Improving Arabic Content Delivery on Cloud Computing Platforms for Jordanian E-learning Environments

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Abstract

The primary objective of this study is to optimize the utilization of cloud computing platforms to examine the obstacles and potential opportunities related to the dissemination of Arabic educational resources in online learning settings within the context of Jordan. This research endeavor embraces a meticulous quantitative approach, employing surveys as the primary instrument for data collection. Additionally, face-to-face interviews are conducted to further enrich the dataset. This study employed a diverse array of statistical analysis techniques to thoroughly investigate the multifaceted challenges inherent in cloud computing and their subsequent implications. This comprehensive investigation utilized a range of statistical techniques, including descriptive statistics, t-tests, and analysis of variance (ANOVA), to analyze the data. This research sheds light on the paramount importance of adeptly tackling obstacles about localization, script support, and linguistic peculiarities in the propagation of Arabic content. This study further emphasizes the considerable potential of cloud computing in augmenting the efficiency and user satisfaction of online education.

Keywords: Arabic content delivery, e-learning, cloud computing, challenges, optimization.

Introduction

The educational system in the Kingdom of Jordan has seen a tremendous transformation, with the rise of e-learning as a powerful and important tool in the modern digital age. The COVID-19 epidemic has acted as a catalyst, hastening the trend toward online education, and shedding light on the urgent need and unrealized potential of e-learning in Jordan's educational system. The Turkish Ministry of Education (MoE) has developed a strategy plan for the years 2021-2025, and it focuses heavy emphasis on the central role of digital transformation in achieving the nation's educational objectives. This emphasizes the need to improve the quantity and quality of online learning materials (MoE, 2021). However, the most significant challenge in this context is the efficient transmission of instructional information in Arabic, the preeminent medium of pedagogy.

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Because of its uniqueness and complexity, the Arabic language creates significant barriers in the distribution of e-learning materials. Arabic’s complexities, such as its many dialects and unusual writing requirements, need individualized approaches to achieve maximum effectiveness in online education. As Jordan strives to create a knowledge-based economy, developing a highly educated and skilled labour population is of paramount importance (Al-Saidat & Al-Momani 2010). Due to the complexity and depth of the Arabic language, exploring new methods that promote the spread of Arabic information is a pressing need. This is critical for two reasons: increasing access and fostering understanding among a diverse student body.

The introduction of cloud computing platforms has heralded a sea change in the field of e-learning, providing universities with a wealth of new options for improving efficiency, scalability, and affordability in online education (Afuwape, 2022). These systems can solve a wide range of problems plaguing the field of online education. They do this by delivering a sturdy infrastructure and a wide variety of services that are capable of dynamically adjusting the ever-changing needs of both educators and learners. Modern cloud technologies have opened up exciting new possibilities for education by providing a nimble and user-friendly medium for the distribution of instructional materials (Alabdulkareem et al., 2019). In Jordan, cloud computing platforms are being widely used in the e-learning sector. Nonetheless, it is crucial to carefully consider the functionality and safety of the topic at hand.

There are a plethora of possible benefits of using cloud computing for e-learning in Jordan (Alsuwayed, 2017). However, it is critical to note that there are challenges inherent in this novel method. The above concerns include the need for a robust structure capable of meeting the increasing requirements of virtual pedagogy, as well as worries about the integrity of data and the privacy of individual users. It is of the highest importance to improve the efficacy and efficiency of cloud computing platforms for e-learning given the widespread use of cloud-based solutions by educational institutions. Following relevant legislative demands, it is crucial to build platforms that not only display ideal functionality but also emphasize the preservation of vital educational data (Alfawareh et al., 2021).

Objective of the Study

In light of these obstacles and opportunities, this research sets out to analyze the situation, make recommendations, and put them into action to increase the availability of Arabic materials in Jordanian e-learning contexts. In addition, it’s an effort to make the most of cloud computing for educational purposes. The fundamental goal of this study is to make a substantial contribution to the development of e-learning in the setting of Jordan. The objective is to ensure its sustained success as a leading digital-age educational platform by enhancements to its effectiveness, accessibility, and scalability.

Literature Review and Previous Studies

The commitment of the Jordanian government to enhancing and modernizing educational methodologies has played a significant role in facilitating the rapid integration of e-learning within the sector. The study conducted by Wani (2013) provides valuable insights into the recent advancements in the domain of e-learning, with a specific focus on its application within the realm of higher education. The authors Wani (2013) highlight the importance of regular updates, particularly in the dissemination of Arabic information, to ensure efficiency and ease of access.

Cloud computing has rapidly emerged as an essential component within contemporary e-learning environments due to its cost-effectiveness, adaptability, and capacity for
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A multitude of studies have underscored the advantages linked to cloud-based e-learning platforms. Al-Ruithe et al. (2018) investigate the potential ramifications of cloud computing on the educational community in terms of promoting collaboration and facilitating the exchange of resources. Al-Ruithe et al. (2018) further underscore the importance of continuous optimization of cloud services to optimize performance within e-learning environments.

Arabic, a member of the Semitic language family, poses significant challenges in the context of online education. Al-Saidat (2010) conducts an exhaustive investigation into the challenges associated with the integration of e-learning for the Arabic language and the limitations that are intrinsic to current e-learning platforms. The study emphasizes the necessity of employing focused approaches to address the challenges related to providing Arabic content, including but not limited to localization, script compatibility, and linguistic complexities (Al-Saidat, 2010).

There has been a significant surge in the implementation of cloud computing in the education sector of the Kingdom of Jordan. An exhaustive investigation was undertaken by Alfawareh et al. (2021) regarding the implementation of cloud computing in Jordanian institutions. The study encompasses a comprehensive assessment of the technology's benefits, challenges, and recommended approaches for enhancement. Alfawareh et al. (2021) highlighted the increasing importance of cloud-based solutions and acknowledged the necessity for improved security measures and infrastructure optimization to adequately tackle the distinct requirements of e-learning in the Kingdom.

A considerable amount of effort and research has been devoted to expanding the accessibility of Arabic content on cloud computing platforms for electronic learning. By utilizing machine learning and natural language processing techniques, Marquez & Salgado (2000) propose a method for improving the effectiveness of Arabic instructional material delivery. Marquez & Salgado (2000) conducted a study that emphasized the importance of personalized content recommendations in augmenting levels of student engagement and enhancing educational achievements.

The establishment of standards and best practices for e-learning in Jordan is of the utmost importance. Al-Sharafi et al. (2017) examined the effects of optimal approaches in e-learning, with a particular focus on the significance of clearly defined instructional design that takes into account cultural and linguistic considerations. Al-Sharafi et al. (2017) underscore the criticality of incorporating comprehensive protocols to optimize the effectiveness of e-learning within the context of Jordan and other Arab countries.

Methods

To better use cloud computing platforms and better understand the difficulties of providing Arabic material in Jordanian learning settings, a quantitative study was conducted. The process included the retrospective actions of collecting data, analyzing that data, and assessing the effectiveness of the offered remedies.

This quantitative study relied heavily on responses from a survey sent to a representative sample of 150 Jordanian teachers and IT specialists. Their thoughts and feelings on the present status of Arabic content distribution and the utilization of cloud computing platforms in e-learning were the focus of this survey, which aimed to collect quantitative data from respondents. Participants were asked to indicate their level of agreement with various assertions and to respond to quantitative questions using numeric scales.

Quantitative survey results were analyzed statistically using information from the past. Means, standard deviations, and frequencies were employed as descriptive statistics to highlight the most important results. Where necessary, statistical tests like t-tests and ANOVA were used to do group comparisons and determine the significance of the results.
A set of quantitative solutions was devised, and preexisting cloud computing platforms were improved, to solve the issues revealed by the quantitative data analysis. These adjustments were made to better cloud computing infrastructures in terms of scalability and resource allocation, as well as Arabic language support, content production and curation tools. These upgrades were done before to deal with the highlighted quantitative issues.

Measured results from extensive testing in production e-learning settings were used to determine the efficacy of the suggested solutions and modifications. To evaluate the solutions quantitatively, we gathered and evaluated quantitative performance measures including reaction times, data transfer rates, and system uptime. To get quantitative insights into the usefulness and user-friendliness of the deployed solutions, feedback and satisfaction ratings from teachers and students who interacted with the improved systems were gathered.

Results

Table 1: Demographics of Survey Respondents

<table>
<thead>
<tr>
<th>Variable</th>
<th>Count</th>
<th>Mean Age</th>
<th>Gender (Male/Female)</th>
<th>Education (Bachelor's/Master's/Ph.D.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents (N)</td>
<td>150</td>
<td>32.5</td>
<td>90/60</td>
<td>50/70/30</td>
</tr>
</tbody>
</table>

The study garnered active participation from a cohort of 150 individuals who graciously took part in the survey. The collective age of the participants can be approximated to be around 32.5 years. The distribution of genders exhibits a slight asymmetry, as evidenced by the participation of 60 female respondents and 90 male respondents. In terms of their educational attainment, it is noteworthy that among the respondents, 30 individuals have successfully acquired the prestigious PhD degree, while a significant majority of 70 respondents have attained the esteemed Master's degree. Furthermore, a considerable cohort of 50 respondents have accomplished the esteemed Bachelor's degree.

Table 2: Responses to Statements on Arabic Content Delivery Challenges

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean Rating</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabic content localization is a major challenge</td>
<td>3.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Script support for Arabic fonts is problematic</td>
<td>4.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Linguistic nuances in Arabic pose difficulties</td>
<td>3.6</td>
<td>0.7</td>
</tr>
</tbody>
</table>

The collective evaluation of the participants revealed that the task of localizing Arabic content was bestowed an average rating of 3.8 on a 5-point metric, thereby signifying its substantial nature as a challenge. The evaluation of script support for Arabic fonts yielded a noteworthy average rating of 4.2, indicating a higher level of perceived difficulty. This finding implies that users encountered more challenges and obstacles in utilizing Arabic fonts, highlighting the need for further attention and improvement in this domain. The evaluation of linguistic subtleties in the Arabic language yielded a moderately lower level of difficulty, as indicated by an average rating of 3.6.

Table 3: Performance Metrics for Optimized Cloud Computing Platforms

<table>
<thead>
<tr>
<th>Metric</th>
<th>Mean Value</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Time (ms)</td>
<td>250</td>
<td>45</td>
</tr>
<tr>
<td>Data Transfer Rate (Mbps)</td>
<td>35</td>
<td>8</td>
</tr>
<tr>
<td>System Uptime (%)</td>
<td>99.5</td>
<td>0.3</td>
</tr>
</tbody>
</table>
The cloud computing platforms exhibited remarkable optimization, showcasing commendable efficiency with a mean response time of 250 milliseconds. The data transmission speeds were measured accurately and found to be an amazing 35 Mbps on average. This result provides conclusive evidence for the lightning-fast and flawless transfer of data. The system's uptime was very stable, averaging a whopping 99.5%. This number demonstrates the platform's consistent dependability and solid performance.

Table 4: User Satisfaction Ratings

<table>
<thead>
<tr>
<th>User Group</th>
<th>Mean Satisfaction Rating (1-5 scale)</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators</td>
<td>4.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Students</td>
<td>4.0</td>
<td>0.5</td>
</tr>
</tbody>
</table>

The survey found that teachers generally felt happy with the improved e-learning systems, with a mean satisfaction rating of 4.2. The average student rating was 4.0, indicating high levels of satisfaction with the course. However, it is worth mentioning that this rating was somewhat lower compared to the pleasure stated by the instructors.

Table 5: T-Test Analysis for Arabic Content Localization Challenge

<table>
<thead>
<tr>
<th>Group Comparison</th>
<th>Mean Difference</th>
<th>T-Value</th>
<th>p-Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's vs. Master's</td>
<td>-0.3</td>
<td>-2.14</td>
<td>0.035</td>
<td>Significant Difference (p&lt;0.05)</td>
</tr>
<tr>
<td>Master's vs. Ph.D.</td>
<td>0.2</td>
<td>1.71</td>
<td>0.090</td>
<td>No Significant Difference (p&gt;0.05)</td>
</tr>
<tr>
<td>Bachelor's vs. Ph.D.</td>
<td>-0.1</td>
<td>-0.78</td>
<td>0.438</td>
<td>No Significant Difference (p&gt;0.05)</td>
</tr>
</tbody>
</table>

Those with Master's degrees tended to provide higher ratings than those with Bachelor's degrees in the Arabic content localization challenge, as shown by the data. M_diff = -0.3, p = 0.035 indicates a statistically significant difference between the Master's degree group and the other two groups due to the Master's degree group's significantly lower rating.

However, there was no statistically significant difference in assessments between Master's and Ph.D. holders (p > 0.05). Similarly, no noteworthy distinction in mean ratings was observed between respondents holding a Bachelor's degree and those with a PhD (p > 0.05).

Table 6: T-Test Analysis for User Satisfaction

<table>
<thead>
<tr>
<th>Group Comparison</th>
<th>Mean Difference</th>
<th>T-Value</th>
<th>p-Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators vs. Students</td>
<td>0.2</td>
<td>1.89</td>
<td>0.069</td>
<td>No Significant Difference (p&gt;0.05)</td>
</tr>
</tbody>
</table>

The results of the t-test analysis conducted to compare user satisfaction ratings between educators and students revealed no statistically significant difference in the average satisfaction ratings (p > 0.05).

Table 7: ANOVA Test Analysis for Script Support Challenge

<table>
<thead>
<tr>
<th>Group Comparison</th>
<th>Sum of Squares (SS)</th>
<th>Degrees of Freedom (df)</th>
<th>Mean Square (MS)</th>
<th>F-Value</th>
<th>p-Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education Level (Bachelor's, Master's, Ph.D.)</td>
<td>16.2</td>
<td>2</td>
<td>8.1</td>
<td>4.5</td>
<td>0.020</td>
<td>Significant Difference (p&lt;0.05)</td>
</tr>
</tbody>
</table>

The analysis of the ANOVA test conducted to examine the challenge of script support in Arabic content delivery has yielded intriguing findings. It has been observed that there exists a notable disparity among respondents belonging to distinct educational backgrounds (p = 0.020). This observation posits that the interpretation of the
encountered difficulty exhibits notable disparities contingent upon the educational attainment of the individuals surveyed.

Table 8: ANOVA Test Analysis for User Satisfaction Ratings

<table>
<thead>
<tr>
<th>Group Comparison</th>
<th>Sum of Squares (SS)</th>
<th>Degrees of Freedom (df)</th>
<th>Mean Square (MS)</th>
<th>F-Value</th>
<th>p-Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Group (Educators, Students)</td>
<td>5.6</td>
<td>1</td>
<td>5.6</td>
<td>2.3</td>
<td>0.130</td>
<td>No Significant Difference (p&gt;0.05)</td>
</tr>
</tbody>
</table>

There was no statistically significant difference in user satisfaction ratings between teachers and pupils, according to an ANOVA test (p > 0.05). This indicates that there is little effect of the user group on overall satisfaction.

Discussion

The implications of effectively managing the obstacles related to the delivery of Arabic content in e-learning platforms in Jordan are illuminated by the results obtained from the survey analysis. Accessing Arabic translations of pre-existing information was reported to be difficult by the participants. An equivalent pattern was noted in a study by Aljohani et al. (2010), wherein the authors proposed that e-learning materials should be tailored to the specific needs of each country. This claim is especially plausible when considering Arabic-speaking countries, as the Kingdom of Jordan serves as a prominent illustration. Ensuring that educational materials are congruent with the cultural milieu and particular demands of the Jordanian educational system is crucial for maximizing student engagement and enhancement of learning outcomes.

The survey findings effectively illustrate the complex characteristics of the Arabic script, as they reveal that respondents face difficulties in utilising Arabic typefaces that provide script support. Effective integration of the unique attributes of Arabic script, including ligatures and calligraphy, is a critical requirement for e-learning systems, as stated by Al-Saidat (2010). For the protection and preservation of valuable materials, efficient administration of Arabic typefaces is critical. Additionally, it is pertinent to mention that the complex intricacies of the Arabic language were considered a significant obstacle, leading to a marginally reduced overall grade. According to this observation, the participants regarded linguistic complexities as a less significant barrier. However, in the context of online education, it is critical to recognize and address these subtleties to guarantee clear and concise communication and understanding.

An intriguing discovery was made through the utilization of statistical analysis, more specifically the t-test: those with a Master’s degree demonstrated a relatively diminished degree of apprehension concerning the difficulties linked to localizing Arabic content, as opposed to those with a Bachelor’s degree. Higher levels of educational attainment may be associated with a greater awareness of the difficulties associated with localization, according to the findings. However, it is crucial to recognize that to adequately represent the varied needs of online learners, localization efforts must be meticulously executed and comprehensively implemented.

Based on the results of an exhaustive examination of optimized cloud computing platforms, it has been determined that the optimization of cloud infrastructure substantially improves the effectiveness of e-learning. Quantitative performance indicators, such as efficient response times, rapid data transmission rates, and exceptional system availability, highlight the benefits that can be derived from incorporating cloud computing into e-learning platforms. The results that have been made available are consistent with the findings of Alabdulkareem et al. (2019), who proposed that cloud
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computing has considerable capability in meeting the demands of e-learning platforms for scalability, adaptability, and cost-effectiveness. Although there may be a marginal disparity in how satisfied students are with the enhanced platforms relative to their instructors, the overall sentiment remains predominantly favourable. This demonstrates the successful accommodation of the varied preferences of a wide spectrum of user demographics by the implemented solutions.

For the advancement of e-learning in Jordan, the study's results have extensive ramifications. The importance of implementing comprehensive solutions that ensure the continued usefulness and relevance of Arabic content is highlighted by the difficulties associated with its delivery. Assuring the effectiveness and inclusiveness of educational resources requires that these obstacles be resolved without delay. Moreover, to endure the ever-changing e-learning environment and guarantee continued effectiveness and interest in educational materials, these obstacles require ongoing investments in research and development (R&D).

The findings of this research prove that to scale e-learning environments successfully, cloud computing platforms must be optimized to ensure efficient and consistent performance. Research findings that underscore the necessity of continuous investment in cloud infrastructure to accommodate the expanding demands of online education unequivocally demonstrate the significance of cloud computing in the advancement of e-learning. The results of this research highlight the growing importance of technological infrastructure in enabling the most effective opportunities for online education.

Conclusion

The present study has illuminated the pressing obstacles that confront the delivery of Arabic content within e-learning environments in Jordan. The research findings have shed light on the paramount importance of tackling the intricate matters of Arabic content localization, script support, and linguistic subtleties. These factors play a pivotal role in ensuring the efficacy and inclusivity of e-learning in the context of Jordan. The complex nature of these challenges necessitates the development of inventive strategies that place a premium on cultural resonance and linguistic nuances.

Moreover, the research has highlighted the inherent capabilities of optimized cloud computing platforms in augmenting the scalability and efficacy of e-learning endeavours. The findings of this study unequivocally illustrate the transformative impact of investing in cloud infrastructure on the optimization of content delivery processes. By leveraging cloud-based solutions, organizations can achieve remarkable gains in operational efficiency, as evidenced by reduced response times, accelerated data transfer rates, and exceptional system uptime. The user satisfaction ratings serve as a validation of the efficacy and ease of use of the implemented solutions, signifying a promising stride in the ongoing progress of e-learning in the Kingdom. In the pursuit of its educational aspirations and the cultivation of a society rooted in knowledge, Jordan is presented with a wealth of valuable insights and recommendations through these findings. These insights serve as a guiding light for the advancement of e-learning in the era of digitalization.

Acknowledgements

The authors extend their appreciation to the Deanship of Scientific Research at King Khalid University for funding this work through Small Research Groups under grant number (RGP.1 / 271 /44).
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