CLOUD MIGRATION, ITS RISKS AND OPPORTUNITIES

A systematic literature review (SLR)

Lappeenranta–Lahti University of Technology LUT

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ABSTRACT

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This study explores the risks and opportunities associated with migrating legacy systems to cloud by categorizing them into four (4) themes; technical, organizational, strategic, and business. As organizations transition to cloud environments, understanding the motivations and criteria for successful implementation is crucial. This research addresses three key questions: motivations for cloud migration, considerations and strategies for migration, and major risks and opportunities pre and post migration.

A Systematic Literature Review (SLR) analyses academic papers and case studies from 2014-2024 was conducted to perform a thematic analysis. The findings reveal the interconnectedness of risks and opportunities, highlighting their influence on decision making in organizations. Successful cloud migration is driven by cost efficiency, scalability, and enhanced collaboration, yet significant risks, such as data security concerns and service disruptions, must be effectively managed.

Practical recommendations are provided to help organizations navigate these complexities. This research contributes to the existing knowledge by offering a structured analysis of cloud migration dynamics, guiding stakeholders in leveraging cloud technologies effectively. The study also outlines limitations and delimitations, suggesting future research directions to explore the ripple effects of cloud migration risks and opportunities with case studies.

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To Joel, I could not have done this without your love, you are my aurora.

ABBREVIATIONS

SLR	Systematic Literature Review
CC	Cloud Computing
SLA	Service Level Agreement
IaaS	Infrastructure as a Service
PaaS	Platform as a Service
SaaS	Software as a Service
CAPEX	Capital Expenditure
OPEX	Operational Expenditure
AWS	Amazon Web Services

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1 Introduction

Cloud migration has become a critical topic for businesses seeking to enhance competitiveness and operational efficiency. Is cloud migration a fleeting trend or is it a strategic necessity for modern businesses? How can businesses find a balance between mitigating risks and optimizing opportunities?

Cloud migration, described as "the process where you move digital assets like data, applications, and IT resources to the cloud" (AWS, 2024), enables businesses to leverage cloud services to enhance their digital capabilities, and stay ahead in a fast-changing digital world (Abbas and Chikwarti, 2023). This shift is not just a trend; it is a necessity for businesses seeking to stay agile, cost-efficient, and competitive (DigitalOcean, 2024). The growing popularity is due to its numerous benefits such as scalability, agility, cost-effectiveness, remote access, etc.

The COVID-19 pandemic increased the adoption of cloud services, as organizations were forced to accommodate remote employees and adapt to online demand for services, events, and commerce (Tech Target, 2022). Consequently, cloud migration has become a strategic priority for businesses looking to modernize IT infrastructure, streamline operations, and achieve digital transformation. According to Gartner (2023), by 2026, approximately 75% of organizations will have adopted cloud-based data infrastructure (cited in IBM, 2024). This increasing reliance on cloud services raises questions on understanding impacts of cloud adoption, effective management of associated risks and optimizing benefits.

Despite its numerous benefits, cloud migration is not without risks. Concerns such as data security, downtime, control over data must be carefully considered. Organizations must evaluate these risks and develop strategies to maximize the benefits of their cloud migration efforts.

With the projected growth of the cloud migration market, from USD 232.51 billion in 2024 to USD 806.41 billion by 2029 (Mordorintelligence, 2024), it is important to explore the risks and opportunities that accompany this shift. This research aims to examines the complexities involved in migrating legacy and on-premises systems to the cloud, providing a comprehensive exploration of its associated risks and benefits.

1.1 Key Findings of Previous Research

Much research has already been conducted on cloud migration. Cloud migration is said to be growing at a healthy pace, but other concerning factors are ignored (Kommisetty and Abhireddy, 2024). Reducing cloud migration complexity significantly accelerates digital transformation (Wen et al. 2024). To break down these complexities, Iqbal and Colomo-Palacios (2019) reiterated the importance of effective planning, understanding benefits and risks, and selecting the right cloud provider. Zalazar et al. (2015) provided a foundational understanding of the technical challenges of the migration process, identifying potential risks, especially in security. Similarly, Fahmideh et al. (2017) focused on the organizational challenges, stressing the importance of strategic planning. Numerous studies have also highlighted the opportunities cloud migration presents, including cost reductions, operational flexibility, and improved business scalability (Mejía-García et al., 2024). The ability to "pay only for the resources consumed" has been identified as one of the key financial advantages, leading to substantial cost savings. Moreover, scalability is essential for industries like banking, where fluctuating workloads and peak transaction periods necessitate elastic cloud resources (Hussein and Wilbrod, 2024).

1.2 Research Gap

Despite these contributions, there is lack of comprehensive studies that integrate benefits and challenges of cloud migration in a holistic manner. Most studies focus on technical challenges and leave out broader implications (Wen et al., 2024), and few have explored how organizations can balance these opportunities and risks for successful cloud migration. As Rossana et al. (2024) suggested, integrating both white and grey literature can provide professionals and researchers with strategies for migrating legacy and on-premises systems to the cloud. This study aims to fills this gap by offering in-depth analysis of the risks and opportunities with cloud migration, considering technological, operational, and strategic aspects.

1.3 Research Objectives

This study aims to provide a comprehensive synthesis of the risks and opportunities involved in cloud migration, focusing on legacy and on-premises systems. By categorizing, and analysing these risks and opportunities in cloud migration, this research will offer valuable insights for IT professionals, business leaders, students, and researchers. The key research questions addresses are.

Research Questions	Motivation
RQ1 - What are the motivations for cloud migration and when do we say cloud migration is successful?	This will give insight into the practical reasons organizations embark on cloud migration studies, comparing their results to the objectives, and highlighting what indicated their successful migration.
RQ2 - What considerations should be made and what strategies are available to organizations?	This question aims to highlight the importance of planning and critical considerations to be made before embarking on the cloud migration journey and the adoption of existing strategies to match the needs and situation of the business
RQ3 - What are the major opportunities and risks during and after cloud migration?	This aims to understand the impacts of cloud migration businesses

Table 1: Research questions and motivations

To achieve these objectives, this study will adopt a systematic literature review (SLR) methodology, ensuring a structured review of existing literature and industry reports, including white and grey literature. Real-world case studies of successful cloud migration projects will also be discussed.

1.4 Structure

This research is structured to have seven chapters. The first is the introductory chapter, outlining the research objectives and structure while giving a brief overview of the topic and a review of past literature. The second chapter explores existing research on cloud migration. The third gives a detailed understanding of the research design process. The fourth gives a thematic analysis of risks and the fifth thematic analysis of opportunities. Chapter 6 presents the synthesis from the analysis, discusses how the identified risks and opportunities interact, offers insights into how businesses can manage trade-offs during cloud migration, and the closing chapter summarizes the key findings, discusses limitations, and suggests areas for future research.

2 Background of study

This chapter gives brief description of cloud computing and its services. It explores the motivations for cloud migration, the criteria for successful migration, considerations and strategies, the associated risks and opportunities, and risk mitigation techniques. It aims to provide a comprehensive understanding of cloud migration strategies that have shaped business decisions and the ongoing evolution of cloud computing.

2.1 Cloud Computing

According to ISO (2023), as cited by Wikipedia in the article “Cloud computing” (2023), defined cloud computing as a “paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand." Cloud computing traces its origin traces back to the 1960s, but it was not until the late 1990s and early 2000s, after the invention of the world wide web in the 1980s and rise of the internet, that the cloud gained more popularity (Foote, 2021; History of cloud computing, 2024).

As cloud computing evolved, it introduced various service models that have revolutionized how businesses and individuals' access and utilize technology. These service models offer distinct advantages and cater different needs. They are.

2.1.1 Infrastructure as a Service (IaaS)

According to Microsoft Azure (2024), IaaS is a “type of cloud service that offers essential compute, storage, and networking on demand, on a pay-as-you-go basis.” It is like having a virtual machine, accessing servers, storage, security and data centres from a provider. Examples are Amazon Web Services (AWS) and Google cloud. IaaS is most flexible model but demands significant technical expertise (Wen et al., 2024), which makes deployment quite complex.

2.1.2 Platform as a Service (PaaS)

PaaS as defined by Microsoft Azure (2024), is a cloud computing service that supplies an on-demand environment for developing, testing, delivering, and managing software applications. This is like having an equipped workplace that provides all the necessary tools and services to create software, on rent. Examples include Heroku and Google App Engine. To adopt PaaS, it requires understanding the platform's specific language and tools which makes it relatively complex as use depends on user's experience of the platform (Wen et al., 2024).

2.1.3 Software as a Service (SaaS)

A method for delivering software applications over the internet, on demand and typically on subscription basis (Microsoft Azure, 2024). Once you pay for the service, you can use it from anywhere over the internet, e.g. Microsoft 365 and Salesforce. This is the simplest as business responsibility is simply input and management of data (Wen et al., 2024), making it easier to adopt and to use.

2.1.4 Serverless Computing

Serverless computing enables developers to build applications faster by eliminating the need for them to manage infrastructure (Microsoft Azure, 2024). You do not have to manage servers by yourself, and everything needed in running, scaling or managing infrastructure is automatically provided by the service provider. Example is AWS Lambda and Azure Functions.

Cloud computing possesses characteristics like on-demand self-service, resource pooling, broad network access, rapid elasticity and measured service (Bansal, 2023)

2.2 Motivations for Cloud Migration

Cloud migration refers to the process of transferring business operations into the cloud (Wen et al. 2024). Cloud technology offers on-demand computing resources, eliminating the need for active management by users who can store software, hardware, and network services

remotely (Capgemini, 2022). According to Hajlaoui et al. (2022), cloud computing is characterized with rapid elasticity, measured service, on-demand service etc., as characteristics of cloud computing. Different businesses have made this shift to cloud for several reasons. These reasons differ from business to business.

Every business that embarks on the journey of cloud migration have specific needs. These goals may be unique to the industry or pertain to overall business improvement. For Spotify, the primary motivations for migrating to the cloud were strategic focus and operational efficiency (Gustavsson, 2019). As the company and its customer base grew, they needed to focus on delivering music and podcasts without the burden of managing data centres. In contrast, Betabrand moved to cloud to improve operational efficiency and scalability, ensuring smooth operations during surges in web traffic (Filatov, 2019). Similarly, Shopify migrated to enhance operational efficiency and customer support (Filatov, 2019), while Etsy focused on improving performance and strategic focus (Filatov, 2019). For banks in Uganda, the shift was driven by cost reduction, operational efficiency, and enhanced data security (Hussein & Wilbro, 2024).

According to Gustavsson (2019), the success of the migration for Spotify was not only measured by meeting initial objectives but also achieving a timely completion of the migration and a zero disruption during the migration process. Betabrand successfully migrated with no website issues, even during peak usage times like Black Friday (Filatov, 2019). Similarly, Ugandan Banks recorded reductions in both capital expenditures (CAPEX) and operating expenditures (OPEX) following migration (Hussein and Wilbro, 2024). This highlights that a successful migration is one which meets the objectives of migrating, in the required time and remains beneficial on the long term.

While operational efficiency remains a common motivation, the specific needs of each business alongside the characteristics of their legacy systems guide the consideration and strategies for migration.

2.3 Considerations and strategies

Different companies approach cloud migration based on their unique operational needs and the complexity of their legacy systems. For Spotify, a key consideration was selecting the most suitable cloud hosting model. After evaluating the risks and complexities of a hybrid solution, they adopted a mixed strategy of lift-and-shift and application rewrites (Gustavsson, 2019).

According to Hajlaoui et al. (2022), all constraints of a company must be carefully assessed before deciding on the type of migration.

Abbas and Chilwarti (2023) highlight security and compliance as critical considerations. They identify three primary migration strategies:

- Lift-and-shift: Moving applications to the cloud without redesigning them. This is the simplest strategy, cost-effective but labor-intensive after migration (Kommisetty and Abhireddy, 2024)
- Re-platforming: Optimizing some parts of an application for the cloud while avoiding full redesign. This strategy takes some benefits from cloud features like managed services simple abstraction; however, it can be expensive and risky (Kommisetty and Abhireddy, 2024).
- Application rewrite (refactoring): A complete redesign to take full advantage of cloud-native features.

Iqbal and Colomo-Palacios (2019) further add retiring unused systems and re-purchasing cloud-based solutions as additional strategies. A key factor in choosing the right strategy is conducting a thorough risk analysis and planning for mitigation.

2.4 Risks and mitigations

Cloud migration poses various risks, including integration challenges, security concerns, and data availability issues. Kommisetty and Abhireddy (2024) emphasize the importance of robust security measures, such as encryption protocols and recovery plans, to mitigate these risks. Mejía-García et al. (2024) highlight additional risks, such as vendor lock-in, downtime, and data security. They suggest phased migration as a gradual approach that allows early identification and mitigation of issues. Backup and recovery plans, along with encryption, are recommended to protect against data loss and breaches.

In conclusion, the motivations for cloud migration vary across industries, driven by factors such as cost efficiency, operational improvement, scalability, and strategic focus. Successful migrations are characterized by meeting these objectives on time and ensuring long-term benefits. Different strategies, such as lift-and-shift, re-platforming, and rewriting, are adopted

based on the specific needs and legacy systems of businesses, with considerations like security, compliance, and hybrid cloud models playing a role in decision-making.

Risk analysis and mitigation are critical to address challenges such as data security, integration issues, and downtime. By understanding the motivations, strategies, and risks of cloud migration, businesses can make informed decisions and develop effective migration plans that support long-term growth and innovation.

3 Research Methodology

This chapter provides a comprehensive overview of the research method, explaining why it was adopted and how it was designed. It specifies the eligibility criteria for studies, the information sources, the search strategy, the selection process, the data collection process, synthesis methods, and certainty assessment for this SLR.

3.1 Systematic Literature Review Approach

Cloud migration is an evolving research field with a growing body of research. While advancements have been made, understanding its complexities from different perspectives: technology, business, strategic and organizational remain crucial. As noted by Brereton et al. (2007), there is need to systematically aggregate outcomes from empirical studies related to a particular topic in Software Engineering. A systematic literature review (SLR) on cloud migration contributes to this need by discouraging research redundancy and validating existing findings. It facilitates the intersection of different perspectives, providing an exhaustive study, without the resource constraints of conducting primary research.

3.2 Research Design

An SLR differs from a non-structured review by following a well-defined and evaluated review protocol. This protocol encompasses a three-phase, iterative process: planning, conducting, and documenting (Kitchenham, 2004; Brereton et al., 2007). Each process involves several activities as shown in *fig.1* below.

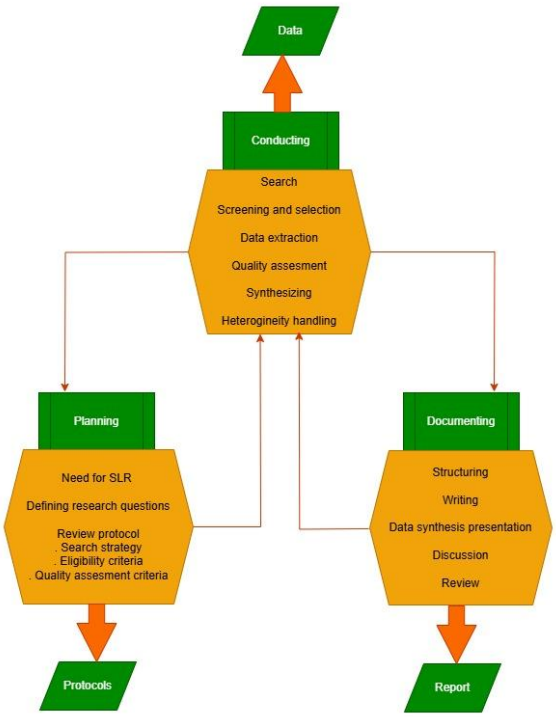

***Fig1*: Overview of SLR process**

3.2.1 Planning Phase

The planning phase establishes the need for an SLR and defines the research questions based on the study's objectives (see Section 1.3). This phase also involves creating a review protocol, which specifies the methods for conducting the review, including the search strategy, eligibility criteria, and quality assessment (Kitchenham, 2004). The planning phase took 3 weeks to complete.

Search Strategy

A search strategy was developed to identify relevant studies. It involved the use of the following key words combination; "cloud migration," "adoption," "legacy system," "on-premises," "risk," "opportunities," "threats," "challenges," "benefits."

Fig. 2: search strategy

In addition to keyword combinations, a publication date filter was applied to include studies published between 2014 and 2024 from the following databases; Research Gate, IEEE Xplorer, ACM, Google Scholar. The search process was as follows:

- Initial search using the keywords, resulted in 1,187 studies
- Screening by abstract reduced the pool to 622 studies.
- Comprehensive review to check relevance and subsequently, a full-text review based on eligibility criteria left with 38 studies.

Fig. 3 below shows the total number of studies found in the preliminary search

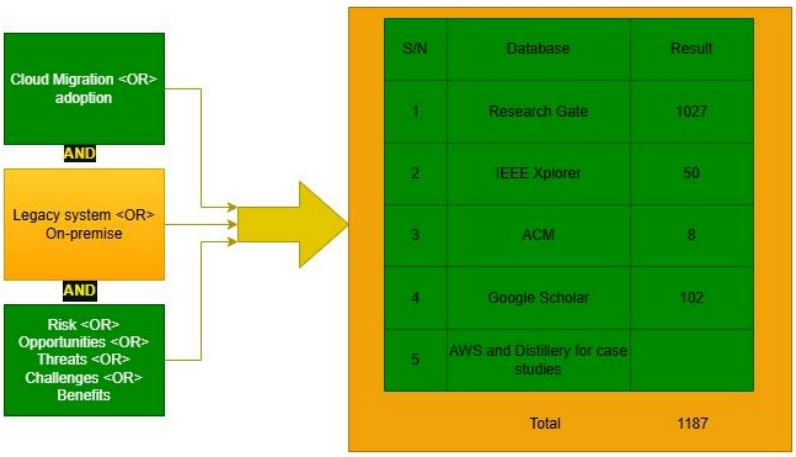

Fig 3: preliminary search results

Eligibility criteria

The eligibility criteria specify the conditions that must be met for studies to be included in this review and reasons for studies to be excluded from this review. The inclusion criteria are as follows:

Criteria	Why?
Studies must focus on cloud migration, including its risks, and opportunities	To ensure it is in line with research objectives
Published within the last 10 years (2014-2024)	Guarantees findings are current and relevant to today's policies and innovations.
Case studies, surveys, and systematic reviews on cloud migration	Provides diverse perspective and rich data sources
Published in peer-reviewed journals, conference proceedings, or reputable grey and white literature sources.	This will ensure credibility and quality of studies
Studies offering practical insights, solutions, or evaluation of cloud migration	Cloud migration require actionable insights
Available in full text	Ensures in-depth interpretation is accuracy.

Table 2: inclusion criteria

Studies were excluded if they;

- did not focus on cloud migration.
- discussed cloud-to-cloud migration
- are not available in full text.
- were published before 2014.
- Lacked verifiable credibility.
- Consisted solely of expert opinions without supporting evidence

Quality assessment criteria

The quality of the primary studies was assesses using a standardized set of criteria, which downsized the pool to 33 high-quality studies. Studies were rated using a points-based system: 'Yes' = 1, 'Partially' = 0.5, and 'No' = 0 (Jamshidi et al., 2013). Scores were assigned based on the following questions:

General Items	Points		
	Yes = 1	Partially 0.5	No = 0
Are the research problem and motivation clearly stated?			
Are research methodology and data synthesis appropriate designs for the study?			
Are the insights and lessons explicitly stated?			
How clear was the reporting, and is there obvious bias?			
Specific Items			
Is the research focused on migration toward the cloud?			
Do conclusions flow from evidence?			
Are the results validated in a non-trivial evaluation context?			

Table 3: Quality Assessment Criteria

3.2.2 Conducting Phase

The conducting phase began with the preliminary search, applying search strings across four databases within the specified 10-year timeline (2014-2024). The initial search yielded 1,187 studies, including some irrelevant studies. The screening process, which involved reviewing

titles, abstracts, and applying eligibility criteria, reduced the pool to 38 studies. Then 33 studies after quality assessment were implemented.

To enrich the review, case studies from recognized cloud service providers like AWS were incorporated, along with case study compilations from reputable sources. The data collection and analysis took 7 weeks to complete.

Study Selection and Quality Assessment

Given the surplus of relevant studies, a ranking system was used to narrow the pool to 33 studies. The ranking was based on quality assessment score drawn from (table 3), to prioritize high quality studies that offer valuable insights to the topic.

Data extraction and synthesis

The data extraction process aimed for comprehensiveness and accuracy. To collect relevant information from each study, a form was used which includes the following fields:

- Date of extraction
- Study type – to understand the methodologies used.
- Study context – provides background and applicability.
- Type of cloud – distinguishes findings by cloud environment.
- Cloud provider – compares service offerings.
- Migration type – details where the migration originated.
- Motivation for migration – explains drivers for migration.
- Success metrics – evaluates the outcomes.
- Migration strategies – identifies industry best practices.
- Risks encountered – highlights risk and helps with mitigation.
- Risk mitigation strategies – outlines actionable steps for managing risks.
- Opportunities gained – lists the benefits of migration.
- Failure metrics – identifies areas for improvement.
- Key lessons – offers insights for future migrations.

- Research gaps – highlights limitations and areas for future research.

The extraction process was supported by tools like ChatPDF, and reference management was handled using Mybibs. The data was organized using Word.

3.2.3 Documenting

The final phase involves documenting and reporting of the SLR. With the assistance of ChatGPT, a structure outline was developed. This structure ensures that all phases of the research are documented and presented comprehensively.

4 Risks in cloud migration

During cloud migration, organizations face different challenges as identified in the selected literature reviewed. These challenges have been categorized into four major themes based on their impact domain: technical, organizational, business, and strategic risks.

- **Technical risks** relate to technological challenges involved in cloud migration.
- **Business risks** concern financial and operational impacts.
- **Organizational risks** stem from internal processes, culture and structure of the organization.
- **Strategic risks** are long term impacts of cloud migration on the growth and positioning of the business.

These themes reflect the most critical domains that impact cloud migration, representing broader areas where challenges can arise. This grouping allows for a structured approach to understanding and mitigating migration risks.

4.1 Technical risks

Technical risks are of major concern when talking about cloud migration, with cloud migration itself being a technical strategy for organizations. These risks directly impact the success of the cloud migration process because it involves major change in IT infrastructure. According to the literature reviewed, technical risks are the most frequently cited issues in cloud migration. These risks can result from the complexities of both the legacy infrastructure and the cloud environments and can lead to delays, increased costs, or failed migration if not predicted, planned for, or effectively managed.

4.1.1 Integration; Interoperability, and compatibility

According to Crudu (2024), interoperability is the ability of different systems to communicate, and compatibility means they can run in the cloud environments effectively. Integration makes sure systems are compatible and can exchange information. It involves bringing data,

applications, and different systems together and apply them to the cloud environment. When different systems or components have incompatible architectures, there is a challenge.

As mentioned by Rana and Rahman (2018), integration issues often arise when moving parts of an application to the cloud while maintaining communication with the legacy system. This scenario makes it necessary to create temporary wrappers to handle the complexity.

“Integration with existing IT systems poses a significant challenge in cloud migration projects. Legacy systems often use proprietary formats and protocols that may not seamlessly integrate with cloud services. Implementing middleware solutions or APIs can facilitate smooth interaction between legacy systems and cloud-based applications” (Kommisetty and Abhireddy, 2024). This highlights the problems of integration that arise from the rigid architecture and outdated protocols of legacy systems, as they are usually tightly coupled and lack flexibility in integrating them into the loosely coupled architecture design of cloud environments.

To mitigate this risk, a thorough compatibility assessment should be conducted during the pre-migration phase. This can guide decisions on which cloud service provider should be employed, and whether middleware or service adapters can be used to bridge the incompatibilities. The temporary wrappers as suggested by Rana and Rahman can also be used to mitigate risks from communication between legacy systems and already moved components.

4.1.2 Service interruption (system downtime)

During cloud migration, systems or services may fail to be fully operational, reliable, or accessible to both internal users and external customers. If not professionally managed, it can completely be unavailable. These outages can occur even because of reliance on the internet which is a public service (Kommisetty and Abhireddy, 2024). According to Hussein and Wilbrod (2024), most data migration projects are organized to occur during off-hours, especially over the weekends, to manage this risk.

4.1.3 Lack of control over data

Cloud migration involves entrusting sensitive data to cloud service providers and this is a major concern. Mejía-García et al. (2024) highlighted this by stating that the responsibility for

sensitive data shifts to the provider, which can cause insecurity among users. With the entire infrastructure of businesses and even their application running on servers that are on the cloud administrator's side, the client lacks control over the resources and even over its information once it is uploaded to the cloud.

4.1.4 Performance concerns

Enhanced performance is one of the motivations of cloud migration in many organizations. Post-migration, businesses expect their systems to not only function correctly in the new cloud environment but also perform better. Performance issues can show in various forms, such as slow application response times, delays in data processing, or inefficient use of resources, and can negatively impact user experience, operational efficiency, and business outcomes.

As Kumar (2024) pointed out, factors like network latency, resource shortages, and software compatibility can impact performance. To address this, organizations should conduct performance testing to identify bottlenecks and optimize the cloud infrastructure for specific environments. Highlighting the need for post-migration optimization for a successful cloud migration journey.

4.1.5 Data loss, security, and integrity

Data is the most crucial resource, for any business (Hussein and Wilbrod, 2024). It is the most crucial factor to consider, and it has several aspects (Kumar, 2023). They rise from how data is transferred, stored, and protected during and after migration.

Data loss is unintentional deletion, corruption, and inaccessibility of data during or after migration. Data loss is one of the highest risks in data migration (Hussein and Wilbrod, 2024). Data security is a crucial concern for cloud customers (Nagahawatta et al., 2024).” It is the protection of sensitive business information from unauthorized access, attacks, or leaks, and data integrity ensures that data remains accurate, consistent, and unaltered during and after migration. “Data integrity is likewise a challenge for data migration into the cloud” (Amin and Vadlamudi, 2021). If your data is not sensitive, you just have the only issue of ensuring it gets into the cloud seamlessly (Amin and Vadlamudi, 2021).

According to Kajiyama et al., (2017), unrecoverable data in an unforeseen event were the largest concern in the list of risks in cloud migration for SMEs, with 24 percent (18 of 74 respondents) considering this a discouraging factor. Stating that “not only malicious attackers but also external forces, such as exemplified by the FBI raid case in Texas (National Institute of Standards and Technology, 2011), or even the cloud service provider going out of business, could potentially result in a total loss of data.”

In the case study on the beverage distribution industry by Zalazar et al. (2015), mitigation strategies were recommended. They emphasized the importance of service consumers evaluating security policies presented in the Service Level Agreement (SLA), that the cloud service meets their minimum-security requirements, guarantees lawful processing and compensation in case of violations, and clearly states non-disclosure policies on what information will circulate in the cloud environment. Kumar (2024) suggests that a thorough risk assessment and a comprehensive security plan are essential for mitigating data-related risks.

4.2 Business Risks

These are risks that impact the business domain of organizations in cloud migration. They affect profitability, revenue generation, and market positioning.

4.2.1 Vendor lock-in

Cloud migration may cause over-dependence of a business on a cloud service provider's infrastructure, making it difficult to switch providers when business needs call for it. When each cloud provider uses their own APIs and platforms, it becomes difficult and costly for consumers to adapt applications or their components across different platforms (Hajlaoui et al., 2022). According to Kumar (2024), migrating to a specific cloud provider may lead to vendor lock-in, limiting the organization's ability to switch to another provider if needed. Organizations should consider using a multi-cloud strategy that allows them to use multiple cloud providers to manage this risk (Kumar 2024; IBM 2024).

4.2.2 Migration costs and Hidden costs

IDC (2024) as cited by Hussein and Wilbrod (2024) stated that organizations typically incur migration costs of 15% to 20% of their annual IT budget during the initial phase of cloud adoption. Hussein and Wilbrod (2024) further presented cloud migration as a risk that may impact IT costs. They highlighted the initial investment required for the migration process as a primary concern in cloud migration as the transition to the cloud involves upfront expenses, including migration planning, data transfer, and training.

Hussein and Wilbrod (2024) also cited a survey by Forrester Research (2024) which revealed that 42% of organizations reported challenges in managing cloud service costs and optimizing their cloud spend. Adding that to effectively manage cloud cost management, there should be monitoring and optimization efforts to avoid unexpected expenses and ensure that cloud resources are used efficiently.

There could also be hidden and unexpected costs that could arise from managing failures. As addressed by Iqbal and Colomo-Palacios (2019), there is a possibility of training employees on the new cloud system and software platforms which may add additional costs.

4.2.3 Business continuity risk

As stated in section 4.1.2, cloud migration is likely to disrupt business operations due to poor availability and system downtime, and organizations must ensure there an updated and tested business continuity plans for quick recovery from any disruptions. This includes having a backup and disaster recovery plan in place and ensuring that critical applications and data are available during the migration process (Kumar, 2024).

4.3 Organizational risks

Organizational risks arise from internal factors such as staffing, processes, and management changes during cloud migration.

4.3.1 Trust deficit

Amin and Vadlamudi (2021) explains that, despite advances in cloud security models, many businesses remain hesitant to trust cloud service providers with sensitive information. This is because there is possibility of compromise and unauthorized access as data is accessible from anywhere (Iqbal and Colomo-Palacios, 2019). Without full control over their data, organizations feel powerless. This lack of trust in cloud service providers can slow down cloud adoption and impact major stakeholders (Iqbal and Colomo-Palacios, 2019)

4.3.2 User support post-deployment

As stated in section 4.2.2, on a need for employee training to use the new cloud environment. Poor knowledge of the system with the IT staff can lead to security issues, particularly during scaling (IBM, 2023). Impact of cloud migration on IT staffing and skills requirements should be considered (Hussein and Wilbrod, 2024). This is crucial for a smooth transition and maximizing the benefits of cloud computing.

4.4 Theme 4: Strategic risks

These risks impact the long-term direction of the business, influencing its growth and market positioning.

4.4.1 Service provider selection risk

The decision on which cloud provider to choose is a long-term decision that can affect the company's operations and ability to meet future needs. Amin & Vadlamudi (2021) emphasize that the selection process should involve a thorough analysis of providers such as AWS, GCP, and Microsoft Azure, which does not make it easy as these providers are continuously struggling to separate themselves from competitors. A poor choice at this stage can have long-lasting consequences, potentially leading to operational inefficiencies and business risks. This risk impacts the long-term direction of the business and its ability to remain competitive, which makes it a strategic concern.

4.4.2 Compliance issues

There may be regulatory requirements for data storage, security, and handling, depending on the industry. According to a report by KPMG (2023), cited in Hussein and Wilbrod, (2024), 54% of financial institutions identified regulatory compliance as a major cost driver associated with cloud adoption.

In their study, Kajiyama et al. (2017) mentioned regulatory compliance as the second most critical concern in the list of a cloud service provider, with 18 percent (13 of 74 respondents in their survey) viewing this element as a discouraging factor. Furthermore, they stated that an organization may not experience functional or security issues by having its applications and data hosted by a non-compliant cloud provider but depending on the sensitivity of the data there could still be legal penalties for not being compliant with regulations.

5 Opportunities in Cloud Migration

Like the risks, the opportunities of cloud migration have been categorized by their impact domain. These benefits have been grouped into four themes; technical, organizational, business, and strategic risks.

- Technical opportunities are improvements cloud migration brings to an organization's IT infrastructure.
- Business opportunities are related to financial, operational, and market-driven impacts.
- Organizational opportunities demonstrate positive changes in the internal processes, culture, and structure of the organization.
- Strategic opportunities focus on long term impacts of cloud migration on the growth and positioning of the business.

These themes were chosen because they reflect most critical domains that impact cloud migration, representing broader areas where opportunities can arise during migration.

5.1 Technical Opportunities

Technical opportunities are improvements that cloud migration brings to an organization's IT infrastructure. They are scalability, improved security, performance and access to innovative technologies.

5.1.1 **Scalability**

Scalability is the ability of a systems to control workload fluctuations by acquiring and releasing resources (Chanthati, 2024). Cloud services allow businesses to scale up or down with ease. In the case study of commercial banks in Uganda, Hussein and Wilbrod (2024) addressed scalability as essential for accommodating fluctuating workloads, like those

experienced during peak transaction periods or in response to changing regulatory requirements. Cloud computing can easily accommodate more users and handle larger workloads and data (Chanthati, 2024). The Pay-as-you-go model cloud offers (kommisetty and Abhireddy, 2024), allows companies or users to scale considerably and efficiently, eliminating the need to worry about buying, designing, and maintaining their own physical data centres and servers (Mejía-García et al., 2024). This opportunity to scale contributes to business agility and overall improved performance of the IT operations.

5.1.2 Enhanced security posture

Data is imperative for any organization and according to Iqbal and Colomo-Palacios (2019), it is the obligation of the cloud service provider to ensure the security of their infrastructure and the protection of their client's data and applications. Amin and Vadlamudi (2021) cited (Ahmed et al., 2020), stating that "cloud service providers give an undeniable level of security convention to check data assurance by using high-end encryption systems. The complex data centres of cloud providers are based on layered security approaches that incorporate data encryption, password management, solid access controls, and compliance with generic security audits." Having the data hosted in the cloud guarantees secure and reliable storage because of automated back-ups and high-end encryption padlocks that prevent any kind of hacking of the information (Mejía-García et al., 2024). Leveraging these security protocols enhances an organization's security posture.

5.2 Business opportunities

These opportunities cover the financial, operational and market-driven benefits businesses achieve by moving to cloud.

5.2.1 Reduced operational cost

Cloud computing eliminates many expenses associated with traditional IT infrastructure. "Price is one of the key benefits for organizations, so they can concentrate on their core business while placing their main infrastructure services to the cloud service providers (Iqbal and Colomo-Palacios, 2019)." Amin and Vadlamudi (2021) address cost as one of the vital

advantages for organizations in moving to the cloud as it allows them to focus on their business objectives without worrying about primary infrastructure. Mejía-García et al. (2024) validated it as they addressed cost to be the most attractive advantage or at least the most obvious of all advantages offered by migrating to the cloud by paying only for used resources and giving the responsibility for infrastructure implementation to the service provider.

This means that businesses can reduce the operational costs while they focus on core business activities as in the case of Spotify.

5.2.2 **Improved resource management (reusability)**

In their study, Amin and Vadlamudi (2021) stated that as opposed to on-premises data centers, cloud infrastructure solutions present opportunities for managing income for customers, sales, and marketing staff. According to Zalazar et al. (2015), code reuse, loose coupling, and service integration, are all key factors in the cloud environment.

As resources are centralized and shared in the cloud, it allows automated reassignment and repurposing of resources across different applications, services, or departments and as businesses scale up and downsize. Benefiting from cloud-based resource sharing and automation, businesses can ensure resources are efficiently optimized.

5.2.3 Improved business continuity

Improved business continuity is the ability of an organization to maintain critical operations during and after disruptions. This is a significant opportunity for businesses that migrate to the cloud as the opportunity to operate without interruptions heightens. This is because of the high availability, scalability, security enhancement, remote access, cost efficiency, etc., that cloud migration brings. “Cloud backup solutions play an essential role in a proactive approach to get maximum uptime like backup and recovery in a business continuity strategy (Iqbal and Colomo-Palacios, 2019).” Iqbal and Colomo-Palacios (2019) further added that by migrating to the cloud, organizations have access to a large pool of IT resources that gets them the benefits of redundant computer resources without the constraint of geographical location. Kumar (2023), in the study Cloud Adoption: A Modern Approach, recommends the cloud to organizations struggling to establish a robust business continuity solution as the cloud offers a

great extent of high availability and disaster recovery solutions both for IaaS, PaaS, and SaaS by leveraging their zonal and regional data centres.

5.2.4 Operational efficiency (streamline operation)

Due to the automated tools, scalability and flexibility, optimized resource utilization, disaster recovery, cost efficiency, and other benefits that come from cloud computing, migrating to the cloud drives operational efficiency in businesses. Hussein and Wilbrod (2024) in their study stated that cloud adoption influenced the operational efficiency of banks in Uganda as the banks reported improvements in system performance, resource utilization, and reduced downtime, further contributing to overall cost savings.

5.2.5 Improved customer satisfaction

According to Chanthati (2024), the cloud enables enterprises to enhance the overall user experience of their customers. Businesses can improve their agility, responsiveness and service delivery because of the scalability, increased availability and cost savings benefitted from the cloud. Every business primary aim is customer satisfaction and migrating to the cloud makes it easier to achieve.

5.3 Organizational opportunities

This opportunity benefits the structure, culture, and processes of the organization. It contributes to the efficiency and satisfaction of the teams in an organization. It includes remote work enablement which leads to increased productivity.

5.3.1 Remote work enablement

Moving applications, data, and resources to the cloud allows access from any geographical location, which promotes remote work and supports global teams. According to (Mejía-García et al. (2024), the great advantage of cloud is that it can be used and consulted from any device

with internet access. This flexibility cloud offers impacts the organization positively through enhanced productivity and employee satisfaction.

5.4 Strategic opportunities

These are long-term benefits that cloud migration offers businesses in market positioning and growth. Cloud migration allows organizations to stay competitive and adapt rapidly to market needs.

5.4.1 Enhanced flexibility

Cloud computing offers flexibility to adopt different cloud strategies, scale, work remotely, customize solutions, adopt flexible cost structures, etc. “Cloud computing can scale up to greater numbers of users far more easily and support larger workloads and data, which requires enterprises and IT applications and infrastructure organizations to set up and purchase additional networking equipment, physical servers, or software licenses. The teams working remotely will deploy, fix issues, or update various machines being used (Chanthati, 2024).” This is a meaningful strategic opportunity for the growth of business.

5.4.2 Improved ability to specify business needs

With several levels of service in SLAs, options for customizing solutions, and ease of making changes to meet market needs, businesses are better off understanding and identifying needs and specifying these needs to align with their business objectives. As noted by Kommisetty and Abhireddy (2024), “organizations want to respond faster to 'business needs' with their IT strategies to create opportunities, achieve competitive advantage, and deliver shareholder value through the development and delivery of new business services.” This is made possible by the clouds

5.4.3 Improved market competitiveness

Cloud computing provides room for flexibility and the ability to scale as discussed already, reducing the time needed to launch new products. The low operational cost it offers enables businesses to offer more competitive pricing. Improved performance, reliability, and global access enable an environment for improved customer experience and ease of expansion, even giving access to innovative technologies. “By not having to invest a large amount of money, small users can have access to the newest technologies at affordable prices, paying only for what they use. The competitiveness of the system does not lie in the one who has the most resources, but in the one who uses them best (Mejía-García et al., 2024).” Thus, the benefits of migrating to the cloud are enormous but how much a business benefits depends on how much the optimization.

6 Impact Analysis and Interconnections of Cloud Migration Opportunities and Risks

This chapter explores the impacts of cloud migration opportunities and risks across various domains and the relationship between opportunities and risks in cloud migration, to inform the creation of balance in optimizing benefits and mitigating risks.

6.1 Multi-domain Impacts and cross-impact analysis of cloud migration opportunities

While cloud migration opportunities have been categorized in themes based on their primary impact domains, their influence extends beyond these boundaries, creating ripple effects across various areas of an organization. Cloud migration should be viewed as an ecosystem because of the interdependencies of its risks and opportunities. Achieving benefits in one domain often triggers positive impacts in others are, reinforcing the interconnected nature of cloud services.

For example, **scalability**, typically recognized for its technical benefits such as enhancing performance and flexibility (Abbas & Chikwarti, 2023), can also drive business growth. Amin and Vadlamudi (2021) highlight scalability as a business opportunity, allowing organizations to scale operations in response to growing needs. Scalability not only optimizes resource

utilization and reduces costs but also improves overall performance, leading to enhanced customer service and satisfaction—a direct business advantage

Enhanced security posture often considered a technical opportunity impacts the strategic domain of the organization, as stronger security means improved trust and meeting regulatory compliance. This contributes to the strategic domain by aligning with long-term business goals and risk management efforts.

Moreover, Wen et al. (2024) suggested that cloud migration allows businesses allocate their limited resources towards innovation and strategic digital initiatives. This reframes **operational cost reduction** to be a strategic opportunity demonstrating how a business benefit can have a broader impact, driving organizational agility and fostering competitive advantage.

Additionally, the dynamic and automated allocation of IT resources in **resource management** (see 5.2.2) contributes to workload management during scaling, clearly impacting a core technical domain of the organization.

Disaster recovery and high availability, often cited as business continuity benefits, contribute to the technical domain by introducing backup systems and built-in redundancy. These features improve organizational efficiency during crises.

Remote work enablement is another example where a primarily organizational-driven opportunity has far-reaching effects. By reducing the costs associated with maintaining physical office spaces, it becomes a business opportunity and long-term strategic solution for navigating disruptions such as pandemics.

Lastly, the flexibility of cloud services allows businesses to tailor solutions that meet the unique needs of different teams and departments. This customizability not only addresses specific business objectives but also enhances organizational coordination, as solutions can be distributed and integrated across the enterprise. Kommisetty and Abhireddy (2024), highlighted the improvement in business delivery due to faster response to business needs.

Table 4 below, shows the primary domain of opportunities and the other domains they impact.

Opportunities	Primary Domain	Secondary Domain(s)

Scalability	Technical	Business
Enhanced Security Posture	Technical	Strategic
Reduced Operational cost	Business	Strategic
Improved resource management	Business	Technical
Improved business continuity	Business	Technical Organizational
Operational efficiency	Business	Technical Organizational Strategic
Remote work enablement	Organizational	Business Strategy
Improved ability to specify needs	Strategic	Business Organizational

Table 4: cross-impact analysis of migration opportunities

6.2 Multi-domain Impacts and Cross-Impact Analysis of Cloud Migration Risks

Like the opportunities, cloud migration risks also extend beyond their primary impact domains. Understanding the interconnectedness of cloud migration risks is important, as addressing a risk may expose vulnerabilities in another. This reiterates the need for a holistic risk management approach (Fahmideh et al., 2020) during migration.

Data security is primarily viewed as a technical challenge but risks of data breaches, loss influences the strategic position of an organization. A security breach or data loss could lead

to loss of customer trust and reputational damage, disturbing the market positioning of the organization. Additionally, failure to comply in data protection regulations can result in financial penalties, further affecting the business and organizational domains.

Vendor lock-in starts in a business domain but affects technical and strategic domain. When a business is overly dependent on a provider, the idea of switching becomes expensive, making the migrating workload heavy on the technical team because they might need to implement re-engineering as a strategy (Rana and Wanabrahman, 2018). This reliance on vendors also limits flexibility, restricting organization's ability to adopt innovative solutions. Hence, limiting their strategic growth.

Downtime and disruptions although a technical risk, affects business operations. A service outage leads to revenue loss, impacts customer satisfaction and organizational reputation. If the disruptions are prolonged, it can impact the organizations confidence in the cloud, influencing future decisions.

Cost-savings is one of the primary motivations for cloud migration, opinion polls show willingness to adopt cloud to avoid capital investment (kommisetty and Abhireddy, 2024), but **unexpected costs** can rise from unforeseen risks. This can hinder future cloud adoption plans, impacting business strategies as financial sustainability of migration will become a concern.

Lastly, providing user support to staff slows down migration process. Not only that, the lack of knowledge of staff poses risk of other concerns as data security or limit the full optimization of cloud benefits. This affects the organizational competitiveness and strategic goals.

Risks	Primary Domain	Secondary Domain(s)
Data Security	Technical	Strategic Organizational Business
Vendor lock-in	Business	Technical Strategic
Downtime and disruptions	Technical	Business Organizational Strategic
Hidden cost	Business	Technical

		Strategic
User Support Post Deployment	Organizational	Technical Business Strategic

Table 5: multi-domain impacts of risks

6.3 Interconnected Opportunities and Risks in Cloud Migration

Having discussed the opportunities and risks in cloud migration, it is essential to discuss the interplay between them and how organizations can approach the adoption of cloud to maximize opportunities and mitigate risks. This interplay can be found between some risks and opportunities like scalability vs. data loss, cost reduction vs. unexpected expenses etc.

6.3.1 Scalability vs. Data Loss, security, and integrity.

The scalability benefits the cloud brings to organizations, allow them to manage fluctuating workloads and adjust resources as discussed in section 5.1.1, for example in banks. Hussein and Wilbrod (2024) addressed scalability as essential for banks in Uganda to accommodate fluctuating workloads, such as those experienced during peak transaction periods or in response to changing regulatory requirements. This opportunity drives an experience of high volumes of data processing in businesses.

However, scalability also contributes to a lack of data control or even data loss. When businesses scale their operations in the cloud, their reliance on external providers to handle and manage data increases, creating a loss of control. With rapid scaling, data may be transferred between servers and regions frequently, increasing the risks of data loss, security, and integrity

6.3.2 Cost Reduction vs. Unexpected Expenses

31 out of the 33 studies reviewed in this study mentioned cost reduction as a motivation for cloud migration, hence, it is safe to say cost reduction is a primary reason for this journey. As discussed in opportunities, it eliminates the need for purchasing and maintaining equipment and reduces the cost of hiring large IT teams for this purpose. As Mejía-García et al. (2024)

highlighted, one of the primary financial advantages of cloud migration is the ability to "pay only for the resources consumed," leading to substantial cost reduction.

Regardless, organizations must be mindful, that unexpected costs can creep in if the promise of operational cost savings undermines unforeseen costs.

6.3.3 Scalability vs cost

As scaling occurs based on demand, if not properly managed, there is risk of overprovisioning or under provisioning which can lead to greater expenditure, service disruption or instability in the system. When cloud resources are overprovisioned, businesses pay for unused resources as the payment is based on resource availability (pay-as-you-go), (Hussein and Wilbrod, 2024), leading to inflated cost without performance or efficiency.

Striking the right balance in scaling demands continuous monitoring, not over relying on automation and optimizing. By optimizing, fine tuning features provided by the cloud service providers

6.3.4 Operational Efficiency vs. Downtime

While the cloud offers operational efficiency through process automation, resource optimization, and process streamlining etc. (Hussein and Wilbrod, 2024). It can lead to over-reliance on automation, reducing need for human intervention, which can create room for vulnerabilities due to poor monitoring by human. As a result, organization focus more on core business activities while trusting the cloud.

This over-reliance can lead to risk of downtime as clouds are public services just as the internet (Kommisetty and Abhireddy, 2024). Also, vulnerabilities are rarely noticed early until the system totally breaks down.

6.3.5 Remote work access vs Data Security

One of the key organizational opportunities is remote access. This enables flexibility and productivity. However, as cloud enables access from any geographical location, with poor control measures for authentication and authorization, it can leave the possibility of compromise and unauthorized access as data is accessible from anywhere (Iqbal and Colomo-Palacios, 2019). Kaur and Joshi (2020) cited by Santhosh et al. (2024) argues that it remains the business responsibility to be upfront with their data management and security threats. To address this, organizations should implement multi-factor authentication, encryption protocols and access control policies.

7 Discussion

The aim of this study was to provide a comprehensive synthesis of the risks and opportunities associated with cloud migration. As identified in the research gap, that there is lack of comprehensive studies that integrate benefits and challenges of cloud migration in a holistic manner, focusing on technical aspects and leaving out broader perspectives. This section will answer the research questions that guided this research.

RQ1 - What are the motivations for cloud migration and when do we say cloud migration is successful?

The motivation for cloud migration rises from unique business needs, such as operational efficiency, scalability, cost reduction, and agility. These motivations stem from the cloud's promise of scalability, cost efficiency, agility, flexibility, security, improved competitiveness etc. Cloud migration enables competitiveness by allowing businesses adapt to the demand for digital services, following the COVID-19 pandemic (TechTarget, 2022). The ability to access resources on demand, improve business continuity, and enhance global accessibility are motivators.

Following the case studies of Spotify, Betabrand, Shopify and banks in Uganda, success in cloud migration is defined by achieving desired outcomes. These include.

- Meeting predefined business needs.
- Ensuring minimal disruption of operations during and after migration.
- Meeting the timeline assigned to the process.
- Ability to continuously optimize benefits

Thus, success in migration is not only measured by the technical completion but also by how the cloud environment serves the business goals.

RQ2 - What considerations should be made and what strategies are available to organizations?

Before embarking on cloud migration, organizations should consider technical, business, strategic and organizational factors. They should.

- assess carefully their current infrastructure to understand if it needs to be fully migrated or just in parts
- Evaluate the benefits of the cloud both in short and long-term.
- Pay extreme attention and carry in-depth research before choosing a cloud provider or a migration strategy.

The strategies available for organizations are.

- **Lift and Shift (Rehosting)**: This is moving applications to the cloud without making any changes to it.
- **Refactoring and Re-architecting**: These are similar as they both reflect change to the system but while refactoring changes the code structure to take full advantage of cloud services, re-architecting changes the entire architecture of the system.
- **Hybrid cloud or multi-cloud strategies**: Hybrid refers to using both on-premises and cloud solutions while multi-cloud is using more than one cloud providers. This helps diversify risk and maintain flexibility.
- **Phased migration**: This refers to migrating step-by-step, with each step validated before the next. Phased migration contributes to mitigating risks during migration.

RQ3 - **What are the major risks organizations face during cloud migration and how can it be mitigated?**

The major risks in cloud migration include integration, data loss, security and integrity risks, downtime and system disruption, compliance issues and hidden cost. Mitigating these risks starts from the assessment stage through a thorough risk analysis, by understanding organization's legacy systems, deciding components that needs to be migrated (Rana and Wanabrahman, 2018) and predicting possible issues. When these issues have been identified, mitigation strategies can progress from the understanding made influencing the choice of cloud providers, the choice of cloud service model and the choice of migration strategies to best suit the business needs and legacy system limitations of the organization.

However, with all these precautions in place, certain risks or even unidentified ones can come up and the mitigation is particular to the type of risk and the specific nature of the issue. For system integration, use of wrappers and middle wares have been suggested in section 4.1.1. Data loss, security and integrity mitigation emphasized on evaluation of SLAs from service providers regarding meeting security requirements.

7.1 Implications for practice

To address the risks associated with cloud migration while optimizing the benefits, businesses must be proactive and strategic. Here are practical recommendations for decision makers:

- **Risk Assessment**: businesses should conduct a thorough risk assessment and develop mitigation strategies ahead of time. Rana and Wanabrahman (2018), addressed it as initial screening and analysis to gather key information on existing applications and deciding which components need to be migrated.
- **Planning**: Every study in this review called for proper planning before embarking on cloud migration. A detailed roadmap according to analysed requirements should be developed and phased migration possibly adopted to better manage the operation.
- **Multi-cloud or hybrid adoption:** To improve flexibility and mitigate vendor lock-in, a multi cloud or hybrid cloud strategy should be adopted.
- **Data governance:** Data policies should be put in place and businesses should ensure to understand and enquire more about data handling in SLA with cloud providers.
- **Employee training:** For a successful and well optimized cloud migration, a trained team is needed. Businesses should provide training programs to help employees adapt to the new environment.
- **Disaster Recovery:** Businesses should be on the lookout for cloud services with built-in redundancy, keep in place backup systems and regularly test these systems.
- **Continuous Monitoring**: Cloud migration is unending process. Post-migration, businesses should continuously monitor performance and desist from leaving all processes to be fully automated.

7.2 Limitation

There were so many limitations to adopting SLR for this study that must be acknowledged. The major limitation being the absence of primary data. Secondary data provided valuable insights, but primary data could offer more current and wider perspective. This also have influenced the quality and depth of the analysis in this research as it depends wholly on the scope and comprehensiveness of existing body of work.

While this review aims for a comprehensive, objective synthesis, selection of primary studies and categorization by themes can introduce bias. This is because choice of studies from, say, abstract interpretation, development of inclusion criteria, prioritization of findings and interpretation of results are subjective which could affect study conclusions.

Also, as this SLR identifies trends in cloud migration, it represents these findings in a general level. Although study selection was not delimited to industry and location; some studies addressed a particular industry (bank, retail stores, government agencies, technology industries) and some drawn from varying geographical locations (China, Nigeria, Uganda, Southern California, Jordan, Sweden, Brazil), the finding are not generalizable.

Lastly, the cross-domain analysis of risks and opportunities was quite complex and could be speculative. Further research can validate these finding with thorough evaluation and case studies of impacts of migration to different industries.

7.3 Delimitations

This research was specifically limited to the scope of cloud migration risks and opportunities. Other areas that could possibly intersect the topic of this research have been excluded. This includes, the wide range of cloud services, as well as various industries, which have been mentioned but not discussed deeply. To categorize and further analyse the risks and opportunities, four themes including technical, business, organizational, and strategic have been developed based on their area of impact. This means that risks that could be outside these domains are excluded from analysis.

To carry out this analysis, this research used a Systematic Literature Review (SLR), which focuses on secondary data, limiting this study to already existing knowledge. Lastly, the

timeframe filter applied during search for primary studies limits this study by excluding innovations on the works or recent developments during the time of carrying out this research.

8 Conclusion

Adopting cloud is undoubtedly a strategy for organizations looking to remain competitive and efficient in today's market. As discussed in this research, this transition from legacy and on-premises systems to cloud offers both opportunities and risks. The opportunities like improved scalability, operational efficiency, cost reduction, enhanced business continuity, and better resource management, position cloud computing as a transformative technology for modern enterprises. However, to benefit from cloud, businesses must be set to navigate the complexities and risks associated with cloud, such as security vulnerabilities, compliance challenges, lack of control over data, downtime, and operational disruptions.

This research set out to explore these risks and opportunities through a systematic literature review, drawing from both white and grey literature to provide a holistic view of the cloud migration process. The aim was to provide insights not only from technical aspects but also into the business, organizational and strategic considerations.

The findings have shown that while cloud migration is primarily a technical process, business, organization and strategic considerations play important roles in the success of cloud migration. It demonstrates that while cloud migration offers benefits as cost efficiency, remote access and resource management, they are not without risks. Businesses must carefully navigate security, compliance and data loss issues, and create a balance to fully benefit from the full potential cloud offers. The holistic approach to this research provided reinforcement to existing studies that cloud migration goes beyond technical domains. As the process is multi-faceted in impacts and opportunities connected to risks.

From a theoretical stance, this study expands the existing body of knowledge by integrating cross-domain analysis of cloud migration risks and opportunities, which has been discussed in isolation. Practically, it offers implementable insights for businesses planning their cloud migration.

8.1 Key Contributions

This study gives wider perspective to the risks and opportunities of cloud migration, different from the usual technical focus. While past research has thoroughly explored the technical challenges of cloud migration (Zalazar et al., 2015; Fahmideh et al., 2017), the holistic integration of opportunities and risks has been lacking. This study addresses this gap by synthesizing both the benefits and challenges of cloud migration This research contributes to existing literature by offering a comprehensive insight on the interrelationships of these risks and opportunities, the interrelated impacts of opportunities. The study provides a balanced view, recognizing importance of non-technical factors. By understanding the interplay between scalability and data security or cost savings and unforeseen expenses, businesses can approach cloud migration with a more nuanced perspective, creating strategies to mitigate these risks and balance them against the opportunities offered by cloud services .

While this research has provided insight on risks and opportunities, future research should integrate more real-world case studies as the studies presented in this research are limited and conclusions may not reflect different experiences of organizations across different geographical location, sectors, and sizes. These case studies should not only reflect successful migrations but explore unsuccessful migrations, what went wrong, to caution other businesses, especially those in same industry planning to move to cloud. There should also be focus on the use of emerging technologies such as artificial intelligence and edge computing to mitigate risks and aid successful cloud migration (Chanthati, 2024). More research should discuss how current technologies can enhance cloud migration process.

Use of AI

Artificial intelligence was used in this work for structure outlining, brainstorming, search assistance, grammar management and later for language maintenance.

Chat GPT was used for the interconnections between risks and opportunities in December 2024: -

Develop more on these interconnections? The output of the generative AI was adapted and modified for the final answer. The original materials have been saved and are available for viewing, if required.

ChatGPT was used also, for improving and refining grammar and texts on 16 and 17 December 2024: -

Refine this content and identify any gaps in it. The output of the generative AI was adapted and modified for the final answer. The original materials have been saved and are available for viewing, if required.

Copilot was used as a search assistant.

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