VII. CLOUD TYPES

A. Private Cloud

The private cloud provides computing resources distributed among various business units controlled by a single infrastructure. Introducing FedEx in private companies lets an organization emphasize client connection and get one border for many transaction procedures [45]. Before the introduction of private cloud technology, companies encountered many difficulties regarding massive collections of

information, which requires a lot of computing control to analyze. However, when cloud computing was deployed, it reduced time wastage by about sixty percent and provided a parallel execution of batch processes. FedEx controls the company's activities all over the sphere by enabling global demand to deliver position and worldwide list visibility [46]. The hybrid cloud in this sector allows for the company's sales team an exclusive feature of a mobile solution that increases the effectiveness and improves the service of the company and the customer.

B. Public Cloud

More than the private cloud is needed to accommodate many customers and partners; this problem encourages the introduction of the public cloud. Concerning supply chain tracking, some traditional organizations use phone calls and emails to collect the required data, which does not offer timely visibility. It suffers a big blow connecting all stakeholders (Banerjee, 2018). Contrary to the introduction of cloud-based public platforms contributes to capable connection to all customers and supply chains (Khodyakov et al.,2018). Shifting to the free cloud suggests crucial monetary welfare for companies since it reduces the cost due to the nonexistence of possession cost of services providers. The most significant advantage of a public cloud platform is that its delivered information on the timely fulfillment of orders to customers and the minimum price. A natural disaster can reduce the rate of transportation schedules for many companies; therefore, cloud technology provides a solution to such obstacles [46, 47]. Shifting companies to the public cloud offer logistics management services to their customers, subsidiaries, and distributors. Cloud figuring allows minor companies to portion the same amenities as more prominent organizations. For instance, the paybacks of flexibly interrelating and achieving procedures external to the association reduce the cost of ownership of supply series partnerships. Cloud computing needs the arbitrating support of supply sequence addition to achieve predictable achievement. Nevertheless, there is no final sign that cloud figuring has an inspiring result on either supply chain incorporation or operating presentation [48]. A significant positive connection was established

between supply sequence addition and functioning presentation in all symbols used.

VIII. RECOMMENDATIONS

Microsoft Azure makes warehouse and supply chain management greener and neater[49]. Cloud computing can be practical in supply chain organizations and retail distribution to facilitate stakeholder collaboration. Forecasting on the cloud limits distortion of the demand of the actual customers. Cloud computing is a relatively vast supply chain management. Many Microsoft Azure implementations in warehouse retail distribution and supply chain management have yet to be fully discovered. Business email compromises were the second most shared form of social engineering. The mainstream of social business incidents was found externally. Suppliers are subjugating older strengths that have yet to be patched. The organization offers real-time visibility via shipment across the supply chain management and retail warehouse distribution.

IX. CONCLUSIONS

Adopting enabling technology, supply chain management, and retail warehouse distribution should deploy a strong network that can improve the efficiency of the operation. Moreover, providing automated pick lists with coordinated devices and mobile to help reduce waste and eliminate mistakes. The organization of the workstation increases productivity since the workers have everything in one place. Workstations should be deployed all techniques and designs to reduce errors, keep carriers at bay, and improve safety. Supply chain management and retail warehouse distribution should optimize labor efficiency to generate effective picking plans and provide a high-volume ratio for the organization. The companies should streamline operations. To optimize and maximize all available space, companies should include taller storage units that can accommodate many goods and use standardized bins to improve the neatness and orderly of the shelves. The organization should adopt lean inventory to increase stock safety and allow suppliers to use larger quantities more often.

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