



Empowering Business and Improving Efficiency through Effective Integration of Cloud Computing in Digital Transformation of the Education Sector

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0. Executive Summary

Cloud computing became more important and rapidly spreading in different sectors, including education sector, due to multiple advantages it provides, as well as opportunities for improving educational process. Cloud computing has become an essential element in providing the technical infrastructure required for supporting digital education, according to the strategic objectives of digital government in the Kingdom of Saudi Arabia, which aims to achieve high levels of efficiency and effectiveness in government services, including education.

The role of cloud computing is represented in improving the quality of education in several aspects, the first of which is flexible storage and access, as it allows students and teachers to access educational materials from anywhere and at any time, which contributes to enhancing flexible education and self-learning, as well as saving resources, as cloud computing reduces the need for large investments in technical infrastructure, in consistency with the strategic objectives of Digital Government Authority (DGA) in enhancing investment efficiency, in addition to cooperation and interaction between students and teachers, which contributes to providing an interactive and rich educational environment. As well, Cloud Computing allows continuous updating of educational content and educational tools easily and quickly, which guarantees the availability of the latest educational resources. Finally, cloud computing solutions provide advanced security guarantees that protect educational information and data, which is in line with cybersecurity strategy that is part of the national strategy for digital transformation.

The aligning cloud computing with Saudi Vision 2030 is of great importance in supporting the achievement of the vision's goals, especially with regard to developing the digital economy and enhancing the role of education sector as a key element in economic and social growth. In light of this great importance of cloud computing in the educational field, it seems that there is an urgent need for effective strategies contributing to adopting these technologies in the educational sector on a large scale, concentrating on improving the quality of education and providing equal educational opportunities for all segments of society.

Cloud computing is a main factor in achieving a set of strategic goals in the Kingdom sought for by the Digital Government Authority (DGA), within the framework of Vision 2030 and the national strategic plans for digital transformation. These goals include: Enhancing government efficiency through adopting advanced technologies like cloud computing to improve daily operations in various sectors, including education, achieving integration between government entities by providing a unified and flexible infrastructure, enhancing the digital economy, improving the quality of services provided to beneficiaries, increasing their satisfaction levels, securing government and educational data and information, as well as expanding and improving the scope of electronic services.

Thus, cloud computing is consistent with the strategic goals of the Saudi Digital Government in achieving "beneficiaries' satisfaction", "business empowerment" and "effective government" by providing effective and flexible educational services that meet the needs of society and contributing to developing the digital capabilities of beneficiaries.

01 Digital Government Trends and Digital Education

1.1 Digital Government Objectives and Its Role in Developing Education

The digital government in the Kingdom of Saudi Arabia sets strategic objectives within the framework of Vision 2030 and the national strategic plans for digital transformation, for improving the education sector through using cloud computing. This provides an opportunity for the development of a flexible and integrated education system to transform educational institutions into integrated digital environments, using cloud computing. The most important of these objectives are the following:

- **Enhancing government efficiency:** Through ensuring the effectiveness of government services and improving daily operations in cloud governmental education.
- **Achieving integration among governmental entities:** By contributing to achieving integration and effective communication among governmental entities by providing a unified and flexible cloud infrastructure.
- **Motivating digital economy:** By developing the digital economy, through enhancing the role of digital education as a vital element in economic growth by providing the necessary infrastructure for cloud e-learning and innovation in this field.
- **Improving Beneficiaries' Satisfaction:** By improving the quality of services provided to beneficiaries and increasing their levels of satisfaction, which is supported by cloud computing by providing effective and advanced educational services fulfilling the needs of society.
- **Enhancing Cybersecurity:** By providing advanced cloud security solutions to protect government and educational data and information.
- **Expanding E-Services:** By expanding and improving the scope of e-services, as cloud computing is a key factor in achieving this goal by providing flexible and extendable environments and platforms.

As well, digital government seeks for achieving inclusiveness and equality in education, by ensuring complete access to education and promoting educational equality and justice using cloud computing. It also aims at improving the quality of education and learning, by developing high-quality educational content, enhancing self-learning and critical thinking skills among students, in addition to creating collaborative research communities to exchange knowledge and experiences using cloud computing tools. Through these goals, the digital government seeks for achieving a comprehensive transformation in the education sector supporting educational excellence, enhancing learning opportunities for all students, and achieving the utmost benefit of cloud computing technologies.



Cloud computing is considered an essential element in achieving the goals of Saudi Vision 2030, especially in developing and modernizing the education sector, as well as accelerating the progress of digital transformation in educational institutions.

1.2 The Role of Cloud Computing in Achieving Digital Government Objectives

The role of cloud computing in achieving digital government objectives manifested in the fact that it is a powerful tool for achieving education goals, particularly in the context of the strategic goals of the digital government in the Kingdom of Saudi Arabia. These objectives are: Enhancing "beneficiary satisfaction" by improving the quality of education and providing better educational means, "Business Empowerment" by developing technical strategies that enhance the efficiency of educational processes, and achieving "effective government" through using innovative technologies to improve educational services.

The concept of enhancing "beneficiary satisfaction" is achieved by improving access to educational resources, whereas cloud computing allows providing various and high-quality educational resources via the internet, which increases opportunities for self-learning and interactive learning. Education can also be customized through cloud data and analyses to provide customized educational content suitable for the needs and capabilities of each student.

As well, the concept of "Businesses Empowerment" is achieved through improving operational efficiency and enhancing cooperation, as cloud computing helps educational institutions reduce operational costs and continuously update the technical infrastructure, and enables enhanced cooperation between students and teachers, and even among different educational institutions.

The concept of "Effective Government" is achieved by improving educational services and analyzing data for continuous improvement, as the government can provide more effective and interactive educational services, reduce the digital gap among regions, as well as data collected through cloud systems can be used to analyze the performance of students and teachers, and to develop more effective educational strategies.

From this viewpoint, Cloud Computing is considered an essential element for achieving the goals of Saudi Vision 2030, especially in developing and modernizing the education sector, besides accelerating the progress of digital transformation in educational institutions.

02 Cloud Computing in Education Sector

2.1 Overview of Cloud Computing and Technical Transformation

Cloud computing is an integral part of the technical transformation achieved in the education sector globally and inside the Kingdom of Saudi Arabia. This transformation is evident in several aspects, including digitization and technical expansion, as the education sector is witnessing a major shift from traditional methods to the increasing use of technology. Cloud computing provides a robust platform for storing and processing educational data with high efficiency, and enhancing e-learning by providing interactive educational platforms allowing direct communication between students and teachers, with easy exchange of educational resources, and cloud storage, and comprehensive access that allows educational institutions to store huge amounts of data and educational materials at a relatively low cost, with the possibility of accessing them from anywhere and at any time.

Educational institutions face challenges in developing the technical infrastructure needed to support cloud computing, which requires significant investments and strategic planning. Technical transformation requires effective management of the integration between existing educational systems and new cloud solutions, ensuring smooth and effective operations. The shift to cloud computing in education requires developing the digital competencies of both teachers and students to ensure full benefit from these technologies. Future trends indicate increased investments in digital infrastructure and cloud computing in the education sector to enhance efficiency and improve the quality of education. Expanding access to digital education is one of the main goals of technical transformation, focusing on reducing the digital gap and ensuring educational equality. This technical transformation represents a unique opportunity to radically change the way in which education is provided, as a cloud computing plays an essential role in this transformation and contributes to achieving the strategic goals of the digital government in the Kingdom.

2.2. Benefits of Cloud Computing in Education

Cloud computing offers a different number of benefits that contribute to improving the quality of education and enhancing its effectiveness. These benefits can be summarized in the following points: Improving access and flexibility, as it allows students and teachers to have comprehensive access to educational materials and digital resources from anywhere and at any time which increases the flexibility of learning and facilitates access to knowledge. Cloud computing provides the ability to customize education to meet the needs of each individual student, by providing diverse educational content and resources that are adaptable to different levels of understanding and needs. Cloud computing also enhances collaboration and innovation between students and teachers and among educational institutions which leads to improving the quality of education and exchanging experiences and knowledge.

Cloud computing provides a platform for developing and experiencing new and innovative educational methods, such as: Virtual reality (VR) and interactive learning, which opens new horizons in education. Cloud computing helps educational institutions reduce costs related to technical infrastructure and its maintenance; which contributes to directing financial resources towards improving and developing the quality of education and improving the operational efficiency of educational institutions by facilitating a management of data and information, as well as updating it continuously and securely. Cloud computing provides advanced security features that ensure protecting educational data and personal information of students and teachers which enhances confidence in using digital educational systems.

Cloud solutions help educational institutions comply with local and international security and regulatory standards which enhances the safety of digital educational environment. Therefore, cloud computing is a fundamental pillar in achieving a comprehensive educational transformation characterized by flexibility, collaboration, innovation, and effectiveness, besides it directly supports the strategic objectives of the digital government in the Kingdom of Saudi Arabia, especially with regard to improving the quality of education and expanding its access.

3. The Effect of Cloud Computing in Education Sector

3.1 The Effect of Cloud Computing on Beneficiaries' Satisfaction

3.1.1 Improving Education Quality and Its Impact on Beneficiaries

Cloud computing is an effective tool for improving education quality, as it provides flexibility in accessing educational resources and facilitating collaboration and interaction between students and teachers. This is evident through providing interactive learning environments and rich educational resources that can be easily accessed from anywhere and at any time. Improving the quality of education through cloud computing leads to enhance beneficiary satisfaction, which is reflected in prompting education levels and providing students with the skills required for succeeding in the knowledge economy. It also contributes to creating new job opportunities and enhancing innovation, which leads to sustainable economic and social development.



Enhancing cloud computing contributes to beneficiary satisfaction with the quality of education provided and to achieving significant progress in the digital education process.

3.1.2 Local and International Practices to Achieve Beneficiary Satisfaction

There are studies revealing the best practices and lessons learned from the application of cloud computing in the education sector, providing valuable insights on how to develop and implement effective strategies for using cloud technology, help achieve digital government goals, and meet beneficiary needs. As well, it is obvious that cloud computing plays a fundamental role in achieving continuous improvement in the quality of education and a positive impact on beneficiaries in the Kingdom of Saudi Arabia, as this technology provides the opportunity to develop the education sector comprehensively, and contributes to achieving the strategic goals of the digital government and enhances beneficiary satisfaction.

In this important aspect, there are local and global successes that demonstrate the importance of adopting cloud computing in the field of education. For example, King Saud University saved 40% of its IT infrastructure costs after adopting cloud solutions. Educational institutions in the Kingdom have also adopted this technology and benefited greatly from it in improving operational efficiency and cost, in addition to enabling them to provide interactive and attractive educational content which contributed to increasing success rates and academic achievement, as well as ensuring the continuity of education during the Covid-19 pandemic.

During the Covid-19 pandemic, the percentage of using cloud educational platforms increased to more than 200% which contributed to maintaining 95% of the effective educational process. In the global context, we have observed similar success, as cloud computing facilitated access to educational resources and enhanced collaboration between students and teachers in universities around the world. In India, for example, cloud computing has reduced the time required to conduct scientific research by 30% which improved scientific research and enhanced university and vocational education in developing countries.

In impact analysis, we find that enhancing cloud computing contributes to increasing beneficiaries' satisfaction with the quality of education provided, and to achieving significant progress in the digital educational process, by providing advanced educational tools and interactive platforms that enhance the educational process, and contribute to directing governmental and administrative policies for education.

3.2 The Effect of Cloud Computing on Business Empowerment

3.2.1 The Effect of Digital Education on Economic and Commercial Environment

The impact of digital education on the economic and commercial environment reflects a significant shift towards knowledge economy, where the drive for this transformation represents a fundamental foundation. Digital education, supported by cloud computing, is considered an essential element in this context, as cloud technology enhances access to educational resources, improves workforce skills, and enhances productivity and innovation. Through this immediate and flexible access to educational resources, continuous and adaptive learning is promoted, which supports the development of various sectors.

In the business environment, digital education opens up new horizons for entrepreneurship and innovation, as individuals can leverage from it to develop advanced technical and managerial skills, build start-ups, and provide new business solutions. Cloud computing facilitates this process by providing a flexible and scalable infrastructure, which supports innovation and growth. Digital education, through cloud computing, can contribute to improving the efficiency of business operations, as companies can leverage from data and analyses to make more effective decisions and improve business strategies. The ability to analyze big data and automated learning, provided by cloud computing, are considered valuable tools for growth and innovation in the business environment. On the other hand, investing in digital education and cloud computing contributes to developing the technical infrastructure of the Kingdom of Saudi Arabia, which leads to enhancing national technical capabilities and supporting local innovations in fields, such as artificial intelligence and information technology.

In terms of economic outcomes, digital education can have a direct positive impact on the Gross Domestic Product (GDP) by improving the skills of the workforce and promoting entrepreneurship, which enables the Kingdom to achieve faster and more sustainable economic growth. Within the framework of national goals, digital education plays a pivotal role in achieving economic diversification, as through developing new skills and enhancing technical capabilities, it can reduce depending on traditional industries and explore new sectors for growth. On the other hand, digital education enhances the Kingdom's global competitiveness, by developing advanced technical skills and promoting innovation, which contributes to improving the Kingdom's position as a center of excellence and innovation internationally.

Digital education also contributes to enhancing inclusiveness and equality in access to education, as cloud technology provides educational opportunities for less developed regions, which contributes to reducing social and economic gaps.

Finally, digital education contributes to achieving environmental sustainability, by reducing the need for physical resources, and improving energy efficiency, as cloud computing reduces the carbon footprint related to traditional Information Technology (IT) infrastructure. In the context of research and development, cloud computing supports research in several fields, including education, where educational institutions can benefit from it to conduct advanced research and develop innovative educational content.

3.2.2 Local Efforts of Business Empowerment in The Government

In the Kingdom of Saudi Arabia, we have witnessed a series pioneering initiatives in the field of digital education, as several programs and projects have been launched depending on cloud computing to improve the quality of education and enhance interaction and understanding among students and teachers. These initiatives include the technical infrastructure projects launched by the Kingdom for supporting cloud computing in education, including projects to develop technical infrastructure in universities, such as "King Abdullah University of Science and Technology" (KAUST).

Efforts also included developing advanced e-learning programs, such as "Ain" and "Rawdah" programs, which provide digital educational materials for students at various educational levels, facilitating access to education and enhancing understanding and comprehension. In the context of distance education, the Kingdom worthily participated in efforts for developing distance education platforms, as well as accelerating development processes to ensure the continuity of education during Covid-19 pandemic, which confirmed its commitment to achieving sustainable and effective education.

In addition, the Kingdom efforts were not limited to the local level only, but also included its participation in global initiatives aimed at promoting digital education, such as its partnership with Microsoft to develop cloud-based educational solutions, and international organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), for developing advanced digital education strategies, reflecting that it comprehensive commits to improving the quality of education.

Research and innovation efforts in the Kingdom are significantly supported. This support is represented in initiatives such as "Support for Research and Development" funded by King Abdulaziz City for Science and Technology, and Educational Innovation Funding Program of the Ministry of Education. The support also includes the development of laboratories and research centers specialized in the field of cloud computing and educational technology. By focusing on developing technical and vocational education, it reflects the ongoing focus in modernizing the education sector to fulfill the needs of labor market, as well as enhancing national capabilities in technical and industrial sectors.



3.3 The Effect of Cloud Computing on Government Effectiveness

3.3.1 Improving Government Efficiencies through Cloud Computing

The Kingdom of Saudi Arabia seeks for enhancing government efficiencies by adopting the use of cloud computing, by developing its infrastructure and improving its technical systems. It has benefited from cloud computing to modernize old systems and integrate multiple systems into unified platforms, which has contributed to enhancing administrative efficiency and improving the quality of government services. By developing the infrastructure, the Kingdom has been able to facilitate and accelerate providing governmental services, as well as improving and simplifying the procedures for obtaining official documents and submissions online.

The use of Cloud Computing with its integrated analytical tools and supporting educational platforms represents an effective tool in analyzing big data; enabling the Kingdom to make informed decisions based on accurate data and advanced analyses. In addition, the development of smart services through cloud computing enhances the efficiency of government services, and improves the user's experience, including providing advanced and responsive services to the needs of beneficiaries. With the increase in cyber threats, the Kingdom is leveraging from cloud computing to enhance information security and protect government data, by applying advanced security standards and integrated protection strategies. The Kingdom supports digital initiatives that depend on cloud computing to improve public services and enhance transparency, including projects such as "Saudi Vision 2030".

Cloud computing also contributes to enhancing cooperation and integration between different governmental entities, which improves efficiency, reduces duplication of work, saves costs and maximizes resource utilization. In the context of emergencies, cloud computing enhances the Kingdom ability to respond quickly to emergencies and crises, as well as developing mobile services to enable beneficiaries to access government services easily and at any time, which enhances the user experience and increases satisfaction.



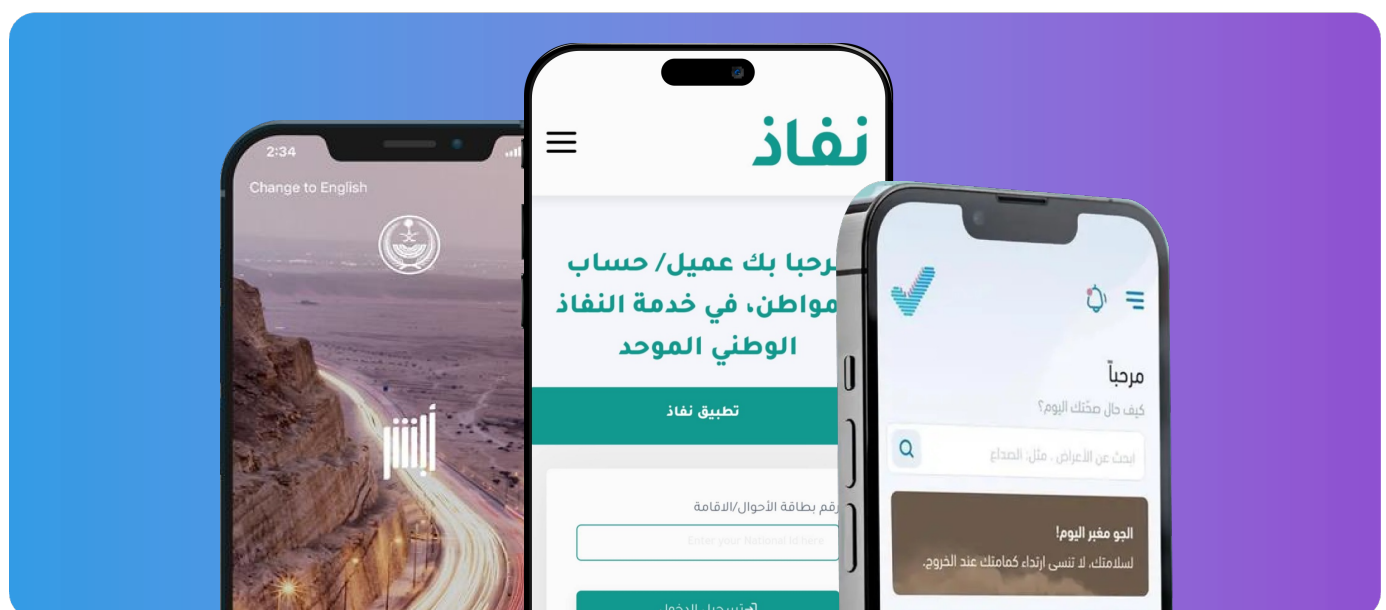
3.3.2 Internal Practices on the Effectiveness of Digital Government

In the Kingdom of Saudi Arabia, universities have witnessed an increasing application of cloud computing with the aim of improving learning and teaching processes. These efforts have included updating curricula, and providing diverse educational resources, as well as enhancing cooperation between students and teachers. The Kingdom has also launched e-learning initiatives, based on cloud computing, which has contributed to the effective continuity of the educational process, particularly during the Covid-19 pandemic.

The Kingdom has witnessed major projects to develop digital infrastructure using cloud computing, such as "Absher" platform, which provides more than 200 electronic government services to more than 21 million users. Cloud computing has also been used in the healthcare sector for improving medical data management and providing more effective and accurate health services, which has contributed to improving the quality of care provided to beneficiaries. For example, "Sehhaty" application helped in providing remote medical consultations.

The Kingdom has adopted smart government projects based on cloud computing, which contribute to improving efficiency and transparency in government work, and facilitating access to government services. The "Nafath" Digital Platform is an example of this development, as it provides fast and unified access to government services for individuals and companies. The infrastructure for big data has also been developed using cloud computing, enabling government entities to collect and analyze big data more efficiently, and use it in strategic decision-making.

In the context of technology and innovation, the Kingdom encourages the private sector to use cloud computing to enhance innovation and develop advanced technology solutions, which contributes to the development of the digital economy. The Kingdom is developing an advanced framework for cybersecurity that is compatible with cloud computing applications, ensuring the protection of data and privacy of beneficiaries and government institutions.



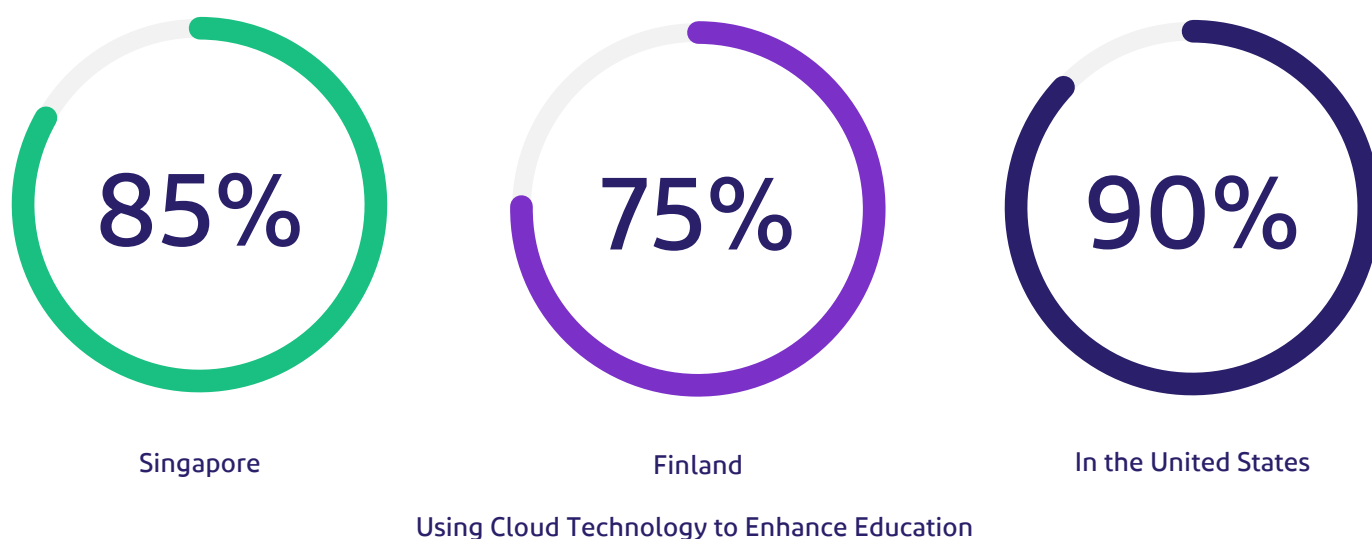
4. Benchmarking International Experiences: Challenges and Solutions for Cloud Computing Adoption in Saudi Arabia

4.1 International Experiences in Education Sector

In the context of cloud computing in education sector, reviewing international experiences is deemed important, as it focuses on the several benefits of applying this technology. These experiences provide an opportunity to learn from the experiences of other countries, which can be adapted to the local reality in the Kingdom of Saudi Arabia. For example, in the United States, about 90% of educational institutions use cloud technology to enhance education through platforms, such as Google Classroom and Microsoft Teams. International experiences include many examples of using cloud computing to improve the educational process and enhance the technical infrastructure of educational institutions, which opens the way for applying the best ways of cloud computing technologies in the Saudi educational environment.

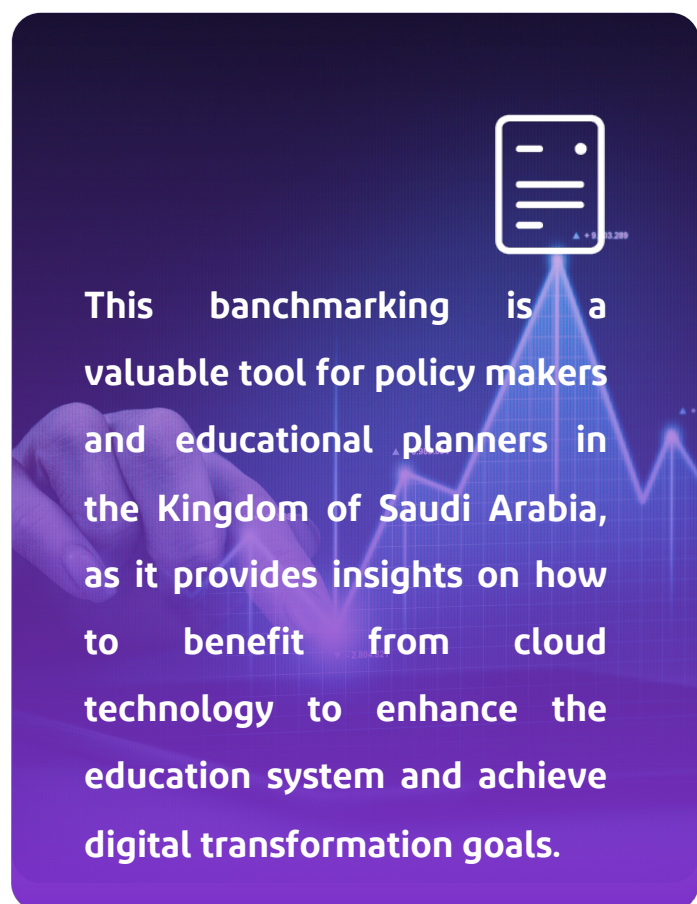
International experiences highlight benefits such as: Improving access to educational resources, increasing collaboration between students and teachers, in addition to enhancing efficiency in managing educational resources, and emphasize the importance of cloud computing in enhancing adaptation and flexibility in educational systems. In Finland, reports showed that 75% of high schools rely entirely on cloud computing to deliver lessons and manage assessments. On the other hand, the educational reality in the Kingdom should learn from these experiences to determine how to adapt them to the local reality, by evaluating the current infrastructure and specific educational needs, in order to ensure the success of cloud computing adoption.

Focusing on the lessons learned from these experiences is essential to determine the best practices and avoid common mistakes, including technical integration strategies, developing digital skills for teachers and students, and ensuring data security. Another example is the "Smart Nation" initiative in Singapore, where all schools were equipped with cloud infrastructure allowing students to access educational resources online with a success percent up to 85%. Reports and research covering these experiences can be referred to provide comprehensive and objective insights into the impact of cloud computing in education, which helps build a deeper understanding of how this technology can be effectively implemented in the Kingdom of Saudi Arabia.



4.2 Benchmarking Cloud Education: Saudi Arabia vs. Developed Countries

The importance of comparing trends and policies in the education sector is a vital tool for understanding how cloud computing is impacting the international level and enabling Saudi Arabia to achieve the utmost benefit of these experiences. This section includes a comparison between the different strategies and policies adopted in different countries and how these lessons can be applied within the Kingdom. The analysis of educational policies in this context includes a study of educational policies in different countries, such as the United States of America, Finland and Singapore, besides how cloud computing is integrated into these policies, focusing on aspects that enhance educational innovation and achieve effectiveness and efficiency. For example, the United States allocated a budget exceeding 13 billion dollars for developing cloud education, as this budget enables schools to provide integrated digital resources.



In terms of comparing educational systems, this section provides an analysis of the use of cloud technologies in different educational systems, focusing on their application to improve the educational process and the challenges they faced. In Finland, experiments indicated that the use of cloud computing in education led to 20% increase in student achievement.

This comparison indicates how global digital trends impact the education sector, and the effectiveness of these trends in achieving positive educational outcomes, with an analysis of policies that support innovation and digital transformation in education. It is possible that lessons can be taken from these countries and how they can be analyzed to apply inside the Kingdom, including developing educational curricula, improving technical infrastructure, and enhancing the digital skills of teachers and students.

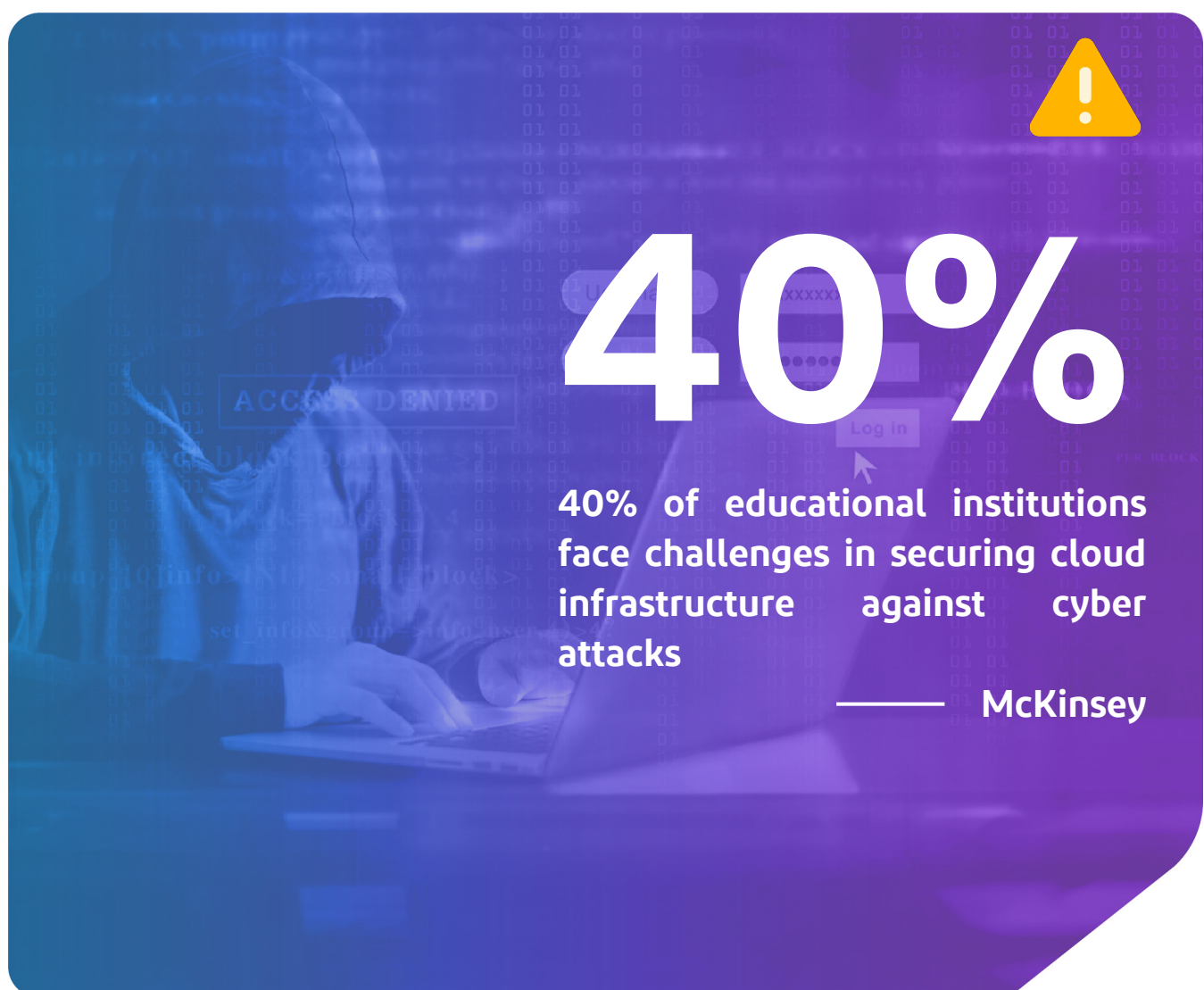
These global practices enhance the development of educational policies and future directions of the Kingdom regarding cloud education by providing clear visions on the importance of learning from international experiences, in addition to the useful focus on benefiting from cloud computing technology to achieve the goals of effective digital education in the Kingdom. Thus, this ensures the achievement of the strategic goals of digital government.

4.3 Technical and Regulatory Challenges

This section approaches the technical and regulatory challenges related to adopting cloud computing in education sector, concentrating on the Saudi context or environment. These challenges include: Cybersecurity issues, technical infrastructure, besides administrative and regulatory challenges. According to a Mckinsey Report, 40% of educational institutions face challenges in securing cloud infrastructure against cyber attacks.

In terms of technical challenges, cybersecurity is a major challenge as it requires securing data and protecting it from cyber attacks. For example, a major university in the United Kingdom was exposed to a cyber attack that led to the suspension and breakdown of its cloud education systems for 48 hours. This also includes challenges related to the effective development and maintenance of the technical infrastructure required to support cloud computing in education, as well as technical integration among different systems. As for regulatory challenges, they are administrative challenges: such as challenges of change management, cloud computing training, and employee skills development. Also, includes political and legal challenges such as: Regulations and policies related to privacy and cybersecurity, and resistance to change.

Technical and regulatory challenges pose significant obstacles, but they can be overcome through thoughtful strategies such as: Enhancing cybersecurity, improving technical infrastructure, developing flexible policies and regulations, and training and skills development programs.



4.4 Strategic Solutions of Challenges

This section focuses on strategies to overcome the technical and organizational challenges facing the adoption or application of cloud computing in the education sector, emphasizing the importance of these strategic solutions and the context of some international experiences to benefit from them within the context of the Saudi educational environment. **The most important solutions to these challenges are the following:**

Solutions of regulatory challenges



are represented in:

- Creating a clear regulatory framework by developing laws and regulations that support using cloud computing in the education sector.
- Setting policies that guarantee the privacy and safety of personal data for students and teachers.
- Developing partnerships and cooperation.
- Motivating entities through awareness, workshops and studies related to cloud computing.
- Developing a comprehensive strategic plan for the concept of change management.

Solutions of technical challenges



This includes:

- Upgrading the technical infrastructure.
- Developing networks, storage capabilities, and computing resources to bear the loads of cloud systems.
- Developing strategies to secure data and systems from cyber attacks.
- Empowering capabilities and training.
- Enhancing cybersecurity.
- Employing technologies and tools associated with cloud computing.

These are some international experiences that have succeeded in finding strategic solutions to handle and encounter these challenges:

- In the United States, the government adopted the "Cloud First" initiative to encourage educational institutions to adopt cloud solutions which led to improvement with a percent of 30% in operational efficiency in some universities.
- In Singapore, where an integrated legal framework for cloud computing was implemented, it resulted in 15% increase in cybersecurity rates for the education sector.

These strategic solutions include providing training and professional development for teachers and administrators to increase their understanding and ability to use cloud solutions, integrating technology and cloud computing skills into curricula, as well as building strategic partnerships with cloud computing service providers, and encouraging cooperation and exchange of experience among educational institutions.

These strategies are considered the essential step towards achieving the maximum benefit from the capabilities of cloud computing, besides overcoming challenges in the education sector, contributing to improving educational process and enabling students and teachers to access rich and diverse educational resources.

5. Conclusions and Recommendations

5.1 Analysis of Research Results

This section analyzes the results related to the impact of cloud computing in the education sector, focusing on the specific context of Saudi Arabia, and comparing it with international contexts.

The results refer to a significant improvement in education quality, thanks to flexible and comprehensive access to educational resources via cloud computing, besides an increase in interaction between students and teachers, and greater cooperation among educational institutions.

Studies have shown an increase in beneficiary satisfaction with educational services as a result of the improvements provided by cloud computing, and the data indicate that cloud computing in education contributes to enabling the economic environment and stimulating innovation and entrepreneurship, as well as improving the efficiency of government operations and services.

Moreover, the analysis and comparison of results from the experiences of advanced countries in cloud education demonstrates the importance of adopting specific and effective strategies in applying cloud computing in education, while providing strategic solutions to overcome the main challenges.

This brief research provides valuable evidence of the vital role of cloud computing in enhancing the education sector in the Kingdom. The results indicate tangible improvements in the quality of education, beneficiary satisfaction, and government efficiencies, which reinforcing Kingdom's position as a leader in digital transformation of education.

5.2 Recommendations For The Future

The recommendations for the future include a set of important actions to enhance the effective use of cloud computing in the education sector.

Firstly: it should be focused on improving and expanding IT infrastructure, including investments in security and privacy technologies to ensure data protection and infrastructure sustainability.

Secondly: training programs should be developed for teachers and administrators to enhance their understanding and skills in using cloud technologies, as well as integrating cloud computing skills into curricula to enable students and prepare them for modern technology.

Thirdly: clear policies and guidelines should be developed to guide the use of cloud technologies in the educational environment, concentrating on cooperation between the governmental and private sectors for developing and implementing appropriate solutions.

Recommendations also include enhancing research and development in the field of cloud computing to improve teaching and learning methods, in addition to building international partnerships and benefiting from successful models, focusing on continuous monitoring and evaluation to measure the effectiveness of cloud computing, and modifying strategies according to the evaluation.

Finally: focus should be placed on innovation in the use of cloud computing to enhance interactive and flexible learning, as well as readiness to adapt to ongoing technological changes, and exploring new uses for cloud computing in education.

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