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Empowering Education: Revolutionizing Academic Advising with Blockchain Technology

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ABSTRACT: The objective of this paper is to explore the potential integration of blockchain technology into academic advising systems within higher education institutions. This research paper aims to investigate the transformative impact of blockchain, a decentralized digital ledger system, in the field of academic advising of UTAS[Salalah]. The paper will delve into the secure, transparent, and tamper-proof nature of blockchain technology, which ensures the integrity of academic records and advising processes. By analyzing the benefits of blockchain in academic advising, including secure record-keeping, efficient verification of academic credentials, and the automation of advising processes through smart contracts, this study seeks to provide a comprehensive understanding of how blockchain can enhance efficiency and transparency in higher education. Moreover, this conceptual research paper will examine the empowerment of students through blockchain, also enabling seamless transitions between advisors and advisees. Additionally, this research paper will explore the potential for blockchain to foster global peer-to-peer mentorship and collaborative advising environments, transforming traditional advising methods. While acknowledging the promises, the study will critically assess the technical challenges and privacy concerns associated with implementing blockchain in academic advising. Ultimately, the goal is to present a roadmap for successful blockchain adoption in academic advising, thereby facilitating enhanced efficiency, transparency, and security for advisors and students in higher education institutions.

1. INTRODUCTION

In the rapidly evolving landscape of higher education, two groundbreaking concepts have emerged to redefine the way academic systems function: blockchain technology and academic advising. Blockchain technology, characterized by its decentralized digital ledger system, stands as a beacon of security, transparency, and data integrity. It operates by linking individual records into an immutable chain, ensuring that once a piece of information is added, it becomes impervious to alteration, thus providing an unparalleled defense against tampering and fraud. Concurrently, academic advising in higher education institutes has transformed into a personalized and supportive process. Academic advisors, often faculty or staff members, play a pivotal role in guiding students through their educational journey, assisting them in making informed decisions about academic, career, and personal goals. This multifaceted support system equips students with essential knowledge about degree requirements, course selection, and available resources. Moreover, advisors help students identify their strengths, explore potential career paths, and plan for their future endeavours. This paper explores the synergistic potential of integrating blockchain technology with academic advising, illuminating the transformative impact this amalgamation could have on higher education institutes, enhancing the advising process in

unprecedented ways. Blockchain technology provides a secure and transparent foundation for data storage, sharing, and transactions, enhancing the reliability and integrity of data used in analytics processes.

Academic advising in higher education institutes involves a series of steps aimed at assisting students in making informed decisions about their education path. The process typically follows these steps in UTAS:

a. Orientation and Introduction:

New students are introduced to the academic advising system during orientation programs when they are admitted to the college. They learn about the importance of academic advising and the role of advisors in their educational journey. Once the advisor-student pairs are determined, students are informed about their assigned advisors. Students receive communication, which may include emails or notifications through the institution's student portal, indicating the name and contact information of their assigned advisor.

b. Assignment of Advisors:

Students are assigned academic advisors, often based on their major or field. Advisors are faculty members specializing in academic counselling. During the initial meeting, the advisor introduces themselves, explains their role, and discusses the student's academic goals and interests. Advisors provide an overview of the curriculum, degree requirements, and available resources within the department or college. The details collected for an advisee, typically consist of the details for each advisee such as Personal Information, Student ID, their contact information along with Academic Information such as student's current academic status, including GPA and any previous academic warnings or probation. They also collect the course history details like the list of courses taken, grades received, and credits earned. The advisor also collects information about the class schedule, including course name and timetables. In UTAS Salalah campus, it's a common practice to assign different advisors to students at different levels of their academic journey. This approach is especially prevalent in programs that span multiple educational tiers, such as diploma, advanced diploma, and bachelor's levels. Each level represents a distinct phase in a student's education, with unique challenges, requirements, and goals. Consequently, assigning specific advisors to each level so that the students receive tailored guidance and support at every stage of their academic progression. The advisors use Colleges Information Management System [CIMS] and Academic Record Management System [ARMS] in addition to individual excel files maintained by the advisors.

c. Course Selection and Registration:

Advisors assist students in selecting appropriate courses for the upcoming semester. They provide guidance on prerequisites, course availability, and potential challenges. Advisors help students register for classes and may provide override permissions if necessary. At the diploma level advisors play a foundational role. They assist students in transitioning from secondary education to higher education. Advisors provide essential information about the program structure, academic expectations, and university policies. They help students understand the fundamentals of their chosen field of study and navigate the initial challenges of college life. The advisors at this level focus on academic orientation, study skills development, and adjustment to college-level coursework. At the advanced diploma level, advisors take on a more specialized role. They assist students in delving deeper into their chosen field of study. Advisors provide guidance on advanced coursework, practical applications of knowledge, and potential career pathways. They help students explore specialized areas within their discipline, enabling them to make informed decisions about their academic futures. At the bachelor's level, advisors take on a comprehensive role. They assist students in their final stages of academic preparation, ensuring that they are well-equipped for the transition to the professional world or advanced studies. Advisors provide guidance on advanced coursework, capstone projects, graduate school applications, and career planning. They help students align their academic achievements with their long-term goals, preparing them for successful entry into the workforce or postgraduate education.

d. Monitoring Academic Progress:

Advisors monitor students' academic performance, including grades and course completion. The students fall under the categories of Normal or Under-Probation. They identify students who might be struggling academically called under-probation and offer support or referrals to tutoring services. Advisors assist students in planning their academic trajectory to ensure timely graduation. They review graduation requirements and help students track their progress toward degree completion.

e. Follow-Up and Evaluation:

Advisors conduct follow-up meetings to assess students' progress and address any new concerns. Feedback

mechanisms, such as surveys, may be used to evaluate the effectiveness of the advising process.

f. Student-Advisor Meeting:

Students meet their advisors to discuss academic goals, interests, and career aspirations. Advisors provide an overview of the curriculum, academic requirements, and available resources. The meeting may involve creating an academic plan tailored to the student's goals during the student's study period in the college.

The following section discusses the issues with the semi-automatic advisory systems using multiple independent systems in the UTAS campus. environment.

2. DRAWBACKS OF CURRENT SYSTEM IN UTAS

Having multiple advisors for a student across different academic levels (diploma, advanced diploma, and bachelor's degree) can present several drawbacks. Different advisors might have varying approaches and recommendations, leading to inconsistencies in advice and guidance. This lack of continuity can confuse the student and create conflicting directions in their academic journey. Different advisors may have limited knowledge about the advice given at previous levels, leading to incoherent academic planning. This lack of coherence can result in a disjointed educational experience for the student. Advisors at different levels might have different perspectives on the student's academic and career goals. This misalignment can lead to conflicting advice, causing confusion, and hindering the student's ability to make informed decisions. Coordinating information and communication among multiple advisors can be complex. Important details might get lost or miscommunicated, leading to misunderstandings and misinformed decisions. When responsibility is divided among multiple advisors, it can lead to a diffusion of accountability. No single advisor might feel fully responsible for the student's overall academic and personal development, potentially affecting the quality of support provided. Each advisor might focus on specific aspects of the student's academic journey, leaving gaps in holistic support. Essential interconnected areas, such as extracurricular activities, career planning, or mental health support, might be overlooked, affecting the student's overall development.

3. LITERATURE REVIEW:

a. Academic Advising:

Higher education institutions have established academic advisor systems to facilitate communication between students and their mentors. This system primarily aims to offer guidance and mentorship, aiding students in their academic journey. With the advancement of information and communication technology, the implementation of this system has become more efficient. The prevailing trend involves advisors and students to communicate seamlessly on matters related to education and learning.

Academic advising is a dynamic process that assists students in understanding their life and career aspirations and in formulating educational plans to achieve these goals [1]. In higher education institutions, the academic advisor system is designed to facilitate communication between students and advisors. The primary objective of this system is to offer guidance and mentorship to students in their academic pursuits. Academic advisors, especially those well-versed in student challenges, are ideally suited for this role. They play a crucial role in assisting students in making high-quality academic decisions [2]. Drawing from Terry O'Banion's advising model, as well as insights from Noel and Levitz [3], advisors can focus on five essential areas of knowledge and skills: Guiding Program Selection, Assisting with Course Selection, Planning Course Schedules Certain advising systems incorporate agent systems and additional components to enhance the advising process. These components include scheduling systems, academic calendars, bulletin board systems, appointment systems, and system-generated reports used for administrative purposes. Academic advising can be divided into two main categories: academic and non-academic. Academic advising helps students with important things related to their studies. These include registering for courses, choosing the right classes, tracking academic progress, and planning their studies. These are the main things in academic advising [4]. Apart from these main things, students also need help with other study-related matters like knowing the school schedule, understanding course details, and arranging their classes. These are called secondary matters in academic advising. It also helps students with their future careers. Advisors can give guidance about jobs and career opportunities. They can also help with general information students might need. Additionally, advising also covers non-academic areas such as career advice and general information. If students have any issues or problems related to school or personal matters,

they can talk to their advisor about it. So, academic advising is not just about classes—it's about helping students with many aspects of their education and future [5]. Academic advising in higher education institutes refers to a personalized and supportive process where students receive guidance, mentorship, and information from academic advisors to help them navigate their educational journey effectively. Advisors assist students in making informed decisions about their academic, career, and personal goals [6]. These advisors, often faculty or staff members, provide students with information about degree requirements, course selection, academic policies, and resources available on campus. They also help students identify their strengths, interests, and areas for improvement, offering tailored advice on choosing majors, minors, and elective courses [7]. Additionally, academic advisors may help students explore potential career paths, discuss internship and research opportunities, and guide them in planning for post-graduation goals, such as further education or entering the workforce. The goal of academic advising is to empower students to make well-informed decisions about their education and future, fostering their academic success and personal development [8][9][10]. In practical terms, a blockchain network comprises a group of computers or servers (nodes) linked together and operates on a shared communication system, often called a protocol. The primary purpose of these network nodes is to validate transactions occurring within the network and maintain an accurate record of system information, ensuring its integrity. For this to happen, all nodes must follow the same rules and communicate using the same protocol. The evolution of blockchain technology and its widespread adoption have resulted in the creation of various communication protocols tailored to the specific requirements of platforms utilizing this technology [11].

b. Blockchain:

Blockchain technology is a decentralized digital ledger system that records transactions across multiple computers in a way that ensures the security, transparency, and integrity of the data. Each record in the blockchain, called a "block," is linked to the previous one, creating a chain of blocks. Once a block is added to the chain, it cannot be altered without changing all subsequent blocks, making it highly secure against tampering or fraud. This technology is the foundation for various applications which aid in verifying the authenticity of digital assets [12]. Blockchain technology is a fundamental process used for digital verifications, like verifying cryptocurrencies [13]. It's being used in many creative ways in various fields. In education, especially higher education, it helps to enhance learning. Think of it as a tool that improves how students learn by connecting them with knowledgeable peers and mentors. These connections involve personal inquiry, social interaction, and expert guidance, all made better by blockchain technology [14–16]. Alzahrani and colleagues discovered that collaboration among employees is vital for enhancing quality and expanding services. Effective communication among staff, faculty, and students is crucial for any organization, regardless of its academic nature. Modern technologies like emails, texts, social media apps, and blockchain have facilitated collaborative projects in education and various sectors [17]. Ullah and his team discovered that some schools are using blockchain technology for education. In some places, it's used to handle academic degrees and grades. To use it, you need a college degree and assessments based on your grades. Also, people can take many courses online, attend group meetings, give presentations, and do research activities. Some educational institutes use a special technology called Distributed Ledger Technology (DLT) to confirm credentials from online courses. Sony and MIT use blockchain for clear evaluations and storing information. Holberton School also uses a similar technology to store degrees and educational details. This special system can hold different kinds of information, and each student has a unique ID for their records [18]. The core features of blockchain technology, namely immutability, decentralization, traceability, and currency properties, have been identified as pivotal in the context of Higher Education (HE) sector [19]. Immutability signifies that once data is recorded on a blockchain, it cannot be altered, ensuring the integrity and security of educational records. Decentralization means that the information is not stored in a single central location but across multiple computers, enhancing transparency and reducing the risk of manipulation. Traceability allows for a complete and unchangeable history of data, making it easy to verify credentials and track academic achievements. Additionally, the consideration of reliability, transparency, availability, and trust, as highlighted by Awaji and colleagues, further emphasizes the significance of blockchain technology in education [20]. These attributes ensure the reliability of information, the clear and open flow of data, its accessibility, and the establishment of trust among all stakeholders involved in the educational processes. In the HE sectors, where the accuracy and security of academic records are paramount, these features make blockchain an ideal and transformative solution,

fostering a trustworthy and efficient environment for managing educational data. In a study conducted by Tapscott and Tapscott, the potential applications of blockchain technology in Higher Education (HE) were thoroughly explored [21]. According to their findings, blockchain technology offers a versatile solution that can be applied across various transaction categories. This includes, but is not limited to, certificates, data, monetary transactions, student records, and profiles, as well as the management of data related to workers and stakeholders within educational institutions [22][23][24]. Moreover, the study highlighted the technology's ability to revolutionize access to online libraries and address copyright issues effectively. By incorporating blockchain, academic institutions can enhance the security, transparency, and efficiency of various processes within the educational landscape. Blockchain's immutable nature ensures the integrity of certificates and student records, making it an ideal solution for combating fraud and maintaining the authenticity of educational achievements. Furthermore, the decentralized and transparent nature of blockchain transactions fosters trust among stakeholders, simplifying administrative procedures and enabling seamless management of diverse aspects of the educational ecosystem. These insights shed light on the transformative potential of blockchain technology, paving the way for innovative solutions in the field of Higher Education.

4. PROPOSED SOLUTION:

After brief discussions on the issues with the current advising system, the research team has proposed a solution for the issues. A Study on the Impact of Inter-Advisor Communication Gaps on Student Progression and Performance. The existing academic advising system assigns students to individual teachers across three levels of degree programs (Diploma, Advanced Diploma, and Bachelors). The progression of students between these levels depends on their Cumulative Grade Point Average (CGPA) and Semester Grade Point Average (SGPA). Advisors are responsible for monitoring students' academic progress and making course recommendations based on their CGPA and SGPA. However, there are challenges related to inter-advisor communication, where information about students' progress is not consistently shared between different levels of advisors. This lack of communication hinders the effective support and guidance provided to students, potentially impacting their academic performance and progression.

This research paper investigates the profound impact of blockchain technology on enhancing the academic advising processes at UTAS [Salalah]. Blockchain technology, with its decentralized and transparent nature, addresses the specific challenges faced by students, advisors, and educational institutions in the new proposed advising system. By providing an immutable ledger, blockchain ensures data security, prevents tampering, and enhances overall efficiency in advising processes. In defining the objectives of blockchain integration, institutions can prioritize enhanced data security, streamlined communication, and improved advising efficiency. By choosing the right blockchain platform – whether public, private, or consortium – based on scalability and privacy concerns, educational institutions can tailor the technology to their specific requirements. Blockchain implementation includes robust encryption techniques, safeguarding all stored data to maintain student privacy and confidentiality. Access control mechanisms, facilitated through smart contracts, manage permissions, ensuring that only authorized individuals can view or modify specific advising data, enhancing data security protocols. Academic records, encompassing grades, certifications, and achievements, can be securely stored on the blockchain. This ensures data integrity and prevents unauthorized alterations, enabling easy and secure verification of academic credentials. Employers and other institutions can seamlessly verify the authenticity of students' academic achievements, enhancing trust and credibility. Smart contracts play a pivotal role in automating advising processes. From course registration to enrollment criteria verification, smart contracts ensure adherence to specific requirements before students can proceed. Transparent communication channels, facilitated by smart contracts, promote efficient interactions between students, advisors, and institutions, fostering a seamless advising experience. Blockchain technology facilitates the development of decentralized advising platforms. These platforms empower students to connect with advisors globally, fostering a collaborative advising environment. This research aims to address a critical issue in the existing academic advising system by exploring the impact of communication gaps on students' academic journeys. By identifying these challenges and proposing effective solutions, the study will contribute valuable insights to educational institutions, policymakers, and administrators, enabling them to enhance the support mechanisms for students. Ultimately, this research seeks to improve the overall student experience, ensuring that students receive

consistent and tailored guidance throughout their academic endeavors.

Integrating blockchain technology into academic advising in Higher Education Institutes can greatly enhance efficiency, transparency, and security in student advising processes. This conceptual paper proposes the following to achieve this integration using blockchain technology, with its decentralized and transparent nature, addresses the specific challenges faced by students, advisors, and educational institutions in the current advising system. By providing an immutable ledger, blockchain ensures data security, prevents tampering, and enhances overall efficiency in advising processes for student records. The blockchain technology can be combined with academic advising in higher education institutes to enhance various aspects of the advising process. Blockchain can securely store academic records, including grades, certifications, and achievements. This ensures the integrity of the data and allows students and advisors to access a tamper-proof record of academic progress. Academic credentials stored on a blockchain can be easily and securely verified by employers or other educational institutions. This reduces the chances of credential fraud and streamlines the hiring or admission process. Smart contracts on a blockchain could automate certain processes in academic advising, such as course registration. These contracts could ensure that students meet specific criteria before enrolling in classes, streamlining the registration process. Blockchain provides a transparent and decentralized ledger, allowing students to have more control over their data. They can grant specific permissions for advisors to access relevant information, enhancing privacy and data security. Blockchain-based academic credentials can be portable across institutions and even international borders. This can be particularly useful for students transferring between universities or pursuing studies abroad, ensuring that their academic achievements are recognized globally. Blockchain can support the development of decentralized advising platforms where students can connect with advisors globally. These platforms can facilitate peer-to-peer advising and mentorship, creating a collaborative and diverse advising environment. By integrating blockchain technology, academic advising in higher education can become more efficient, transparent, and secure, benefiting both students and institutions. However, it's essential to address technical challenges, data privacy concerns, and ensure user-friendly interfaces to make such implementations successful. The next section lists the technical challenges that should be addressed by the developers of this system.

5. TECHNICAL CHALLENGES:

Implementing blockchain for academic advising in UTAS[Salalah] presents a range of technical challenges, despite the potential benefits it could offer in terms of transparency, security, and efficiency. Here's an in-depth analysis of these challenges:

a. Scalability:

The Blockchain networks, especially public ones, face scalability challenges. UTAS[Salalah] typically involves many students, faculty, and staff, and the volume of transactions and data can be substantial. Ensuring that the blockchain network can handle the scale of academic advising transactions, including course registrations, grade updates, and counseling sessions, is crucial. This requires careful consideration of consensus algorithms, block size, and transaction speed.

b. Integration with Existing Systems:

UTAS[Salalah] has complex and established information systems. Integrating blockchain with these existing systems can be challenging. The Blockchain implementation needs to seamlessly interface with Student Information Systems (SIS), Learning Management Systems (LMS), and other relevant databases. A standardized approach to integration, possibly through APIs, is essential to ensure compatibility and minimize disruptions.

c. Privacy and Data Protection:

Privacy concerns are paramount in academic settings. Student data, grades, and advising records need to be handled with utmost care. Designing a blockchain system that ensures data privacy while still maintaining transparency and auditability is challenging. The use of private or permissioned blockchains, encryption techniques, and adherence to data protection regulations are essential components of the solution.

d. User Experience:

Blockchain systems are often criticized for their complexity and lack of user-friendly interfaces. Designing a user interface that is intuitive for students, faculty, and advisors is crucial for successful adoption. This involves creating dashboards, notifications, and user experiences that are comparable to or better than existing systems.

e. Smart Contract Security:

Smart contracts, which automate processes on the blockchain, need to be secure to prevent vulnerabilities and exploits. Thorough code auditing and testing are required to identify and eliminate security loopholes. Smart contracts should be designed with modularity and upgradability in mind to address security issues promptly.

f. Costs and Resource Allocation:

Implementing and maintaining a blockchain system can be resource intensive. A comprehensive cost-benefit analysis is necessary to understand the financial implications. UTAS[Salalah] need to allocate resources for development, maintenance, and ongoing support. Collaboration with blockchain development experts or companies may be considered.

g. Regulatory Compliance:

The university is subject to various regulations related to data privacy and security. Ensuring that the blockchain system complies with existing and evolving regulations is critical. This may involve collaboration with legal experts to navigate the complexities of data protection laws and educational regulations.

In conclusion, while blockchain has the potential to transform academic advising in UTAS[Salalah] addressing these technical challenges is crucial for successful implementation. A thoughtful and collaborative approach, involving stakeholders from various domains, is necessary to develop a robust blockchain solution that meets the unique needs of academic institutions.

6. CONCLUSION:

Blockchain technology is a boon for the current organizations to maintain the documents which are handled by various people and departments without maintaining the duplicates of the old independent versions of the documents. This advantage can be adapted by the educational domain for academic advising. Incorporating blockchain technology into academic advising processes revolutionizes the educational landscape, enhancing transparency, security, and efficiency. Through thoughtful implementation and continuous refinement, blockchain-powered advising systems pave the way for a more robust, collaborative, and student-focused educational experience. To mitigate the mentioned drawbacks, educational institutions should establish clear communication channels among advisors, encourage collaboration, and ensure that advisors are well-informed about the student's entire academic journey. The amalgamation of the blockchain with the AI technology may give cutting edge advantage to the advisers and students to proceed in their academic journey without much hustle. This will help the universities to reduce the dropping rate of the students due to the lack of proper academic advising and counseling. The main administration may make policies and give proper training to all the staff members and students to use the system. The cost incurred by the system can be subsidized considerably by the maximum utilization of the existing technical resources of the university.

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