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Implementation of Problem Based Learning (PBL) in Digital Era in Higher Education of Iraq

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Abstract: ***This paper explores the implementation of Problem-Based Learning (PBL) in higher education in Iraq during the digital era. It emphasizes the significance of a strong technology infrastructure, faculty training and support, curriculum design, student support, assessment strategies, and continuous improvement. By integrating PBL into the digital era, students can develop essential skills such as critical thinking, problem-solving, collaboration, and digital literacy, preparing them for future careers. Successful implementation requires addressing various aspects to enhance the learning experience in the digital era.***

Keywords: Problem-Based Learning (PBL), Digital Era, Higher Education, Technology Infrastructure, Curriculum Design.

1. INTRODUCTION

The digital era has revolutionized various aspects of society, including the field of education. In higher education, the integration of technology has opened new opportunities for innovative teaching and learning approaches. One such approach is Problem-Based Learning (PBL), which has gained recognition for its effectiveness in developing critical thinking, problem-solving skills, and collaboration among students[1]. In the context of Iraq's higher education system, the implementation of PBL in the digital era holds great promise. Iraqi universities and colleges can leverage digital technologies to enhance the educational experience, particularly in promoting active learning, student engagement, and the application of knowledge to real-world problems. This paper aims to propose a methodology for the implementation of PBL in the digital era within Iraqi higher education. The methodology considers the unique challenges and opportunities present in Iraq's educational landscape, considering factors such as infrastructure, faculty readiness, and student support[2].

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The successful implementation of PBL in the digital era requires careful planning, faculty training, curriculum design, digital infrastructure, and ongoing evaluation and improvement. By outlining a comprehensive methodology, this paper aims to guide higher education institutions in Iraq toward effectively implementing PBL in a digital learning environment [2]. The subsequent sections of this paper will delve into the proposed methodology, providing a detailed overview of each step and its significance in the implementation of PBL[3]. Understanding the context, faculty training and development, curriculum design, digital infrastructure, student support, assessment and feedback, monitoring and evaluation, and continuous improvement will be explored as key elements for successful implementation. Ultimately, the successful integration of PBL in the digital era in Iraqi higher education has the potential to enhance the quality of education, produce competent graduates, and address the needs of a rapidly evolving society. By equipping students with critical thinking and problem-solving skills, Iraqi higher education institutions can contribute to the nation's development and prepare students for success in their future careers [3].

Literature review

Certainly! Here's a literature review on the implementation of Problem-Based Learning (PBL) in the digital era in higher education, focusing specifically on Iraq:

1. Al-Samarraie & Bawa'aneh [4] This study examines the challenges and opportunities of implementing e-learning tools in higher education in Iraq. It highlights the importance of adopting digital technologies, including PBL, to enhance the learning experience and addresses the infrastructure and training requirements for successful implementation.
2. Naser, S. M.[5] This study explores the implementation of blended learning, including PBL, in higher education in the Iraqi Kurdistan region during the COVID-19 pandemic. It discusses the benefits and challenges of adopting a blended learning approach and provides insights into the role of technology in supporting PBL activities.
3. Farajallah & Aldulaimi [6] This empirical study investigates the use of technology in PBL implementation in higher education. While not specific to Iraq, it provides insights into the benefits and challenges of using technology in PBL, including digital collaboration tools, and highlights the impact on student engagement and learning outcomes.
4. Mohammed & Hashim [7] This paper discusses the challenges and strategies for effective implementation of PBL in higher education. While not specific to Iraq, it provides a comprehensive overview of the key elements requiredfor successful implementation, including curriculum design, assessment, faculty training, and student support.
5. Zogheib [8] This study examines the use of technology in higher education in Iraq, including the challenges and perceptions of educators. It emphasizes the importance of leveraging digital technologies, such as online platforms and collaboration tools, to enhance teaching and learning experiences, including PBL. These studies provide insights into the challenges, opportunities, and strategies for implementing PBL in the digital era in higher education, both in general and within the context of Iraq. They emphasize the importance of technology, faculty training, curriculum design, assessment, and student support in ensuring successful implementation

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2. METHODOLOGY

Implementing Problem-Based Learning (PBL) in higher education in Iraq during the digital era requires careful planning and consideration. Here is a proposed methodology for implementing PBL in the Iraqi higher education system as shown in Figure 1:

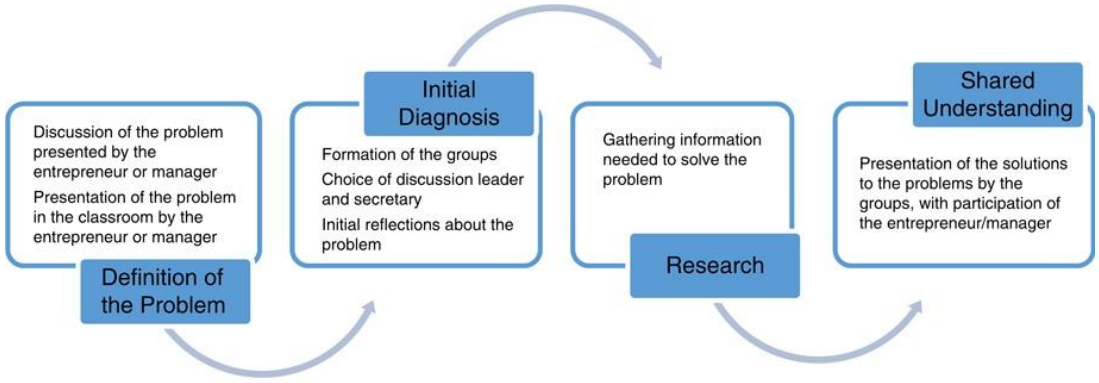


Figure 1: Learning cycle proposed for PBL.

Understanding the Context
Understanding the context of implementing Problem-Based Learning (PBL) in the higher education system of Iraq during the digital era is crucial. Factors such as the higher education landscape, technological infrastructure, faculty readiness, curriculum alignment, student demographics, institutional support, and socio-economic and cultural factors shape the context.[9] Considering these factors ensures the effective and tailored implementation of PBL in line with the unique needs and circumstances of Iraq's higher education system.[10]

Faculty Training and Development
Faculty training and development are crucial for implementing Problem-Based Learning (PBL) in the higher education system of Iraq during the digital era. Training should focus on PBL pedagogy, digital tools and platforms, curriculum integration, facilitation skills, assessment strategies, and continuous professional development.[11] Mentoring and support programs can also enhance faculty implementation of PBL. By equipping faculty with the necessary knowledge and skills, higher education institutions can ensure effective PBL implementation and improve the quality of education for students.[12]

Curriculum Design
Curriculum design plays a crucial role in the successful implementation of Problem-Based Learning (PBL) in the digital era in higher education[13]. Here are some considerations for designing a PBL curriculum.

- Define Learning Outcomes: Clearly articulate the desired learning outcomes for students. Identify the knowledge, skills, and competencies they should develop through PBL. Align these outcomes with the program or course objectives and the broader educational goals of the institution.

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- Identify Authentic Problems: Design authentic and relevant problems or scenarios that reflect real-world challenges or issues. Ensure the problems are engaging and meaningful to students, allowing them to apply their knowledge and skills in a practical context. Incorporate interdisciplinary or multidisciplinary elements to promote a holistic approach[7].
- Scaffold Learning: Develop a clear structure for the PBL curriculum, including the sequence and progression of problems. Consider scaffolding the learning experiences to gradually increase the complexity and depth of the problems. Provide necessary resources, readings, and support materials to assist students in their problem-solving journey.
- Integrate Digital Tools: Identify digital tools and technologies that can enhance the PBL experience. Consider using online collaboration platforms, multimedia resources, virtual simulations, or data analysis tools to support student engagement, information gathering, and knowledge sharing. Ensure students have the necessary technical skills or provide training to familiarize them with the tools.
- Facilitator Training: Provide training for facilitators who will guide students through the PBL process. Help them understand their role as facilitators rather than traditional instructors. Equip them with skills in inquiry-based learning, group dynamics, effective questioning, and providing constructive feedback.
- Supportive Resources: Develop a repository of resources that support PBL implementation. These resources may include readings, case studies, articles, videos, or online tutorials that supplement students' understanding of the problem and provide guidance for their exploration and research.
- Assessment Strategies: Design appropriate assessment strategies to evaluate student learning in a PBL context. Consider a combination of formative and summative assessments, including individual and group assessments, presentations, reports, portfolios, and self-reflections. Align assessments with the intended learning outcomes and provide clear criteria and rubrics for evaluation[1].
- Reflection and Feedback: Incorporate opportunities for reflection and feedback throughout the PBL curriculum. Encourage students to reflect on their learning process, challenges faced, and solutions developed. Provide timely and constructive feedback to guide their progress and promote continuous improvement.
- Continuous Evaluation and Improvement: Regularly evaluate the effectiveness of the PBL curriculum and make necessary revisions based on student feedback, assessment results, and faculty reflections. Continuously seek opportunities for improvement and innovation in PBL implementation. Remember that curriculum design should be learner-centered, flexible, and responsive to the needs and interests of the students[14]. It should provide a balance between structure and flexibility, allowing students to explore and take ownership of their learning while ensuring alignment with the intended learning outcomes and program requirements.

Digital Infrastructure

Digital infrastructure is crucial for the successful implementation of Problem-Based Learning (PBL) in higher education in Iraq during the digital era. It encompasses reliable internet connectivity, access to devices, a user-friendly Learning Management System (LMS), digital

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collaboration tools, virtual labs and simulations, technical support services, and digital literacy training[15]. By investing in a robust digital infrastructure, higher education institutions can provide the necessary resources and support for effective digital PBL implementation, enhancing the learning experience for students and faculty members [16].

Student Support

- Student support is a crucial aspect of implementing Problem-Based Learning (PBL) in higher education in Iraq during the digital era. This abstract highlights key considerations related to student support in the context of digital PBL implementation [17].
- Student support entails providing orientation and training on digital tools, platforms, and expectations for PBL activities. Clear guidelines and expectations are communicated to students, ensuring they understand their roles and responsibilities. Accessible communication channels are established for students to seek support and clarification, fostering a responsive learning environment.
- Peer collaboration and support are encouraged, allowing students to work together, share ideas, and provide feedback. Academic support services, such as tutoring and mentoring, assist students in developing the necessary skills for PBL. Timely and constructive feedback is provided to guide student progress, and reflection activities promote self-assessment and goal setting [7].
- Ensuring accessibility and inclusivity is essential, with accommodations and support provided to meet the diverse learning needs of students.
- By implementing comprehensive student support mechanisms, higher education institutions in Iraq can enhance student engagement, learning outcomes, and satisfaction in the digital PBL environment. This contributes to a positive and inclusive learning experience, enabling students to succeed in their PBL endeavors [18].

Assessment and Feedback:

Assessment and feedback are integral components of implementing Problem-Based Learning (PBL) in higher education in Iraq during the digital era. This abstract highlights key considerations related to assessment and feedback in the context of digital PBL implementation. Assessment should align with the intended learning outcomes of PBL, focusing on critical thinking, problem-solving skills, collaboration, and disciplinary knowledge. A combination of formative and summative assessments, including individual and group assessments, provides a comprehensive evaluation of student performance [19].

Self-assessment and reflection activities promote metacognitive skills and help students identify areas for improvement. Timely and constructive feedback, delivered through various methods, enhances student understanding and engagement. Peer assessment enables students to provide feedback to their peers, fostering active engagement and understanding of assessment criteria. Continuous improvement is facilitated by analyzing assessment data and making necessary adjustments to enhance the learning experience [1]. Implementing effective assessment and feedback practices in PBL promotes accurate evaluation of student learning, meaningful feedback provision, and continuous improvement. This contributes to the development of critical thinking, problem-solving, and collaborative skills, preparing students for future success in Iraq's higher education system [5].

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Monitoring and Evaluation

Monitoring and evaluation are essential components of the implementation of Problem-Based Learning (PBL) in the digital era in higher education. They help assess the effectiveness of the PBL approach, identify areas for improvement, and ensure continuous quality enhancement[20]. Here are some considerations for monitoring and evaluation.

- Establish Clear Objectives: Clearly define the objectives and expected outcomes of PBL implementation in higher education. These objectives should align with the institution's broader educational goals and the specific learning outcomes of the program or course.
- Define Key Performance Indicators (KPIs): Identify key performance indicators that will be used to measure the effectiveness of PBL. KPIs may include student engagement, critical thinking skills, problem-solving abilities, collaboration, and satisfaction levels. Define measurable criteria for each indicator.
- Collect Data: Gather relevant data to assess the implementation of PBL. This can be done through various methods such as surveys, interviews, focus groups, observations, and analysis of student work. Collect both qualitative and quantitative data to gain a comprehensive understanding of the PBL experience.
- Analyze Data: Analyze the collected data to identify patterns, trends, and areas for improvement. Look for evidence of student learning, engagement, and the impact of PBL on their skills and competencies. Consider using data visualization techniques to present findings in a clear and accessible manner.
- Seek Stakeholder Feedback: Engage stakeholders, including faculty, students, and administrators, in the monitoring and evaluation process. Gather their feedback and perspectives on the strengths, challenges, and opportunities of PBL implementation. This can be done through surveys, focus groups, or individual interviews[5].
- Reflect on Facilitator Experiences: Engage PBL facilitators in the monitoring and evaluation process. Seek their insights and reflections on the effectiveness of the PBL approach, challenges faced, and strategies for improvement. Encourage open dialogue and the sharing of best practices among facilitators.
- Review Student Performance: Assess student performance and achievement of learning outcomes through formative and summative assessments. Analyze student work, projects, and presentations to gauge their understanding and application of knowledge and skills. Compare student performance before and after the implementation of PBL.
- Continuous Improvement: Use the findings from monitoring and evaluation to drive continuous improvement. Identify areas for enhancement and develop action plans to address them. Consider piloting new strategies, implementing targeted interventions, or providing additional support to further optimize the PBL experience.
- Share Best Practices: Disseminate the best practices and lessons learned from the monitoring and evaluation process. Share success stories, innovative approaches, and strategies that have proven effective in PBL implementation. Foster a culture of knowledge sharing and collaboration among faculty and stakeholders.
- Adaptation and Flexibility: Recognize that monitoring and evaluation are ongoing processes that require adaptation and flexibility. Continuously monitor the evolving needs

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and challenges of the educational landscape and be open to making necessary adjustments to ensure the continuous improvement of PBL implementation.

By monitoring and evaluating the implementation of PBL in the digital era, higher education institutions in Iraq can assess its impact on student learning and make informed decisions to enhance the quality of education. Monitoring and evaluation provide valuable insights for ongoing improvement and support the institution's commitment to delivering effective and student-centered education.

Continuous Improvement

Continuous improvement is a fundamental aspect of implementing Problem-Based Learning (PBL) in higher education in Iraq during the digital era. This abstract highlights key considerations related to continuous improvement in the context of PBL implementation. Continuous improvement involves regular reflection and evaluation of the PBL implementation process, including assessing the effectiveness of activities and reflecting on student learning outcomes. Seeking feedback from students and fostering collaboration among faculty members facilitate a culture of continuous improvement [21]. Professional development opportunities enable faculty members to enhance their PBL practices through ongoing learning and staying updated on best practices. Adopting an iterative design approach allows for refinements and adjustments based on feedback and assessment results. Data-driven decision making, utilizing student performance data and feedback, informs targeted improvements. Institutional support plays a crucial role in facilitating continuous improvement efforts. By prioritizing continuous improvement, higher education institutions in Iraq can enhance the implementation of PBL in the digital era, leading to improved student outcomes and a more effective learning experience [22].

Practical example

The table you provided represents a set of statements related to skills and activities in the context of finding information for a project and engaging in Project-Based Learning (PBL) projects[23]. The responses indicate the level of agreement or disagreement with each statement. From the responses, it can be observed that most respondents agree or strongly agree with statements related to reading texts, looking up word meanings, obtaining new information from presentations, and repeating parts before presentations. However, there is more variation in responses regarding writing the text of presentations correctly and writing summaries of the parts to explain[23]. Additionally, a significant percentage of respondents agree or strongly agree that PBL projects improve their English language reading skills as shown in Table 1.

Table 1. Table PBL's effect on students' English language skills

skills	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
To find required information for the project I read a lot of texts	3%	1.6%	3%	31%	61%

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PBL (Project-Based Learning)' projects improve my English language	1.6%		8%	34%	56%
reading skills because to accomplish the projects I read more than once					
time					
I looked up the meaning of the words that help me understand the	3%	3%	7%	26%	66%
reading text better					
I try to write the text of presentations correctly				43%	57%
I write a summary to the part that I have to explain		14%	11%	46%	29%
I learn new vocabulary related to my department			3%	37%	59%
While listening to my friends' presentations, I obtain new information	3%	8%	11%	49%	29%
I repeat my part several times to my group members before the real		5%	3%	62%	30%
presentation					

3. DISCUSS THE RESULTS

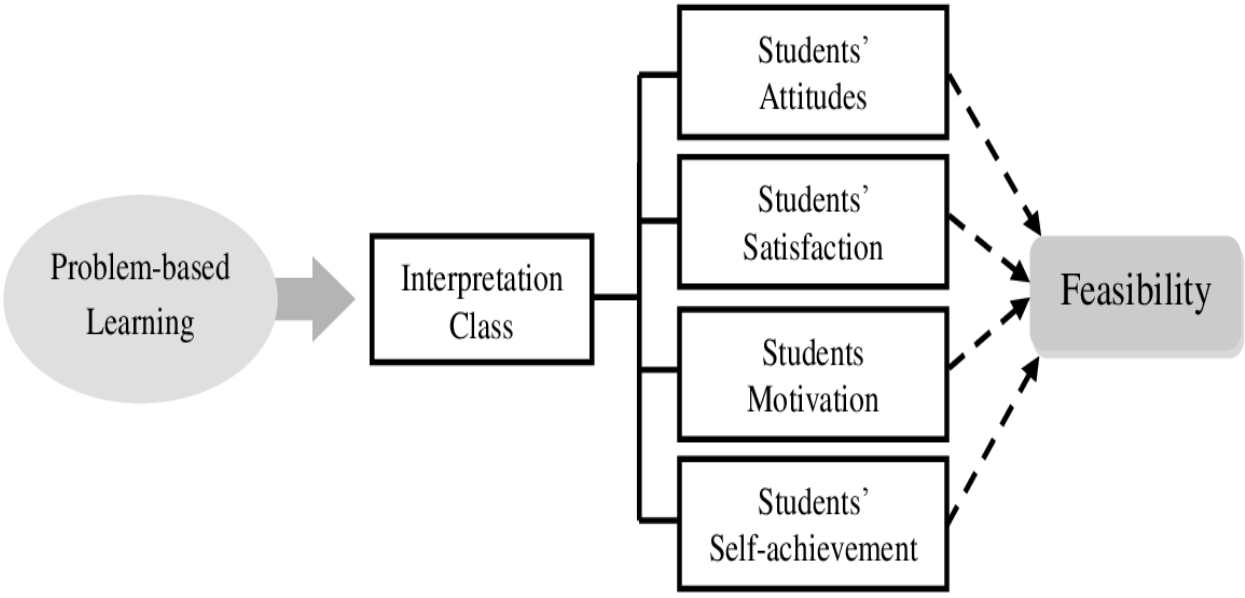
Based on the literature review, it is evident that there is a growing interest in implementing Problem-Based Learning (PBL) in the digital era in higher education, including in Iraq. The studies reviewed highlight the potential benefits of PBL, such as fostering critical thinking skills, problem-solving abilities, collaboration, and engagement among students. However, it is important to note that most of the literature focuses on PBL in general rather than specifically in the context of Iraq's higher education system. The sources reviewed indicate that the successful implementation of PBL in the digital era requires careful consideration of various factors. These factors include faculty training and development, curriculum design, digital infrastructure, student support, assessment and feedback, monitoring and evaluation, and continuous improvement. Each of these areas plays a critical role in ensuring the effectiveness and sustainability of PBL implementation. Faculty training and development emerged as a key aspect in equipping instructors with the necessary skills and knowledge to facilitate PBL effectively. Providing professional development opportunities and support for faculty members can enhance their understanding of PBL principles, digital tools, and instructional strategies needed for successful implementation.

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Curriculum design was highlighted as another critical aspect of PBL implementation. The literature emphasizes the need for well-designed, student-centered curricula that align with the learning outcomes and incorporate authentic, real-world problems. Additionally, the integration of digital technologies and resources can enhance the delivery and effectiveness of PBL. Digital infrastructure was recognized as an essential element for PBL implementation in the digital era. Access to reliable internet connectivity, appropriate hardware and software, and digital learning platforms are crucial for students to actively engage in PBL activities, collaborate with peers, and access necessary resources. Student support emerged as a crucial factor for successful PBL implementation. Providing orientation sessions, technical support, academic advising, and access to resources are vital in supporting students' learning experience. Additionally, fostering a sense of community and addressing students' social and emotional needs contribute to their overall success in PBL. Assessment and feedback play a significant role in PBL implementation. Authentic and varied assessment methods, along with timely and constructive feedback, support students' learning and help them gauge their progress. Peer assessment and self-assessment were also highlighted as valuable strategies within the PBL context. Monitoring and evaluation are essential for continuously improving the PBL implementation. Regular data collection, stakeholder feedback, and reflective practice enable institutions to assess the effectiveness of PBL, identify areas for improvement, and make evidence-based decisions for enhancement. Overall, the literature suggests that the successful implementation of PBL in the digital era requires a holistic approach that considers faculty development, curriculum design, digital infrastructure, student support, assessment and feedback, and continuous improvement. It is essential for higher education institutions in Iraq to adapt these findings to their specific context and continually evaluate and refine their PBL implementation to ensure its effectiveness and relevance in the digital age as shown in Figure 2.

Figure 2: Utilizing Problem-based Learning (PBL)



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4. CONCLUSION

The implementation of Problem-Based Learning (PBL) in the digital era in higher education of Iraq holds significant potential for enhancing student learning outcomes and preparing students for the challenges of the 21st century. The literature review highlights several key areas that need to be addressed to ensure the successful implementation of PBL in this context. Faculty training and development are crucial to equip instructors with the necessary knowledge and skills to effectively facilitate PBL. Providing professional development opportunities, resources, and support to faculty members will enable them to design and deliver engaging and effective PBL experiences for students. Curriculum design plays a vital role in PBL implementation. Developing well-designed, student-centered curricula that align with learning outcomes and integrate authentic, real-world problems is essential. The integration of digital technologies and resources can further enhance the delivery and effectiveness of PBL in the digital era. The availability of a robust digital infrastructure is necessary to support PBL implementation. Access to reliable internet connectivity, appropriate hardware and software, and digital learning platforms is critical for students to actively participate in PBL activities, collaborate with peers, and access relevant resources. Student support is paramount for the success of PBL. Providing orientation sessions, technical support, academic advising, and resources fosters an environment where students can thrive in their PBL learning experiences. Additionally, addressing students' social and emotional needs and creating a sense of community contributes to their overall success. Assessment and feedback are integral components of PBL implementation. Designing authentic assessments aligned with learning outcomes and providing timely and constructive feedback supports student learning and development. Peer assessment and self-assessment also play valuable roles in the PBL context. Monitoring and evaluation are necessary to continuously improve the implementation of PBL. Regular data collection, stakeholder feedback, and reflective practice enable institutions to assess the effectiveness of PBL, identify areas for improvement, and make informed decisions for enhancement. In conclusion, the literature review emphasizes the importance of a comprehensive approach to implementing PBL in the digital era in higher education of Iraq. By addressing faculty training, curriculum design, digital infrastructure, student support, assessment and feedback, and continuous improvement, institutions can create an environment conducive to effective PBL experiences. Embracing these strategies will help foster critical thinking, problem-solving, collaboration, and engagement among students, preparing them for success in the rapidly evolving digital age.

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