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Cloud-Based MIS Model for Medium and Small Enterprises in Ethiopia

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Abstract

There is a lot of market pressure on small and medium-sized businesses. Because of this, they are under pressure to enhance their management and information systems (MIS) in an effort to increase the benefits and lower the costs of these systems. Due to very rapid developments in IT technology, for small and medium-sized enterprises are facing very difficulties to keep update them with latest changes in IT infrastructures. For improvisation in their existing MIS System, latest computing model systems like cloud computing, mobile computing are suggestible. The greatest added value of implementing MIS seems to be achieved through the innovative idea of combining information management tools and approaches to the challenge of developing complex, high-quality technical solutions. MIS can be implemented with existing commercial data warehouses and cloud reporting products, which in this case appear to be the most cost-effective program solution. By outlining the concept of cloud computing and investigating its logical architecture, this study employs the model and technology in the development of a cloud-based MIS for small and medium organizations (SMEs) in Ethiopia and analyses their impact on organizational performance. Based on the cloud-based MIS model's objectives, quantitative and qualitative data from target organizations is collected using surveys, interviews, and observations. Data on their hardware, software, operational processes, data security, and personnel may be included. Cloud technologies are identified by reviewing cloud-based platforms and services that meet Ethiopian medium and small firms' needs. Scalability, dependability, security, cost-effectiveness, and system compatibility should be considered.

Keywords: Cloud computing, Management information system, Medium scale industry, Small scale industry.

Introduction

Despite their ubiquity, cloud computing and mobile applications continue to serve as invaluable tools for modern businesses. When it comes to supporting their processes within their shared services architecture, several firms have turned to their own private or hybrid clouds.

When it comes to managing information systems, technology plays a huge role. In today's cutthroat market, no industry can make it without these essential tools. On top of that, it's not uncommon for businesses to need more funding as they expand.

Businesses must enhance their utilization of Internet services in order to compete effectively. Employees can be incentivized even further by them. Businesses can enhance their operations and draw in additional customers by developing new applications on the cloud. Companies should exercise caution when utilizing cloud computing and related services (1). Clients and workers should only use these services while they are in an immediate location with access to the Internet.

Because cloud computing is typically reserved for online workers alone, offline workers are often unable to use it (2). On the other hand, businesses with the right infrastructure can use this technology. This study discusses the creation, applicability, and performance of a MIS based on cloud computing technology, as well as its uses and implications. Extensive evidence and study strongly support the advantages of cloud-based MIS for SMEs. Below are several theories and studies that provide evidence for these advantages like cost

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savings, improved cooperation and communication, heightened data security safe gourds and dependable backup and recovery procedures, resulting in improved data security and disaster recovery. Yes there are many successful cloud based MIS models available for medium and small enterprises. Some popular options include NetSuite, QuickBooks Online, Zoho One, Microsoft Dynamics 365, Salesforce (3-7). The emergence of micro and small enterprises (MSEs) has been widely recognized as a significant driver of job creation, leading to a substantial reduction in poverty. Ethiopia has implemented a range of ambitious projects and development strategies to stimulate economic growth. The primary and all-encompassing goal of these development programs has been to guarantee widespread economic expansion. This is because widespread economic expansion is the primary means of reducing poverty by creating employment opportunities. Ethiopia has placed a high priority on the development of MSEs as a means to achieve economic growth, generate employment opportunities, and establish an industrial economy. The main goal of the strategy framework was to establish a conducive environment for the development of MSEs and to offer more specific policy support to MSEs. This support aimed to enable MSEs to contribute to economic growth, generate sustainable employment opportunities, foster collaboration among MSEs, serve as a foundation for medium and large-scale enterprises, and stimulate export activities.

Cloud-based MIS models provide smooth interaction with other business systems and applications, hence improving collaboration and efficiency. SMEs in Ethiopia commonly employ various software solutions to handle distinct business operations, including accounting, inventory management, and customer relationship management. Cloud-based MIS have the capability to seamlessly interface with various software solutions, enabling the smooth transfer of data and ensuring real-time synchronization. This integration obviates the necessity of manual data entry and diminishes errors, hence enhancing overall productivity and operational performance. Ethiopian SMEs choose to implement cloud-based MIS models primarily because they are cost-effective, scalable, accessible, secure, capable of integration, and offer collaboration advantages. SMEs can utilize advanced MIS functions to improve their overall business performance and competitiveness in the market.

Small and medium-sized enterprises

Businesses are defined very differently depending on the region and economy in question. It classifies businesses using a number of factors, many of which are derived from official sources within and outside of government, including SME agencies, ministries, government organizations, and national data bureaus and institutions all over the globe.

There is discrepancy in the definition of SMEs among various government institutions in Ethiopia, including the Ministry of Trade, the Central Statistics Agency, and the Federal Micro and Small Enterprises Development Agency (FMSEDA) (8). SMEs in Ethiopia are defined using the criteria in Table 1 (9). This is done for the sake of this study.

Table 1: SMEs Definitions Adopted from Seyoum et al. (9)

Firm Category	Categorization Criteria
Micro Business organizations	Business have workforce ranging from 1 to 5 employees
Small Business organizations	Business have workforce ranging from 6 to 30 employees
Medium Business organizations	Business have workforce ranging from 31 to 100 employees

Advantages of SMEs over large corporations include the ability to make choices and put them into action quickly, as well as the ease with which employees may communicate with one another. However, there are numerous obstacles that they must overcome. The lack of resources is the main cause of these issues for SMEs. These constraints impact their ability to compete via training and development, planning and control, funding, and the use of new information technology. Because they lack the resources to acquire new IT services, SMEs are at a disadvantage when it comes to delivering enhanced products and services. These businesses play a crucial role in every nation's economy. Nonetheless, by enhancing their capacity to leverage emerging technologies like cloud computing, SMEs can maintain competitiveness in this dynamic and unpredictable market.

Management information systems

MIS is a system that transforms raw data into meaningful information and effectively communicates it to managers at various levels within an organization. The information can enhance the process of successful decision making or planning (10). MIS encompasses the activities of collecting, storing, and retrieving pertinent information, as well as transmitting it for the purpose of effectively managing, operating, and planning the business activities of an organization. An information system is a defined as a system that transforms data into relevant and valuable information, and generates management reports that aid managers in their decision-making process. The success of efficient decision-making is regarded as the central aspect of any management process and relies on the information accessible to all activities and elements of the management process (11). The MIS offers data through predetermined reports and visual representations to facilitate company decision-making (12). Figure 1 depicts the correlation between management information systems and the process of decision-making. The issue at hand is the absence of a defined evaluation model to assess the effectiveness of MIS. An evaluation model specifically targeting technology management and utilization by managers needs to be designed and developed. Furthermore, there are preexisting success models that specifically emphasize technology.

The MIS paradigm integrates departments to improve management and decision-making. Let's examine each MIS model department's insights: HR is vital to managing human resources in an organization. HR workers can use the MIS model to manage employee information, track performance, check attendance, handle payroll, and generate important reports. This improves HR efficiency and effectiveness. Automating time-consuming and error-prone manual operations and procedures is a crucial part of the MIS paradigm. Automation tools streamline processes, boost productivity, and cut expenses. Automation in the MIS model helps integrate systems and data sources, ensuring departmental collaboration and data flows. Financial and accounting integration in the MIS paradigm has many benefits. It simplifies financial transactions, monitors and analyzes financial data in real time, and provides accurate and timely reporting. Budgeting, forecasting, and financial planning can be improved with the MIS model, giving decision-makers strategic financial management information. An organization's assets, equipment, and infrastructure depend on the maintenance department. By include the maintenance department in the MIS model, firms may track maintenance schedules, asset inventories, repair histories, and costs. This optimises maintenance, reduces downtime, and boosts operational efficiency. The MIS approach stores commodity and stock market data in a cloud-based data warehouse. Organizations can access, analyze, and comprehend real-time market data, trends, and indicators. Organizations can make informed investment, portfolio management, risk assessment, and other choices by incorporating this data into the MIS model. A cloud system provides scalability, security, and accessibility for such data. Overall, the MIS model provides a comprehensive framework for connecting and managing organizational functions. It gives decision-makers quick, precise information, boosts operational efficiency, and aids strategic planning. The cloud-based integration of HR administration, automation, finance and accounting, maintenance, and commodities and

stock market data warehouse increases the MIS model, giving firms a competitive edge.

The domain of information systems for SMEs is anticipated to have substantial impacts on the business landscape in Ethiopia. The contributions can encompass the following: Optimized operational efficiency, enhanced decision-making, expanded market reach, fortified supply chain management, improved customer relationship management, promoted innovation and entrepreneurship, facilitated financial management, bolstered data security and privacy, ensured regulatory compliance, and encouraged knowledge sharing and collaboration. In general, by utilizing information systems, SMEs in Ethiopia have the potential to enhance their competitiveness, productivity, and creativity, thereby making a positive impact on the growth and advancement of the economic landscape in the country.

Cloud computing

Cloud computing is a technological innovation that allows consumers to conveniently access a wide range of online services. Cloud computing is a technological framework where various resources such as application software, processing capabilities, data storage, backup facilities, and development tools are provided as services over the Internet. Individuals utilizing this technology can effortlessly utilize the available services on the Internet without requiring any prior operational expertise. The system is partitioned into several pieces, namely the cloud infrastructure, cloud platforms, and cloud applications (13). Clouds can be categorized into four types: public, private, communal, and hybrid. At this location, either a public or hybrid cloud infrastructure utilize to facilitate the sharing of information and enable cost-effective management information system operations. Cloud Computing encompasses three distinct service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) (14).

A major development in computing, cloud computing provides computing services to the general corporate community on an as-needed basis, much like water, power, telephone, and gas. Cloud computing is the practice of providing software, hardware, and application services over the Internet (15).

Utilization cloud based systems in businesses

Cloud-based MIS is the process of managing an organization's operations and transactions using management information systems that are backed by cloud services. This can be done by organizations in the public or private sectors (16). Asset management, data processing, data channelling, and operational management are some of the areas where these companies use cloud-based MIS. There has been a recent uptick in the use of cloud computing as an information system (17). Through cloud-based platforms, organizations have engaged in data flow, functional process management, and sharing (18). Authors in (19) study that investigates the integration of Internet of Things (IoT) technology into the decision-making processes of asset management. The study is published in the journal Business Process Management Journal and authored by feed authors. The authors identify various aspects of IoT adoption in asset management such as data management, data analysis and visualization, and decision support.

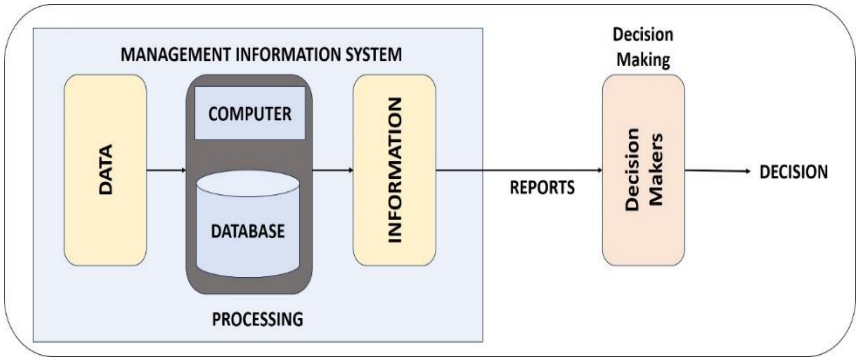

Figure 1: Management information system overview

The research provides insights on the potential benefits of IoT adoption in asset management such as improved efficiency and accuracy in decision-making, increased flexibility and scalability, and enhanced collaboration and communication among stakeholders. Some of the factors that influence the decision to use a cloud-based MIS include the following: the benefits of processing data through such a system, greater transparency, improved accessibility, cost-effectiveness, increased capacity to handle data volumes, customer satisfaction, interaction with customers, and time efficiency (20). In addition to the factors already mentioned, other important factors that influence the adoption of cloud-based MIS include the firm's size, pressure from the business sector, and stakeholders and partners. In order to evaluate the effects of data flow via third-party cloud service providers, it is necessary to establish data structuring and efficient data sharing protocols. Furthermore, for cloud-based MIS data management to be adopted and implemented effectively, stakeholders and partners must work in tandem with it.

The paper (21) proposed a framework for managing information security risks in cloud computing. The framework, known as the STOPE view, is based on the assumption that security threats in cloud computing are based on six key factors: security types, threats, objectives, ranks, protection methods, and effects (STOPE). The paper presents a comprehensive overview of these factors and provides a methodology for establishing a security context in cloud computing environments. Authors in (22) discusses the application of cloud computing in various e-commerce scenarios and its impact on the industry's overall efficiency and performance. Some of the topics covered in the paper include customer service, supply chain management, and inventory management. Additionally, the researchers examine the security and privacy challenges and the potential solutions to address them.

Determinants of cloud computing integration are the factors that influence the adoption of cloud computing by a small and medium-sized enterprise (SME). This empirical investigation aims to examine the impact of cloud computing integration on sustainable performance in SMEs. The study will use the Structural Equation Modelling (SEM) and Artificial Neural Network (ANN) approaches to gather data and analyze results (23).

Authors of (24) discusses the determinants of big data analytics adoption in SMEs. Their study explores the factors that influence the adoption of big data analytics by SMEs and identifies key barriers to adoption. The authors found that the main determinants of big data analytics adoption in SMEs include the availability of financial resources, perceived benefits of big data analytics, and industry-specific factors. Overall, the study highlights the importance of addressing these factors to promote the adoption of big data analytics by SMEs and drive their growth and success. Industry 4.0 refers to the integration of digital technologies such as artificial intelligence and the Internet of Things into the manufacturing industry. The study in (25) identified several factors that may hinder the sustainable adoption of these technologies in the South African manufacturing industry. These include a lack of awareness and understanding of the benefits of industry 4.0, a lack of technical skills and infrastructure, concerns about data security and privacy, and government regulations that may stifle innovation. Authors of (26) discusses the advantages of using cloud computing in sustainable construction in Nigeria and how it can contribute to green infrastructure development. The authors highlight the various benefits such as cost savings, increased efficiency, and improved collaboration, among others.

COVID-19 has posed significant challenges in the supply chain of SMEs and contributed to their financial instability. The ambitious goal of the United Nations Sustainable Development Goals (SDGs) addresses various social, economic, and environmental issues faced by these enterprises. In their recent study, S.B. Nasir, T. Ahmed, C.L. Karmaker, S.M. Ali, S.K. Paul, and A. Majumdar examined the impact of COVID-19 on supply chain viability and its implications for achieving SDGs. They found that SMEs need to adopt innovative strategies, digitalization, and explore alternative (27). Cloud ERP adoption has been gaining significant traction among SMEs in New Zealand. A new study in (28) examines the influential characteristics and benefits of cloud ERP adoption

from a vendor's perspective. The authors found that cloud ERP adoption can bring numerous benefits to SMEs, including improved financial management, enhanced supply chain management, and increased operational efficiency. The study also highlights the key factors that influence cloud ERP adoption in New Zealand SMEs, such as the size of the organization, the level of technological expertise. The authors of (29) discusses the impact of Industry 4.0 technologies and sustainable operations practices on sustainable performance in the manufacturing industry, as presented in the Journal of Cleaner Production. The authors explored the advantages and limitations of implementing these technologies and practices, and found that they can significantly improve environmental and economic performance while reducing waste. Overall, the study provides valuable insights into the role that Industry 4.0 technologies and sustainable operations practices can play in promoting sustainable manufacturing. Authors explores the role of technology adoption in sustainable development (30). The authors provide an overview of the various dimensions of technology adoption, such as innovation, diffusion, and impact, and discuss the opportunities and challenges associated with these factors. They also propose future research agendas that can help to address the current gaps in knowledge on this topic. Overall, the paper offers a valuable contribution to the ongoing debate surrounding the role of technology in achieving sustainable development goals.

Cloud computing has become an essential tool for businesses looking to transform and streamline their operations. A global survey found that firms are utilizing cloud computing in several ways to improve efficiency, scalability, and cost savings. Some of the key ways cloud computing is being leveraged by organizations include improving collaboration by allowing employees to work from anywhere, boosting innovation by providing access to a wide range of tools and services, and optimizing processes through automation and artificial intelligence. Overall, the survey found that cloud computing is playing a critical role in enabling organizations to remain competitive and adapt to rapidly changing market conditions (31). The research and application of cloud platform-oriented intelligent information management systems (IIMS) involve using cloud-based technologies to store, manage, organize, and retrieve information efficiently. IIMS utilizes artificial intelligence (AI) techniques such as machine learning and natural language processing to enhance the management of information resources. This research area aims to address the growing challenges faced by organizations in managing and exploiting their information assets in a cloud-based environment. The application of cloud platform-oriented IIMS can lead to improved decision-making, increased productivity, and reduced costs (32). Cloud computing has become increasingly popular for use in healthcare information systems due to its accessibility, scalability, and security benefits. However, there are also several challenges associated with its implementation, such as ensuring data privacy and security, and integrating cloud-based systems with existing on-premises solutions. To successfully navigate these challenges, it is important to carefully consider the specific needs of the healthcare organization and choose a cloud provider that can accommodate these requirements. Additionally, ongoing monitoring and maintenance of the cloud-based system is essential to ensure its continued effectiveness and security (33). Cloud-based information systems have had a significant impact on organizational performance. They provide cost-effective, scalable, and secure access to data and applications from anywhere, anytime. This enables employees to work remotely, collaborate more easily, and access real-time information, improving decision-making and productivity. Additionally, cloud-based systems reduce hardware and software costs, provide automatic software updates, and ensure data backup and disaster recovery. Overall, cloud-based information systems help organizations to streamline operations, increase efficiency, and improve bottom-line performance (34).

Dependability in cloud computing refers to the reliability and consistency of cloud services, including data and application availability, performance, and security. It plays a critical role in cloud computing adoption as organizations rely heavily on cloud services to support their operations and ensure business continuity.

Ensuring dependability in cloud computing requires a robust service-level agreement (SLA) with cloud providers, effective monitoring and management of cloud resources, and a proactive approach to addressing potential issues before they escalate. Overall, the focus on dependability can help organizations maximize the benefits of cloud computing while minimizing risks and ensuring uptime (35). Cloud computing has revolutionized the sports industry in several ways. This technology enables the storage and management of large amounts of data, which is especially useful in sports, where large amounts of data need to be analysed to improve performance. Cloud computing allows sports teams to store and process large amounts of data, such as player stats, game results, and training data, in the cloud. This makes it easier for teams to access and analyze data from anywhere, at any time. Additionally, cloud computing allows sports teams to collaborate more effectively, allowing team members to share data and work on projects in real-time, regardless of their location (36). Cloud computing has had a significant impact on the accounting information systems of the hotel industry. By using cloud-based accounting software, hotels can take advantage of real-time data and remote access to financial information. This can help improve decision-making and financial performance. Additionally, cloud computing can help hotels reduce costs and improve security, as they do not need to invest in and maintain their own accounting systems and security software (37).

Materials and methods

Nowadays, no company can function without utilizing some type of information technology. When compared to large corporations, SMEs are significantly less likely to use IT on a global scale. How much of an impact are IT initiatives having on SMEs is the central question of the proposed research. It discusses the effects on the company's efficiency, profits, and customer surplus as well as the advantages to the company from investing in SMEs. Operations support, management productivity, and strategic decision support are all areas where the organization derives strategic value, which is taken into consideration as well.

There is no correlation between these variables and the following: the amount of reliance on company data; the amount of time management spends planning and developing various applications; the nature of the competition; or the operational and implementation expenses. But when looking at acceptance, cloud computing should not be ignored. The level of excitement from upper management, how well cloud computing fits in with the overall business strategy, the relative benefits of online shopping, and the level of computer literacy among employees are all important considerations. Particularly for smaller companies, these characteristics differentiate between those who use and those who do not employ new technology.

They discovered that the elements of beliefs and normative controls distinguished adopters from non-adopters. What differentiates adopters from non-adopters are their behavioural ideas and attitudes towards group aspects, such as the distribution of knowledge, the improvement of information accessibility and communication, and the speed with which things are done. The general values supplied by MIS and cloud computing are as follows: initial reduction in IT expenses; resources are available on demand and may be hired; upgrading, maintenance, and scalability are easy; and quick development and integration with other services are easy.

To ensure different viewpoints and knowledge, numerous selection criteria can be used to pick Ethiopian SMEs for research. These selection criteria may reflect sector or population considerations. Selection criteria include expertise and experience, sector-specific knowledge, diversity and representativeness, language and communication abilities, accessibility and availability, ethics, and community connections. Researchers can assure a well-rounded and thorough representation of Ethiopian SMEs by using these selection criteria, improving study quality and validity. The characteristics that define the requirements and constraints of Ethiopian SMEs include restricted availability of financial resources, shortage of skilled workforce, limited technological capacities, inadequate infrastructure, insufficient market information, restricted entrepreneurial skills, lack of access to business development

services, limited availability of information and business networks, and susceptibility to external shocks. Ethiopian SMEs are frequently exposed to external disturbances, including variations in worldwide commodity prices, devaluations of currency, and political instability. These variables can have a negative impact on their ability to generate profit and maintain long-term viability.

Based on the cloud-based MIS model's objectives, quantitative and qualitative data from target organizations is collected using surveys, interviews, and observations. Data on their hardware, software, operational processes, data security, and personnel may be included. Cloud technologies are identified by reviewing cloud-based platforms and services that meet Ethiopian medium and small firms' needs. Scalability, dependability, security, cost-effectiveness, and system compatibility should be considered.

Establishing management's requirements and strategy for MIS

When working with a company that has a number of different systems in place, management needs to be well-versed in all of the data that is available and have a plan to convert it into a format that is more automated. The company ought to undertake a separate project analysis, clarify the precise management demands, and establish the information sources in the event that such a scenario occurs. The environmental system, the business product market, the banking system, the prices of materials and commodities, and the stock market are all examples of external components. On the other hand, the internal structure of the company is comprised of a variety of units, including Human Resource Management, Automation, Strategies Development, Operation Management, Finance and Accounting, Business Management System (BMS), and Maintenance. Figure 2 describes the internal – external systems structure of the case company.

The internal system architecture of the case company

The goal of business asset automation systems is to handle production processes automatically through the use of engineering and computer technology. Various reports, data, and communication interfaces are provided by the control system. To control the procedure, operators use predetermined commands. Using binary code, the system is programmed with the capability.

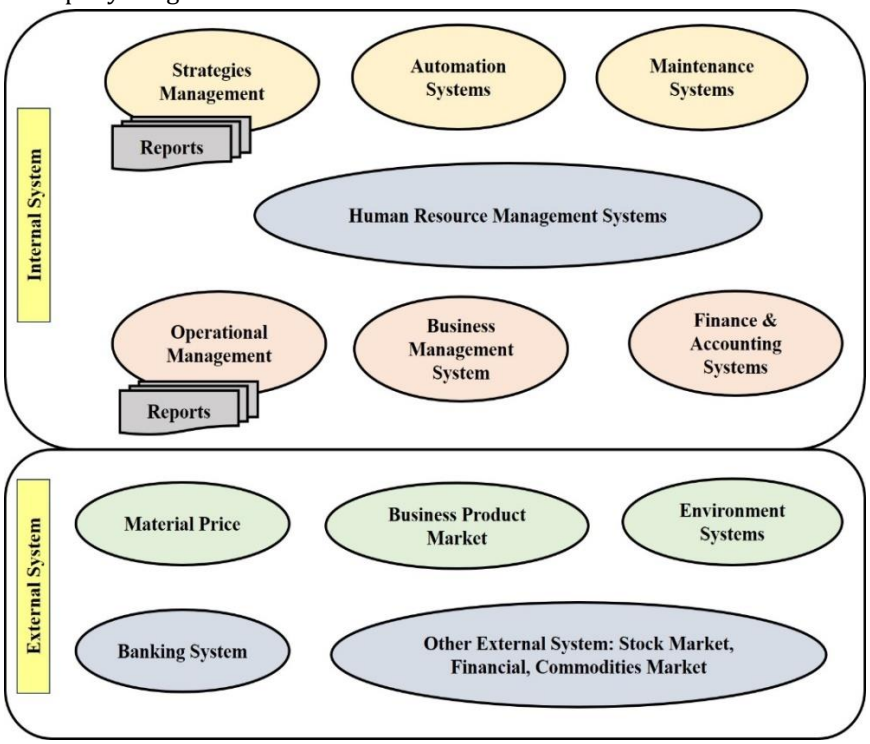

Figure 2: Internal–external systems structure of the case company

Organizations can manage equipment maintenance with the help of computerized maintenance units (CMUs), which comprise of hardware solutions and software packages. By archiving crucial data on the organization's maintenance functions, CMUs raises efficiency and decreases operational expenses. One online tool for HR management is the Human Resource Information Unit (HRIU). It incorporates features that allow users to enter and track personnel data, basic personnel data and information, and integrates these features with the accounting system to best ability. There is a connection between the accounting and finance department and the human resource management department in every manufacturing setting. All financial dealings, records, and operations are kept by the accounting unit. The banking system can be integrated with the accounting and financial unit.

The Business Management Unit (BMU) is crucial in the day-to-day running of production and trade operations, particularly in relation to the Ethiopian market. Production, processing, and distribution systems can be tracked, managed, and optimized with its help. The optimization of item production functions is BMU's primary area of expertise.

Moving MIS to the cloud: Challenges and solutions

Administration of changes, SLA When implementing a cloud-based MIS, it is important to keep in mind the following: management decision-making; user training; and teamwork. Updating the IT infrastructure is essential if the investment, which accounts for at least 5-10% of the entire investment, is to remain competitive with emerging technology. A data gathering and forecasting system that executes various computations, reports, and tasks, it is a part of company management software. Although capital expenditures (capex) are necessary to acquire cutting-edge server hardware, this work argues that technology-based misdirected IT infrastructure is significantly more cost-effective, flexible, scalable, and globally accessible. Strategic value management and operational value management are the two primary areas into which the difficulties of company information management fall.

Plant and equipment investment costs are somewhat expensive. Business assets typically have a lifespan of 20 to 30 years from the moment they are invested. Dealing with the long-term and ever-changing corporate environment is the main difficulty of strategic value management. A computerized system with a substantially shorter life cycle than the average plant controls the plant. There is a three-to-five-year period for system improvements due to financial considerations. Misdirected data is associated with the system. Financial risk, strategic choices, and the company's long-term strategy are considered while making investment decisions. Decisions made at the operational and managerial levels, as well as organizational performance and market expansion, define the short-term vision of the company. Included in this are the goals for the future of the company. A basic area of difficulty and difficulty is created by these two distinct goals. Using a case-based research approach, this paper details the difficulties of today's corporate climate and suggests solutions.

The cloud-based MIS strategy starts with a thorough needs assessment. Determine the system's needs, goals, and processes. Workflow analysis, user needs, and stakeholder input are needed here. Needs will guide system design and development. Create the cloud-based MIS model after needs assessment. Map system architecture, identify important components, and generate a high-level design document. Consider scalability, security, usability, and system integration when designing. End-users and stakeholders should provide feedback at this phase to verify the design fits their needs. Data model determines MIS data storage, organization, and access. Data entities and relationships are defined here. The data model should aide retrieval and analysis. Data security and privacy must also be considered for sensitive data. This phase creates the cloud-based MIS model. The system is developed using the previous design and data model. Writing user interfaces, backend logic, and database integration with computer languages, frameworks, and tools. Agile software development allows feedback and incremental modifications. Cloud-based MIS models must be extensively evaluated after creation to work. System,

integration, unit, and user acceptance testing. Quality assurance discovers and repairs errors and performance bottlenecks. Test the system across devices and platforms for reliability, performance, security, and usability. Cloud-based MIS model is ready for deployment after extensive testing and verification. The cloud must be optimized for scalability, availability, and data redundancy. After deployment, stakeholders and users receive cloud-based MIS training. User manuals, documentation, and training should help. Disaster recovery and backup plans protect the system and data from unanticipated disasters. The cloud-based MIS model needs monitoring and maintenance for maximum performance and security. Software upgrades, bug fixes, and security patches are necessary to fix vulnerabilities. Upgrades and feature enhancements should reflect user and stakeholder feedback.

Result

Logical approach for expert solution

One technological method for collecting data and integrating it with sources in a MIS is a data warehouse (DWH). Applications used in the software-as-a-service (SaaS) layer include MIS, human resources information systems (HIS), taxation and insurance companies, procurement and supplies, support and assistance desk, client relationship management (CRM), logistics and supply chain management (SCM), and maintenance, including database management systems (DBMS), development environments (DE), and operational support (OS) on the platform-as-a-service (PaaS) layer. It also encompasses server, storage, network, and operating system maintenance. A sensor is operating on the Infrastructure as a Service (IaaS) layer. The following new system implementation layers are required to manage tasks: Data Warehouse and Mining; Knowledge Management and DSS; Processing of GPS data; Processing of items; Processing of images; Billing; Authentication; and Control of sensors. In Figure 3, we can see the cloud-based MIS model's layer design.

The given logical approach for the expert solution appears to be valid. It describes the use of a data warehouse to collect and integrate data in a MIS. It also mentions various applications used in the software-as-a-service (SaaS) layer, including MIS, HIS, taxation and insurance companies, procurement and supplies, support and assistance desk, CRM, logistics and SCM, and maintenance, including DBMS, DE, and OS on the platform-as-a-service (PaaS) layer. The idea of a sensor operating on the infrastructure-as-a-service (IaaS) layer is also mentioned. Additionally, it mentions different system implementation layers required to manage tasks such as data warehousing, knowledge management, GPS data processing, item processing, image processing, billing, authentication, and control of sensors.

Concise overview of data warehouses in organization

Data warehouses allow business owners to retrieve and analyze current and historical information from their company's information systems. Here, the business chose to employ a data warehouse (DWH) as a technological means to collect and consolidate inaccurate information sources. The ability to store and add external data to a data warehouse is advantageous since it does not require exporting data from inside the organization or interfering with the operation of internal business systems (38). A data warehouse allows for the consolidation, reorganization, and modification of data as well as the addition of data from other sources to better meet the needs of management and reporting. With a data warehouse, a separate database may set up just for reporting and administration needs. Various data change decisions can be made to support analysis, and the database can be built for management and reporting.

MIS/Data warehouse deployment

Information gathered from the following departments: HR Management, Automation, Finance and Accounting, Maintenance, and the Commodities and Stock Market was stored in a data warehouse on a cloud system.

By merging information from several sources using, the MIS's reporting system searching can be optimize. Basic calculations can be executed by the reporting system. This program can be use with a variety of database packages and providers. Business people without deep technical understanding are the target audience for this

design. An intuitive user interface was a primary design goal in developing this product, which mostly serves for reporting and analysis purposes. Here, it serves as both the foundation for the company's database and the repository for all of its data. Included in this category are relational databases and multidimensional data sources. The data warehouse and system connections used by the case company are schematically shown in Figure 4.

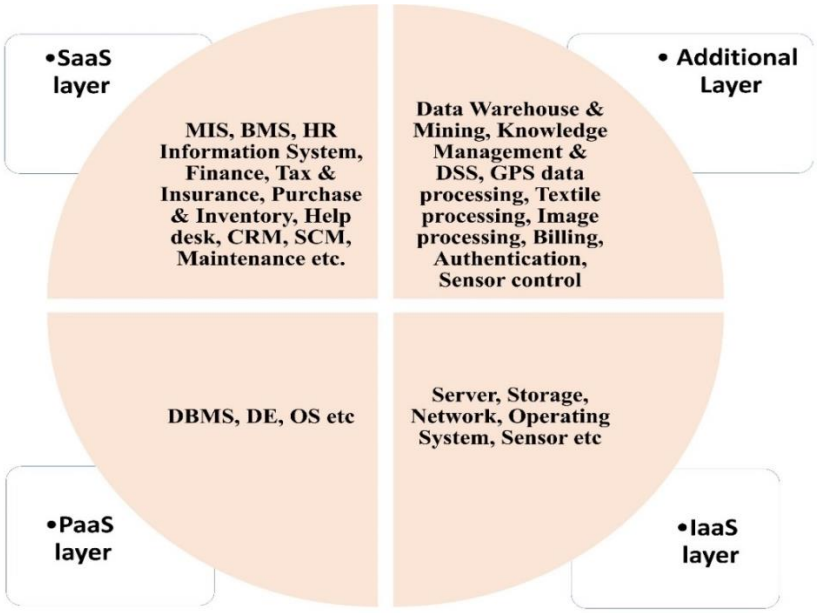

Figure 3: Cloud based MIS model layer architecture

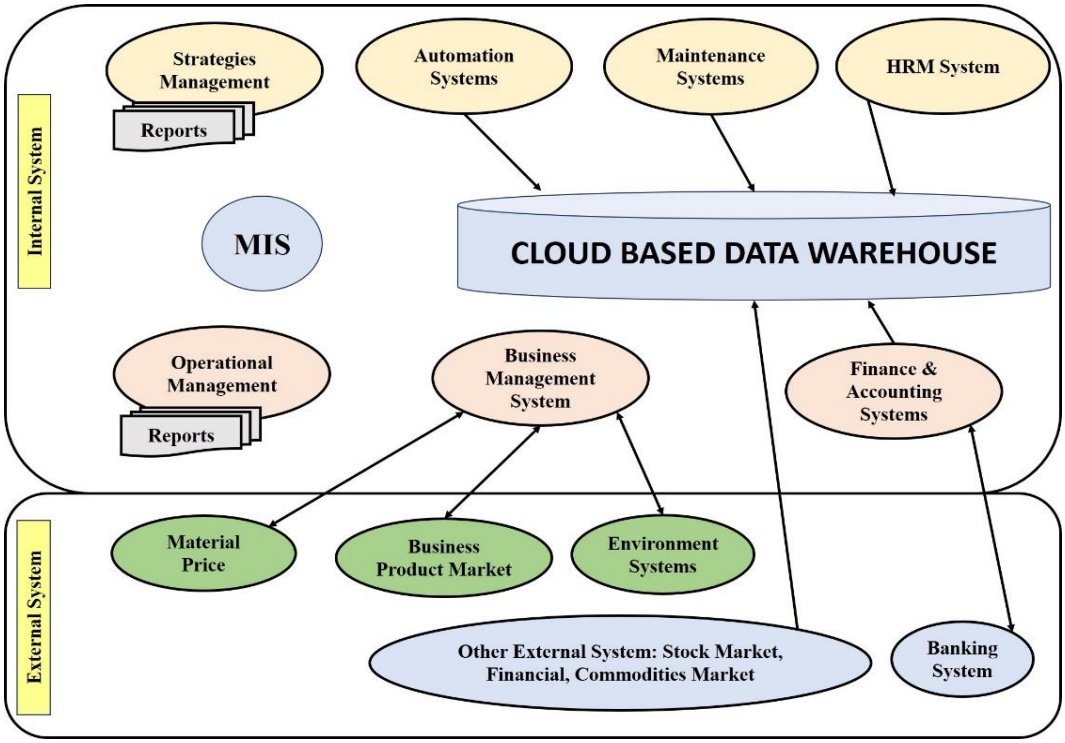

Figure 4: Cloud based MIS and data warehouse model layer architecture

Gateway for presenting MIS reports

Any location in the globe can connect to a secure web-based hybrid cloud. One such use case is as an online method for granting remote access to private company networks. Another use for the cloud is to disseminate MIS reports. Authenticate User Group is a simple file solution. Files can be sent and received securely from any web browser. It enables businesses to safely distribute information in certain instances. A company's demands can be met by tailoring user groups to their specifications.

Cloud-based management information system security and privacy concerns

Both private companies and public agencies are big fans of MIS systems hosted in the cloud. In these industries, it is quickly becoming an essential component of data management. Companies still worry a lot about data security and privacy while they're making plans, even though cloud computing makes data sharing across stakeholders possible (39). Stability in data protection is critical within the context of each organization's unique needs. Security management based on protocols and solutions can eliminate the loss of data hosted in the cloud for the following relevant reasons (40).

1. Organizations utilizing cloud-based MIS are unable to exert control over cloud-driven assets and data (41).
2. Security issues arise as a result of cloud hosts' asset control and agent management (41).
3. Thirdly, neither the providers nor the hosts of the cloud can be guaranteed to function properly (41).
4. Important market data could be leaked to competitors or bad actors, which is a real concern (41).

It is challenging for businesses and government agencies to have faith in cloud systems when they handle complicated and massive volumes of data (39). Full consideration of the unique challenges of data security must be exercised when monitoring the cloud-based MIS (41). Data management in the cloud necessitates vigilant oversight of the management and regulation of many parties. Therefore, data accuracy will have to be a top priority, since it is critical to the data protection strategy of the organization (42).

The data management strategy needs to adhere to the security standards set by SMEs. The diversity of users, platforms, and data management is a challenge for SMEs. Many complex data processing procedures are spawned by dynamic data transport. A great number of intermittent data processors causes different appropriation, making data processing sensitive to multiple dimensions. Data management is made easier because businesses and government agencies rely on cloud providers to store and process their data.

Companies run the risk of data loss when they use cloud platforms and services because they are not under their control (41). The unique security needs of data sent to third-party providers are unknown to them. Because of the implications for data ownership, businesses must organize and oversee data storage and retrieval in compliance with the protocol and security measures in place (41). Complex data processing and project management designs need careful consideration of many aspects. The organization's essential data assets are impacted by cloud-based poor investments.

There are security risks associated with cloud hosting assets that must be thoroughly investigated and resolved. Since the majority of security issues surround online and other cloud-based services, this is an important factor to consider while making the decision to implement it. Many of these services fail to prioritize the safety of the platform that supports them. There are a lot of different kinds of cloud services, and the biggest worry is that the system that backs them up hasn't thought of every possible security measure.

Discussion

With the help of the deployed MIS, strategic management is able to store long-term trends free from the limitations of source systems and provide reports tailored to their specific requirements. More than that, it improves operational management by giving current, real-time data on routine company operations. The major benefit is that it allows for better control over the timeliness and precision of information distribution. The manual transfer of data is not feasible in comparable systems. Case studies in MIS are the focus of this research, which

looks at one company's experience with a project that significantly affects MIS development.

Just like in academic case studies, the findings and technical solutions offered here won't work anywhere else. One should stay away from evaluating MIS elements that violate company secrets, presenting precise computations, and providing thorough logic. Confidentiality breaches, restrictions on the research methodology, and the concealment of corporate identities and data specifications are further drawbacks of this study. In order to generalize the study approach, it would be necessary to conduct additional investigations on diverse example companies.

Companies looking for a low-cost, highly available, scalable IT resource solution with large processing and storage capacity are finding cloud computing to be an appealing alternative. To enjoy these advantages, cloud computing must be implemented well.

Researchers in Ethiopia should focus on the obstacles that both public and commercial organizations face when trying to use cloud computing. Companies face difficulties in adopting cloud computing due to its nature. More and more, problems including security, privacy, trust, awareness, and government policy are taking centre stage. The government, business sector, financial sector, and other organizations in Ethiopia have been hesitant to adopt cloud computing despite its potential operational and economic benefits. This is due to significant concerns around data integrity, security, trust, and protection.

Conclusion

An effective and practical solution for a corporate setting is the installation of a management information system. The real reports from management could end up helping to fix the company's issues in the long run. The reasoning behind the values included therein defines mis factors. The most significant benefit of MIS seems to have been realized when the novel concept of merging information management methods and tools was applied to the problem of creating intricate, high-quality technological solutions. Instead of tackling problems with complex, high-end technological solutions, the primary benefit of MIS seems to come from creative ideas on how to combine information as management tools. It would appear that the most cost-effective program approach is to implement MIS with existing commercial data warehouses and cloud reporting solutions. The expert solution describes how a data warehouse collects and integrates MIS data. MIS, HIS, taxation and insurance companies, procurement and supplies, support and assistance desk, CRM, logistics and SCM, and maintenance, including DBMS, DE, and OS on the platform-as-a-service (PaaS) layer, are also mentioned. IaaS-based sensors are also suggested. It also lists system implementation layers for data warehousing, knowledge management, GPS data processing, item processing, picture processing, billing, authentication, and sensor control.

Abbreviations

ANN: Artificial Neural Network
BMS: Business Management System
BMU: Business Management Unit
CAPEX: Capital Expenditures
CMUS: Computerized Maintenance Units
CRM: Client Relationship Management
DBMS: Database Management Systems
DE: Development Environments
DSS: Decision Support System
DWH: Data Warehouse
ERP: Enterprise Resource Planning
FMSEDA; Federal Micro and Small Enterprises Development Agency
GPS: Global Positioning System
HIS: Human Resources Information Systems
HR: Human Resource
HRIU: Human Resource Information Unit
IAAS: Infrastructure as a Service
IIMS: Intelligent Information Management Systems
IOT: Internet of Things
IT: Information Technology
MIS: Management and Information Systems
OS: Operational Support
PAAS: Platform as a Service
SAAS: Software as a Service
SCM: Supply Chain Management
SDGS: Sustainable Development Goals
SEM: Structural Equation Modelling
SLA: Service-Level Agreement

SMEs: Medium and Small Organizations
STOPE: Security Types, Threats, Objectives, Ranks, Protection Methods, Effects

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Conflict of interest
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