Journal of Contemporary Issues in Business and Government Vol. 30, No. 01, 2024

https://cibgp.com/ P-ISSN: 2204-1990; E-ISSN: 1323-690

THE DIGITAL CLOUD AS A REQUIREMENT FOR ESTABLISHING THE FOUNDATIONS OF THE DIGITAL ECONOMY AMID CONTEMPORARY TECHNOLOGICAL CHALLENGES - REFERENCE TO SERVICE MODELS IN ITS APPLICATIONS

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Received: 12/2023 **Published: 03/2024**

ABSTRACT:
The transition towards a digital economy constitutes a cornerstone in contemporary technological evolution, highlighting the role of the digital cloud as a crucial factor and catalyst for growth and innovation. The digital cloud, with its flexibility, speed, and efficiency in data storage and processing, offers new opportunities for both institutions and individuals to adapt to ongoing technological challenges. It provides effective solutions to these challenges through a flexible and secure infrastructure capable of handling and analyzing vast amounts of data efficiently.

This investigation seeks to illuminate the critical role of cloud computing in laying the groundwork for the digital economy, demonstrating how cloud technology enhances operational efficiencies and augments adaptability for businesses within the digital commerce landscape. Cloud computing has emerged as the preeminent technology among information society professionals and workers, embodying a collection of services delivered by providers through the internet. This enables customers to tap into the providers' advanced capabilities and resources without the necessity of investing in costly infrastructure to achieve similar functionalities within their organizations.

Keywords: Digital Cloud, Digital Economy, Technological Challenges, Cloud Application Models.
JEL Classification Codes :O3, L86, O33.

INTRODUCTION

The hallmark of the current epoch is the ubiquitous integration of advanced information and communication technologies, along with the internet, permeating every facet of life, spanning social, political, and economic domains. These advancements have propelled the global transition towards a digital economy, fundamentally rooted in the principles of e-commerce and information technology within the computing and communications era. This transition has accorded e-commerce a tangible and operational reality, as it leans on computing, communications, and assorted technological methods to facilitate and administer commercial transactions and e-commerce operations.

The digital economy ushers in a myriad of transformations and activities, from the globalization of commerce, finance, and manufacturing. This novel economy is predicated on knowledge, or rather,

scientific and technological insights, and it fosters the creation of new products and services that possess cognitive value over material substance. The rise of the digital economy has surmounted numerous traditional barriers, such as those imposed by geographical distances and the tangible aspects of exchanged goods, paving the way for digital products. This evolution has eased the entry into the digital commerce realm, transitioning economic activities from their conventional formats to virtual platforms, thereby reshaping the geographical contours of marketplaces.

Amid ongoing technological progress, corporations encounter escalating challenges pertaining to cybersecurity and the management of substantial data volumes. Cloud computing presents viable solutions to these issues, offering a flexible and secure framework that facilitates the effective processing and analysis of large datasets. This impending revolution in the realm of the internet has prompted both organizations and individuals towards its adoption. It encompasses services rendered via devices and software linked to a network of servers that host data on a virtual cloud, ensuring uninterrupted connectivity across diverse devices (such as computers, tablets, smartphones, etc.).

Cloud computing is distinguished by its capacity for seamless data synchronization across numerous devices globally. Instances of cloud computing involve document creation on Google Docs, file sharing through Dropbox, hosting private servers on Amazon Cloud, and the storage of music and photos on Apple iCloud. These online functionalities significantly boost user productivity.

This research aims to focus on the importance of electronic computing or what is known as the digital cloud, and its contribution to providing distinction, dynamism, high flexibility, and sustainable competitiveness to entrepreneurial projects, thereby improving the quality of their provided services. From this standpoint, the main question arises: "How do digital cloud technologies contribute to enhancing and developing the digital economy, and what are the leading service models in this field that face contemporary technological challenges?"

To address the content of the research, the following points will be clarified:

- The digital economy and the changes it has brought to the business environment.
- The digital cloud between understanding and application.
- Models of applying electronic computing services in the context of the digital economy.

THE DIGITAL ECONOMY AND THE CHANGES IT HAS BROUGHT TO THE BUSINESS ENVIRONMENT

The concept of the "digital economy" originated in the United States, credited by numerous economic scholars to the pervasive influence of information and communication technologies. This influence extends beyond the realm of technology, affecting both traditional and emerging industries alike (Al-Ghali, 2004, p. 4).

DEFINITION OF THE DIGITAL ECONOMY:

The digital economy is characterized as an economic model driven by digital technologies, encapsulated by digital communication networks like the global information network "the Internet" and internal information networks "Intranet," along with computers, software, and the broader spectrum of information and communication technologies (Mujahidi, 2014, p. 4). It is delineated as:

- A term denoting the internet-centric economy or web economy, engaging with digital data, digital consumers and enterprises, digital technologies, and digital goods (Najm, 2004, p. 88).
- An economic system rooted in digital technology, symbolized by digital communication networks that include the global information network "the Internet" and internal

information networks "Intranet," as well as computing and software solutions (http://us.moheet.com/asp/show, 2023).

A pivotal attribute of the digital economy is its incorporation of information as a critical component alongside the traditional production elements: labor, capital, and natural resources. Information technology has ascended as a quintessential facet of contemporary technology, with its influence permeating beyond productivity to alter the dynamics between developed economies, as well as the interrelations among the public and private sectors, transcending social strata, cultures, and nations.

The digital economy has been coined various appellations, among which are: the new economy, the knowledge economy, the internet economy, the web economy or dot-com economy, and the virtual economy (Hassan, 2019, p. 20). These terminologies reflect the continuous interplay, amalgamation, and coordination between information technology and communication technology.

At its core, the digital economy is underpinned by digital processes and electronic technologies. It encompasses all commercial, service, and transactional activities conducted over digital networks, thereby facilitating the proliferation of the information and knowledge society. This advances the development of digital governance and institutions, e-commerce, e-banking, and electronic administration.

This paradigm necessitates a society well-versed in informatics, an augmentation in the deployment of electronic computers in transactions and operations, an increase in connectivity to the global information network (the Internet), the advancement in the application of commercial software solutions, and the management of human resources alongside educational and training initiatives.

The proliferation and prosperity of the digital economy hinge on the capacity of individuals and institutions to engage with information networks and various internet platforms, requiring active participation in this network. The architectural framework of the digital economy mandates a robust infrastructure within the economy, achieved through the provision of efficient and potent communication networks at reduced costs, and the availability of essential machinery, equipment, and expertise (Al-Najjar, 2004, p. 12).

Information technology significantly influences the nature and strategies of competition, enhancing competitive stances. The market structure is reshaped by the extent of implementation of information and communication technologies within the digital economy, both on domestic and international fronts. It is imperative for information technology to be seamlessly integrated across organizations and various economic sectors, notably manufacturing, agriculture, and the sectors of financial, banking, and investment services.

THE FOUNDATIONS AND NEW ASSUMPTIONS OF THE DIGITAL ECONOMY:

The foundational elements of the digital economy are intricately linked to digital information technology, notably the Internet, and are grounded in a series of innovative principles and frameworks as outlined (Al-Najjar, 2004, p. 278):

- **The law of digital assets:**Unlike tangible assets, digital assets are unique in that their usage does not deplete them. Organizations can leverage these assets across countless transactions to generate value, necessitating a shift in competitive strategies. The initial investment in creating information represents a significant cost, but the marginal cost of its replication approaches zero, illustrating the principle of increasing returns in the realm of digital assets, in stark contrast to the diminishing returns observed with physical assets.

- **New economies of scale:**The concept of economies of scale traditionally implies that production at a smaller scale is more suitable for smaller entities, but as production scales up, larger organizations become more economically viable. However, in the digital economy, this notion is disrupted, as services like banking can be provided to an expansive customer base simultaneously without the constraints of scale.
- **New economies of scope:**The digital economy expands the operational and service delivery horizons through digital assets, enabling simultaneous service provision to a broad audience within a specific domain or across diverse and varied markets and fields.
- **Cost compression per transaction:**The advent of the Internet has revolutionized transaction dynamics, equating clicks with transactions ("Clicks=Transactions"), thereby drastically reducing the cost per transaction. This evolution has led to a surge in overall activity volume, offering significant revenue generation opportunities through digital interactions.
- **Rebalancing supply and demand:**There's a pivotal shift in the digital economy from a supply-oriented approach to a demand-driven model, moving from operating system-centric enterprise strategies to market-centric strategies that respond in real-time to consumer demands. This transition highlights the abundance of supply in various forms, facilitated by the Internet's global reach, against the backdrop of demand scarcity (Mohammed, 2016).
- **The cost of the digital product:** The cost structure and behavior of digital products diverge markedly from those of physical products. The initial creation of a digital product incurs a high expense, but subsequent reproductions are significantly more cost-effective.

CHANGES ACCOMPANYING THE DIGITAL ECONOMY:

The digital economy has brought about numerous changes to the business world that can be considered revolutionary due to their speed (Mustafa, 2022, p. 1423):

❖ General Characteristics:

These primarily relate to markets, the competitive environment, and the production system. Among these characteristics, one of the most significant features of the digital economy is its increased dynamism and the expansion of its market space, as it is not confined by the geographical boundaries of markets after introducing the concept of virtual communities and markets.

This has helped many organizations achieve global reach. Another key general characteristic of the digital economy is its reliance on a networked organizational form through the use of networks and communication technology instead of hierarchical organization. Furthermore, the production system has become more flexible and primarily relies on creativity and knowledge, utilizing digitalization as an alternative to mechanization and automation (Goldner, 2013).

❖ Workforce:

It is observed that its goals in the digital economy differ from those in the traditional economy. While the primary goal in the traditional economy is to achieve full employment, in the digital economy, it is to achieve the highest income through reliance on knowledge-based skills rather than job specialization. This makes the nature of jobs more dynamic in the digital economy than in the traditional one.

ECONOMIC GROWTH:

This aspect covers the previous part related to the workforce due to its close connection with economic growth. Therefore, we find that the primary goal of the traditional economy is to provide as many jobs as possible, which is achieved by striving for full employment and reducing costs.

In contrast, the primary goal of the digital economy is to achieve the highest income to realize growth through focusing on high quality, innovation, and the development of individual skills. Hence, the sources of competitive advantage in the traditional model are fixed, whereas in the digital model, they are variable due to their association with individual and organizational adaptation and learning.

Table 01: Comparison Between the Digital Economy and the Industrial Economy

Economic Characteristics	Traditional Economy	Digital Economy
Markets	Somewhat stable	Dynamic
Competition	National	Global and Local
System	Hierarchical Bureaucracy	Network-based
Political Goal	Full Employment	Adaptation, Conformance, and Maximizing Return
Other Areas	✓ Factory economy ✓ National framework ✓ Regional distribution ✓ Maximum number of customers ✓ Competitive strategy ✓ Supply-based market ✓ Workforce ✓ Payment through traditional banking network	✓ Added-value economy ✓ Continental framework ✓ Network distribution ✓ Customers as needed ✓ Collaboration strategy ✓ Demand-based market ✓ Brain power (knowledge workforce) ✓ Payment through the internet

Source: Michel Amiel, Joseph Jacobs, (1998)

THE DIGITAL CLOUD: UNDERSTANDING AND APPLICATION

Originally, the "cloud" metaphor was employed to depict the Internet in schematic network representations, where a cloud-like figure was used to symbolize the process of data transmission from its origination points to its destinations across the Internet. The conception of offering software as a service was brought to prominence by John McCarthy, a luminary at Stanford University, who posited that "Computing may someday be organized as a public utility." McCarthy envisioned a future in which computational resources and even specialized applications could be marketed as services, adopting a utility-based business model (https://www.forum.hyyat.com, 22-11-2017).

Although this notion gained traction in the late 1960s, interest waned by the mid-1970s as the technological infrastructure at the time was inadequate for sustaining such a futuristic computing paradigm. However, this concept has witnessed a resurgence and has become a prevalent term within contemporary tech circles and organizations.

CONCEPT OF THE DIGITAL CLOUD (CLOUD COMPUTING)

Cloud computing, or the computing cloud, is a paradigm that facilitates the provision of computing resources as services, enabling user access through the Internet without requiring detailed knowledge, expertise, or control over the technology infrastructure that underpins these services (Al-Hamid, 2012, p. 25).

Furthermore, cloud computing encompasses a broader concept that includes Software as a Service (SaaS) among other recent technological advancements, all sharing the principle of leveraging the Internet to fulfill computing requirements.

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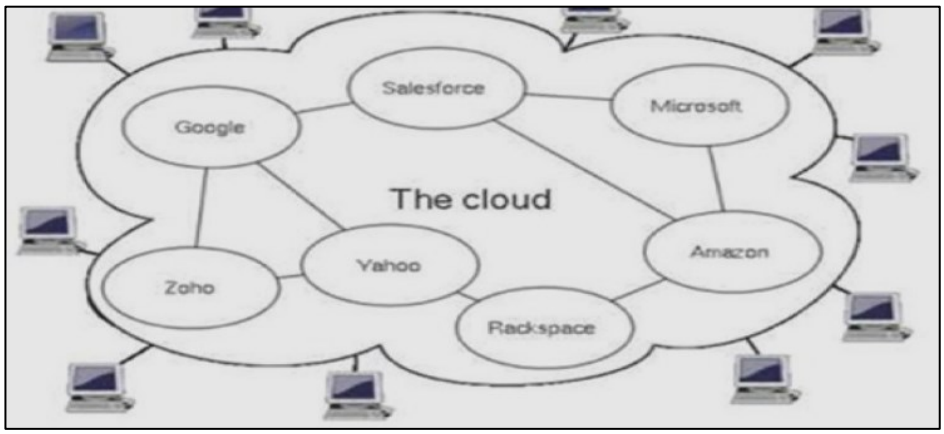
This model has revolutionized IT service concepts and applications, particularly in terms of the infrastructure solutions upon which organizations depend to streamline their operations. A multitude of enterprises, both large and small, have discovered their solutions within this innovative framework. Research by the global consultancy IDC indicates that cloud computing contributed to generating over one trillion dollars in additional revenue for organizations in 2014 (Al-Fiqi, 2017).

Cloud computing is defined as the delivery of computing resources and systems on demand across a network, offering an array of integrated computing services beyond the limitations of local resources. These services encompass data storage, backup solutions, automatic synchronization, software processing power, task automation, email services, and remote printing capabilities.

Upon connecting to the network, users gain the ability to manage these resources through a streamlined programming interface that abstracts and minimizes the complexity of the underlying processes and operations (Shawky, 2023). Under the cloud computing model, IT software evolves from a product-based to a service-oriented approach. The infrastructure of cloud computing is underpinned by sophisticated data centers that provide extensive storage solutions and a selection of software services to users, harnessing the functionalities enabled by Web 2.0 technologies (Marwa, 2014).

Figure 01: Elements on Which the Concept of Cloud Computing Is Based



Source: Sabah Mohammed Kalo, March 2015.

The National Institute of Standards and Technology (NIST) characterizes cloud computing as a paradigm that facilitates widespread, facile, and on-demand network access to a collective reservoir of configurable computing assets. These assets can be swiftly allocated and relinquished with nominal exertion from the management side or need for direct interaction with the service provider. According to this definition, there are five critical features that a cloud service must encompass (Sheikhi, 2023):

- **On-Demand Self-Service**: Users can autonomously procure, utilize, and manage their services at any given moment without the necessity for external assistance or technical intervention to automate the process. This capability enhances convenience for both the consumer and the provider. The implementation is typically through a user interface portal that furnishes essential and relevant information, supported by APIs that are managed by the application or service in the backend.
- **Broad Network Access**: The accessibility to cloud offerings is straightforward and only necessitates a conventional internet connection. It is imperative for cloud service vendors not to stipulate high bandwidth requirements from their clientele for software downloads or other forms of internet connectivity (Mell & Grance, 2023).

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- **Resource Pooling**: In cloud computing, resources are amalgamated to cater to a multitude of users via a multi-tenancy model, dynamically reallocating resources in alignment with consumer demand. This pooling is often facilitated by virtualization technology, enabling the enhancement of system capacity through hosting numerous virtual sessions on a singular physical system, thus generating a multitude of virtual environments from one resource pool.
- **Rapid Elasticity**: This feature signifies the cloud environment's capacity to nimbly expand or contract resources to precisely align with the user requirements, guaranteeing the availability of a scalable infrastructure. Automation and orchestration play pivotal roles in achieving rapid elasticity, where resource utilization triggers expansion processes automatically, and then contracts as necessary to prevent resource wastage.
- **Measured Service**: Cloud service consumption must be quantitatively measurable in terms of time, bandwidth, and data usage among other metrics. This measurable aspect allows for the activation of a pay-per-use model, ensuring that users are billed based on their actual consumption of services.

AREAS OF CLOUD COMPUTING APPLICATION

The scope of cloud computing applications encompasses a diverse range of services that cater to various needs and functionalities, as identified by: (Namaait, 2023)

- **Email Services**: Utilizing email platforms like Gmail or Hotmail is a classic example of cloud computing. In this scenario, the user leverages the server infrastructure provided by companies such as Google or Yahoo for email services, utilizing their storage capabilities for sending and managing emails and attachments.
- **Cloud Storage Services**: Services like Google Drive and Dropbox exemplify online storage solutions that employ cloud computing. These platforms offer users the ability to store files in the cloud, eliminating the necessity for physical storage devices.
- **Cloud Applications**: Applications such as Google Docs and Photoshop Express allow users to perform various tasks, including data and image editing, as well as document and spreadsheet creation, directly within a web browser without the need to install dedicated software on their devices.
- **Cloud Operating Systems**: Innovations like Google's Chrome OS represent advancements in cloud computing, offering a cloud-based operating system that promises to expand the boundaries of what cloud computing can achieve.
- **Cloud Hosting Services**: Amazon's EC2 platform is a notable example of Infrastructure as a Service (IaaS), providing robust hosting services that enable organizations to deploy and manage their applications on a scalable cloud infrastructure. Additionally, Software as a Service (SaaS) models offer users limited control over the operating system and runtime environments, aiding in reducing administrative burdens and costs.
- **Unique Payment Methods**: The success of the Apple Store's payment system illustrates the move towards simpler, cloud-based payment solutions. As the mobile market evolved, the need for alternative payment systems grew, leading to the development of cloud payment services that streamline transactions between app developers and their customers.

From these examples, it's clear that cloud computing technology seeks to fulfill several key objectives, as outlined by Nabil (2023):

- ✓ Providing users with the ability to access files and applications from the cloud, minimizing the need for local storage and processing power, thereby reducing security vulnerabilities and hardware requirements.
- ✓ Ensuring continuous operation and accessibility of cloud services from any internet-connected device.

- ✓ Prioritizing security for web platforms, especially in e-commerce, by adopting comprehensive security measures and obtaining certifications like ISO 27001, SysTrust, and ISO 9001 to safeguard applications, networks, and devices.
- ✓ Facilitating remote access to applications and services from anywhere at any time, with data stored securely on service provider servers rather than on local devices.
- ✓ Leveraging the extensive infrastructure of cloud services for conducting scientific research and complex calculations, which can be completed in significantly less time thanks to the computational power of cloud resources.
- ✓ Offering a high degree of scalability, allowing services to adjust to business demands, accommodate growth, and respond to seasonal peaks or promotional activities effectively.

To benefit from these advantages, a set of elements must be available to ensure security when using cloud computing and to achieve the continuity of its efficiency in a manner that satisfies the customer when using it. Cloud service providers focus on several security elements, including: (Safe Use of Cloud Computing, Monthly Security Awareness Newsletter for Computer Users, 2014.)

- ➢ **Identity Management System**: Ensuring the identity of individuals requesting access to databases and stored information is authentic is crucial. This step is fundamental to guarantee that only authorized personnel can view or manipulate this data.
- ➢ **Complete Data Protection**: Data confidentiality is a shared obligation between service providers and clients. Both parties are tasked with safeguarding the privacy of information and preventing access by unauthorized entities.
- ➢ **Security Elements in Applications**: When programmers undertake the development or modification of applications, incorporating robust security measures is paramount. These measures not only thwart potential breaches but also enhance the overall performance of the applications.
- ➢ **Ease of Use**: Simplifying the process for data storage and retrieval is essential. Complex interfaces increase the likelihood of user errors, so it's important to ensure that the system is intuitive and straightforward to use.

MODELS OF IMPLEMENTING ELECTRONIC COMPUTING SERVICES IN THE CONTEXT OF THE DIGITAL ECONOMY

The domain of information technology is rapidly evolving, giving rise to concepts like the digital economy. To grasp its significance, one only needs to consider California's economy, buoyed by tech giants such as Google, which stands as the sixth-largest globally. The transition to the digital economy necessitates a preliminary phase of digital transformation across organizations and nations (Sharif, 2012, p. 12).

Digital transformation can be succinctly described as the integration of IT technologies and processes with corporate strategies to bolster business efficiency, create new revenue streams, and foster innovation within organizations. This transformation journey is complex; statistics reveal that a mere 16% of UK organizations surveyed have a digital transformation strategy in place. However, over 70% are in the process of developing a strategy that pivots towards a new tech paradigm, specifically cloud computing.

It's critical to understand that not all web-based applications qualify as cloud applications. An application, along with its associated services, must exhibit specific traits to be classified under the cloud computing umbrella.

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REQUIREMENTS FOR ESTABLISHING CLOUD COMPUTING FOR THE DIGITAL ECONOMY TRANSITION:

The application of cloud technology varies across organizations, contingent on their specific needs for accessing services through the cloud and their preferred degree of control over the cloud infrastructure. To cater to these diverse preferences, the cloud can be deployed in various configurations, each with distinct requirements and advantages, as outlined below (https://emadsarhan.com/):

- **Public Cloud**: Within this model, all infrastructure and resources required to deliver the service are housed with an external provider who oversees the arrangement and maintenance of the systems. The responsibility of the client is limited to any applications or software deployed on the user's device. Access to the public cloud service is generally through the internet, and it may offer some services or portions thereof at no cost.
- **Private Cloud**: Contrary to the public cloud, the private cloud infrastructure is dedicated to a single entity or organization, offering exclusive operation, control, and customization over data security, quality, and service efficacy. The organization assumes the responsibility for the organization and management of the service systems, including any client software. Access to private cloud services is typically via an internal (LAN) or external network (WAN), with remote access often facilitated through the internet or a Virtual Private Network (VPN).
- **Community Cloud (Hybrid)**: The community cloud combines elements of both public and private clouds, catering to a consortium of organizations with shared objectives and requirements. These organizations prefer not to utilize a public cloud open to all but seek the privacy and control features of a private cloud. This model allows for the cost and responsibility of the cloud infrastructure to be shared among the members. (Mavodza, 2013, p. 132)

The hybrid cloud introduces additional complexity but also provides enhanced adaptability in aligning with organizational objectives.

In the landscape of cloud computing, the operational framework can be segmented into three foundational categories, upon which all associated services and applications are structured. These categories collectively encapsulate the diverse range of cloud computing services (arageek, 2017):

- **Platform as a Service (PaaS)**:

At its core, PaaS comprises an assortment of libraries, middleware, updates, and runtime tools indispensable for developers to refine and manage software applications as a service. This service model leverages the virtual environments provided by the "Infrastructure as a Service" layer, enabling the deployment and delivery of developed software using the virtual resources of the IaaS framework (Mavodza, 2013).

An exemplary manifestation of PaaS is the Google App Store, which is designed predominantly for developers seeking to launch their applications on a cloud server, bypassing the complexities of the underlying service infrastructure.

- **Infrastructure as a Service (IaaS)**: IaaS offers foundational infrastructure services that can encompass physical servers, virtual machines, network components, storage solutions, or a combination thereof. Clients are granted the flexibility to construct a wide array of computing setups on this managed infrastructure, including the installation of operating systems and applications of their choice. IaaS enables the remote administration of sites via the internet, thus facilitating a more adaptable and cost-effective approach for organizations.

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Notable instances of IaaS include CRM solutions such as Salesforce, billing systems like Invoicera, and Amazon Web Services' data centers, which enhance organizational agility while minimizing expenses.

- **Software as a Service (SaaS)**: As the initial and most prevalent form of cloud computing, SaaS focuses primarily on delivering end-user applications, ranging from email platforms and customer relationship management (CRM) tools to collaborative software and workflow management solutions. It further permits businesses to introduce and manage their bespoke applications within a remote framework, affording them extensive control and capabilities.

As of current, popular SaaS offerings encompass CRM and Enterprise Resource Planning (ERP) systems, empowering many organizations to transition their application usage to the cloud, thereby achieving significant savings in time, resources, and financial outlay (Sheikhi, 2023).

ORGANIZATIONS' RATIONALES FOR MOVING TOWARDS CLOUD COMPUTING SERVICES

Historically, the introduction of a new application within organizations entailed considerable initial investments in infrastructure and personnel training. However, by opting for appropriate cloud service providers, these expenditures can be drastically curtailed. The cloud plays a pivotal role in optimizing technology consumption in today's digital era, with various drivers propelling organizations toward cloud services. These drivers can be delineated into several key factors (Al-Harbi, 2020).

System Factors:

Many system factors lead organizations to use cloud services. An organization might want to add certain features to its current system structure but may lack the expertise or budget to internally provide those features. Thus, they turn to cloud service providers to offer them. These features include:

- **Flexibility**: Cloud infrastructures facilitate the swift adjustment or allocation of resources in accordance with the intensity of demand, thereby enhancing operational agility.
- **Dependability**: Establishing a highly reliable infrastructure in-house can incur significant expenses, typically necessitating multiple redundant systems or even several data center locations.
- **Expandability**: Cloud systems are designed to seamlessly scale up to accommodate the evolving requirements of customers, ensuring that resources are always aligned with demand.
- **Simplified Management**: Maintenance simplicity ranks among the cloud's most appealing attributes, with the cloud provider assuming full responsibility for this aspect. Engaging in maintenance contracts with numerous vendors can be prohibitively expensive, yet a cloud solution consolidates this into a single agreement with the provider.
- **Security and Regulatory Adherence**: Cloud management personnel, including administrators and engineers, are not required to possess a broad spectrum of knowledge. Instead, they can concentrate on fortifying specific environments or types of data. This specialization allows for a more focused approach to implementing robust security protocols and compliance measures. (Al-Fiqi, 2017)
- **More Time for Innovation**: Since using cloud computing offloads many burdens from the organization to the service provider, more time is available for its employees to engage in other activities, most of which are related to innovation, planning, and new strategies for the organization. Statistics have shown that more than 60% of American

and British organizations using this model noticed an improvement in the innovative capabilities of their IT staff. Moreover, the savings from IT costs are invested in innovative activities, as confirmed by 50% of those organizations. (www.tvtc.gov.sa/Arabic/Departments)

- **Lower Costs**: The cost of initiating digital transformation projects is very high, but the cloud computing model has led to a reduction in IT service costs by up to about 30%. For example, the Towergate insurance company was able to reduce its IT costs by $5 million using cloud computing. Cost reduction comes not only from reducing capital costs (CAPEX), which includes purchasing equipment and hardware but also from reducing operational costs (OPEX), including maintenance, license renewal, and more.
- **Clearer Cost Measurement**: In IT, there's a concept called Total Cost of Ownership (TCO) that suggests cost should not only be measured by the device's price but should also include other factors like training. Using cloud computing can reduce total costs by 10% to 30% and also adds more transparency to IT service usage, allowing an organization to more accurately measure how different units use computing resources. This factor led about 30% of British companies surveyed to use cloud computing. (Al-Shiti, 2015)
- **New Services and Products**: Using cloud computing enables organizations to offer new services and products that were not previously available due to high costs or the lack of necessary computing resources. Many new services have been launched thanks to cloud computing, such as Dropbox and Airbnb. There are also many technologies related to computing that use it as a unique source for new services, such as big data and the Internet of Things.

➢ **Electronic Employment**:

Instead of directly employing administrative and technical staff in office settings within the organization, you can work with them virtually over the internet from anywhere in the world. Accessing programs and applications ready for immediate use through the electronic cloud does not require any labor except for consulting related to operating and executing the cloud application to work ideally. (/sites/default/files)

➢ **Increased Profits**:

This is what most organizations, especially profit-oriented ones, strive for. A study by Harvard Business Review confirmed that 40% of organizations that used cloud computing achieved higher profits. The business volume related to cloud computing for Amazon alone is about $11 billion.

With these benefits, it's clear that cloud computing is a distinguished starting point for digital transformation, despite some obstacles that organizations strive to overcome.

MODELS OF IMPLEMENTING CLOUD COMPUTING SERVICES AS AN ENTRY TO DIGITAL TRANSFORMATION

The origins of cloud computing can be traced to the 1960s, though it wasn't until the early 2000s that cloud computing began to take a practical shape, particularly when Microsoft pioneered the concept of delivering software via the internet. This innovation set the stage for a wave of advancements by various firms in the technology sector.

Google, in particular, has been instrumental in advancing cloud computing, deploying a multitude of services that leverage this technology. Google's contribution went beyond merely offering cloud-based services; in 2009, it unveiled a comprehensive computer operating system built entirely on cloud computing principles (Sarhan, 2016). This development underscores the significant focus on cloud computing by leading tech companies, marking a pivotal shift in how software and services are delivered and utilized.

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❖ **Google**:

Google offers all its subscribers with a Google account the Google Documents service, allowing subscribers to write their documents in a program similar to:

- Microsoft Word, publish it online immediately after writing, and allow others to view and edit the document as per the document editor's wishes.
- Design and edit spreadsheets, similar to Excel.
- Create presentations, similar to PowerPoint.
- Edit forms.

Thus, Google Docs users can use applications similar to Microsoft Office applications through the internet. These applications are hosted on Google's servers, providing users with a starting storage space of 1 GB that can be increased. It also allows immediate online publishing after finishing writing.

In addition, Google offers the cloud service Google Drive, which has become globally resonant and widely applied by researchers and information institutions since its introduction in 2012, allowing users to store their various files on Google's main servers. Google Drive is distinguished by its effective diversity in the services provided, including Publisher Support, Research Gate, and Drop Box (Goldner, 2013).

- **Microsoft**: Microsoft offers subscribers of Windows Live Messenger a free storage space through SkyDrive, providing 25 GB free for users' files.
- **Red Hat**: Offers the Open Shift cloud, which was used by Amazon in its diverse projects. This company provides its cloud services for free to gain a competitive edge globally.
- **Amazon**: A leader in cloud computing technology, Amazon offers a vast range of services known as AWS - Amazon Web Services, including many applications, databases, and giant server devices that developers need to complete their work. These services are considered less costly for companies wishing to accomplish extensive and expensive work.
- **Mobile Phone Services**: Mobile companies, both manufacturers and service providers like Apple and T-Mobile, have benefited from cloud computing applications, offering services that allow users of certain types of phones to create personal accounts on these companies' servers. The mobile phone can sync with the personal account on these servers, take backup copies of the phone directory or addresses, and even control and track the phone using these services. (/sites/default/files).
- **Education - University of Arizona**: Used cloud computing to create a digital educational environment that allows students and teachers to interact and access educational resources remotely, especially during the COVID-19 pandemic.
- **E-commerce - Amazon**: Amazon is a pioneer in using cloud computing not only to operate its online store but also through AWS (Amazon Web Services), which provides cloud infrastructure to other companies.

Most software-producing companies now offer their applications through the cloud, ready for immediate operation at a reasonable annual subscription cost. This includes office programs, enterprise resource management applications, content management systems, workflow management tools, e-learning systems, and more.

Customers can now use renowned technical systems through the cloud at a cost much lower than the licensing costs, while at the same time obtaining them in a more secure and stable manner than before. This also eliminates the costs, problems of maintenance, management, protection, and support associated with installed systems.

- **Universities and Schools**: Even universities and schools can now use cloud computing in managing their operations or in the educational process by utilizing tools available on the cloud without the need to install devices, networks, and programs. Relying on cloud infrastructure in the learning system provides the educational institution and teachers with high flexibility in continuous change and development without being tied to specific applications and devices.

  It enables the addition of new tools or the removal or modification of others according to the needs of the curriculum and the nature of the learners and emerging technologies. It also provides easy access via mobile devices used by today's generation, making it closer to learners and more dynamic in dealing with the continuous acceleration of internet technologies and considering the diversity of learners from one course to another (Al-Harbi, 2020).

CLOUD COMPUTING APPLICATIONS IN LIBRARIES:

Cloud computing applications in libraries represent a significant shift in resource management and service provision. By using the cloud, libraries can efficiently and securely store vast amounts of data and digital materials, facilitating broad access. This includes e-books, journals, archives, and educational resources. Additionally, cloud computing allows libraries to offer innovative services such as digital lending, electronic cataloging, and online learning platforms.

Moreover, it aids in enhancing collaboration between libraries and educational institutions through easy resource and data sharing, thus boosting research and education. Overall, cloud computing opens new horizons for libraries to improve their services and expand their reach. (https://www.forum.hyyat.com, 2020).

- **Dura Cloud Service:**

This hosting service primarily focuses on providing its services to libraries and uses its remote servers to offer localized services to subscribing libraries, saving them the costs of maintaining their hardware. The service emphasizes preserving digital collections and providing access to them but also allows for sharing significant historical, humanistic, and scientific collections with other libraries. Several libraries rely on this service, among which:

- **Library of Alexandria in Egypt:**

It uses cloud computing to archive digital documents and books, preserving cultural heritage and providing easy access to researchers and the public. Public libraries using services like OverDrive allow users to access e-books and audiobooks over the internet, stored on cloud servers.

- **The Digital Library of Western State College of Colorado:**

Transitioned from utilizing databases crafted in Microsoft Access to adopting Google App Engine, aiming to curtail expenses associated with database upkeep. The institution's online portal reveals that this shift to Google not only facilitates enhanced management of its periodical assortments but also augments the library's collection and fosters opportunities for both faculty and students to contribute publications on the library's digital platform. Moreover, the library has migrated its web hosting to Google, effectively reducing the financial burden associated with the procurement or leasing of high-cost servers (Al-Hamid, 2012, P 13).

- **Cloud Library eBook Lending Service:**

Introduced in 2011 during the American Library Association's annual conference, it presented an integrated solution for libraries built on the infrastructure created by the German company text GmbH. The 3M Cloud Library provides digital content and devices in the library alongside lending and reading apps. (Al-Shiti, 2015).

CONCLUSION:

The discussions within this study underscore several crucial insights regarding the prerequisites for deploying cloud computing services amidst the digital economy landscape. The digital economy is marked by its dynamic evolution, signifying a profound transformation in the modus operandi of businesses and the manner in which individuals engage with the marketplace. Predicated on digital innovations such as the internet, cloud computing, big data, and artificial intelligence, this economic model paves the way for groundbreaking efficiencies and innovations, thereby elevating the productivity levels of entities reliant on information for their operational planning.

With the advent of Web 2.0 and Web 3.0 technologies, alongside the uptrend in internet bandwidth, a multitude of organizations are now pivoting towards offering their applications via cloud computing. This emergent model, based on a pay-per-use structure, grants elastic access to hardware and software assets.

In essence, cloud computing epitomizes a paradigm shift within the information technology realm, democratizing access to commercial, financial, informational, and administrative applications, alongside security measures and operating systems, via the internet. This shift enables users to utilize sophisticated applications at reasonable costs without the obligations of ownership, maintenance, or licensing fees. It has revolutionized data storage and processing methodologies, allowing entities of varying scales to forego the hefty expenses associated with deploying advanced computer applications for their technical requirements. This transition enhances operational flexibility, elevates efficiency levels, and bolsters security measures. Cloud computing encompasses diverse offerings, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), catering to the escalating data demands and the need for adaptable tech solutions, thus enabling access to resources and applications anytime and anywhere, sans the necessity for substantial infrastructural investments.

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