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RESULTS & DISCUSSION

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RECOMMENDATIONS/SUGGESTIONS

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CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

JOURNAL AND OTHER ARTICLES

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–23

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SECURE DATA MANAGEMENT MODEL (SDMM): ACCESS POLICY HIDING FOR EFFICIENT SHARING AND REVOCATION USING BLOCKCHAIN

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ABSTRACT

In today's context, the secure sharing of sensitive data is paramount for maintaining privacy and confidentiality. Additionally, efficient revocation mechanisms play a vital role in promptly revoking access privileges to prevent unauthorized usage. Our work addresses these concerns by leveraging blockchain technology to share Attribute-Based Encrypted (ABE) ciphertext, which includes an IPFS file URL, access policies, and a revocation list. By incorporating a tree-based revocation mechanism and integrating Attribute-Based Access Control (ABAC) through smart contracts, such as OAMC, SAMC, ACC, and RMC, we ensure the seamless execution of necessary operations. Our system not only protects access policies but also enhances the efficiency of the revocation mechanism. Through extensive experimental evaluation and analysis, we have demonstrated the better performance of our methods compared to existing approaches.

KEYWORDS

ABE, ABAC, tree, revocation, IPFS, Blockchain.

JEL CODES

D82, D85, L86.

1. INTRODUCTION

To ensure the protection of sensitive information and maintain privacy, secure data sharing is crucial. It prevents unauthorized access and safeguards data from potential breaches. Additionally, efficient revocation mechanisms are necessary to promptly revoke access privileges, preventing unauthorized usage and maintaining control over shared data, thereby enhancing overall data security. These objectives can be achieved by leveraging attribute-based mechanisms such as Attribute-Based Encryption (ABE) and Attribute-Based Access Control (ABAC), in combination with blockchain technology, which adds an extra layer of transparency and immutability to the sharing and revocation processes.

Blockchain operates through the integration of cryptographic principles, decentralized architecture, and distributed consensus. Transactions are organized into blocks and connected using cryptographic hashes, forming an unchangeable data chain. Once a block is added, it becomes nearly impossible to alter, ensuring transparency, security, and trust in the system. Consensus algorithms like Proof of Work or Proof of Stake validate and establish agreement among participants on the blockchain's state. The immutability of added blocks ensures transparency, security, and a trustworthy system.

Attribute-Based Encryption (ABE) is a cryptographic method that facilitates access control by leveraging attributes. It enables the encryption of data with specific attributes, ensuring that only users possessing corresponding attributes can decrypt and access the information. ABE empowers fine-grained access control, offering flexibility and customization in the secure sharing of encrypted data.

Attribute-Based Access Control (ABAC) is a security framework that governs access to resources based on associated attributes of users, objects, and the environment. ABAC enables detailed control by considering multiple attributes concurrently, resulting in accurate and context-aware access decisions. This model offers a fine-grained level of access control, ensuring that resources are only accessible to authorized entities based on their attribute values.

In the realm of access control and data protection, ABE (Attribute-Based Encryption) and ABAC (Attribute-Based Access Control) are interconnected yet separate concepts. ABE primarily deals with encryption and decryption, ensuring secure data storage and sharing. In contrast, ABAC functions as an access control model, making access decisions based on various attributes associated with resources.

In this paper, we have used both ABE, ABAC mechanisms on blockchain along with offline storage IPFS and proposed a model to realize efficient sharing and revoking mechanisms. This paper makes three distinct contributions, which are outlined as follows:

- Outsourced storage for data owner in IPFS
- Auxiliary tree-based revocation
- Using blockchain to maintain and store cipher text that contains encrypted IPFS URL data along with both revocation list and access policies
- Access control decisions are based on smart contracts
- Providing forward and backward security with only revocation list update
- Existing Cipher text is not actually updated in blockchain, but copy of cipher text is fetched, modified and updated. The updated cipher text copy is always place in blockchain as new transaction for every revoked use

The rest of the paper is structured as follows in the subsequent sections: The section II of this paper explores into an examination of previous studies and related work. Section III describes the proposed Model, providing a in detail explanation. In Section IV, a detailed analysis of the results is presented and discussed. Moving forward, Section V provides insights into future scope and pivotal research directions. Finally, Section VI concludes by summarizing the key findings and implications of our research work.

2. OBJECTIVES OF THE STUDY

1. To protect access policies from infringement.
2. To provide effective revoke mechanisms.
3. For Providing flexible data sharing.

3. RESEARCH METHODOLOGY OF THE STUDY

Systematic approach and techniques are applied to conduct the research and data is collected through different primary and secondary sources.

4. RELATED WORK

This section will focus on most recent research works investigated on the concepts of ABE (Attribute-Based Encryption), ABAC (Attribute-Based Access Control) and blockchain for secure and trustworthy data sharing. Additionally, the section will concentrate on techniques employed for hiding access policies along with various revoking mechanisms employed until now.

The ReLAC method [1] applies the CP-ABE (Ciphertext-Policy Attribute-Based Encryption) mechanism along with an auxiliary binary tree for user revocation. Access policies and revocation are stored as part of the ciphertext. However, to ensure forward and backward security, the ReLAC scheme incurs a high overhead due to the need for cipher text updates and key generation for each revoked user.

The authors in [2] implemented attribute revocation, which indirectly revokes users. However, the overhead of updating secret keys is greater than that of updating the ciphertext.

In [3], the attribute manager was utilized to address the challenge of attribute revocation in the system. However, the scheme incurred additional computation overhead as it required updating the keys and ciphertext of unrevoked users when revoking a malicious user.

During the update phase described by [4], only a single component of the ciphertext related to the user tree was modified. This approach decrease the computational overhead; however, it also resulted in a reduction in the scheme's security.

The CP-ABE scheme proposed by [5] utilizes a binary tree associated with user formation for implementing attribute revocation and user tracing. This scheme has shown to be effective in ensuring security against chosen plaintext attacks and selective access policy scenarios.

In their work, Yang et al. [6] presented a data sharing mechanism that combines blockchain and edge computing to support attribute revocation. However, the scheme mandates the attribute authority to update the attribute key for users who possess the revoked attribute. Additionally, fog nodes are responsible for carrying out ciphertext updates.

Wan et al. [7] proposed a variant of Attribute-Based Encryption (ABE) with user revocation in the random oracle model. However, this approach requires an additional attribute to record expiration time and necessitates re-encryption to uphold data confidentiality against revoked users. As a result, the scheme incurs linear revocation complexity, as the key generation center must distribute updated secret keys to non-revoked users during each revocation epoch.

In their study, Yeh et al. [8] utilized standard Attribute-Based Encryption (ABE) along with a Merkle hash tree to implement user revocation while considering data confidentiality against revoked users. However, they employed a ciphertext re-encryption approach to safeguard data confidentiality, which resulted in a substantial overhead for data owners who needed to re-encrypt their data in each revocation epoch.

In their work, Hoang et al. [9] developed a forward-secure access control mechanism that incorporates attribute revocation. However, in addition to the intricate ciphertext update operations, the scheme also necessitates updating the non-revoked proof and decryption keys for existing users who possess the revoked attribute.

To safeguard users' sensitive information, researchers have explored policy hiding CP-ABE schemes. Nishide et al. [10] introduced the first partially policy hiding CP-ABE scheme, utilizing AND gates and achieving security in the selective model. Lai et al. [11] supported LSSS (Linear Secret Sharing Scheme) policies, achieving full security, although it did not support a large universe. Lewko et al. [12] proposed a CP-ABE scheme, demonstrating its security based on the dual system encryption method [13].

Okamoto et al. [14] successfully developed a scheme that achieves full security. Cui et al. [15] introduced a policy hiding CP-ABE scheme supporting LSSS policies and a large universe, although it only achieves security in the random oracle model. Han et al. [16] proposed a partially policy hiding CP-ABE scheme based on prime order groups, but it relies on a trusted central authority for secret key distribution.

Wang et al. [17] presented a scheme that provided support for revocation and policy hiding but did not accommodate LSSS policies. Moreover, none of the previously mentioned schemes supported outsourced decryption. In contrast, Zhong et al. [18] proposed a CP-ABE scheme that supported outsourced decryption. However, it lacked correctness verification for outsourced results and fell short in protecting user privacy.

In contrast to the pros and cons of the recent works on policy hiding and revocation mechanisms discussed earlier, our proposed method outperforms these existing methods by offering improved performance with reduced computational overhead. Furthermore, our approach includes a blockchain-based access control system, which serves as an additional feature to enhance trust, privacy, and transparency, setting it apart from the aforementioned methods.

5. PROPOSED SECURE DATA MANAGEMENT MODEL (SDMM)

The proposed secure data management model mainly contains three modules:

5.1 Initial setup Module

In this module data owner is going to store his file in decentralized storage IPFS. This module has following steps

- Data owner(O) stores his file in IPFS and will get URL
- Data owner(O) encrypts that URL using CP-ABE
- Encrypted fixed cipher text is associated with updatable access policies written by owner(O) along with updatable empty revocation list
- Now the resulted cipher text is stored in blockchain
- Data owner then deploy four access control smart contracts OAMC (Object Attribute Management Contract), SAMC (Subject Attribute Management Contract), ACC (Access control contract), RMC (revocation Management Contract) to control the access

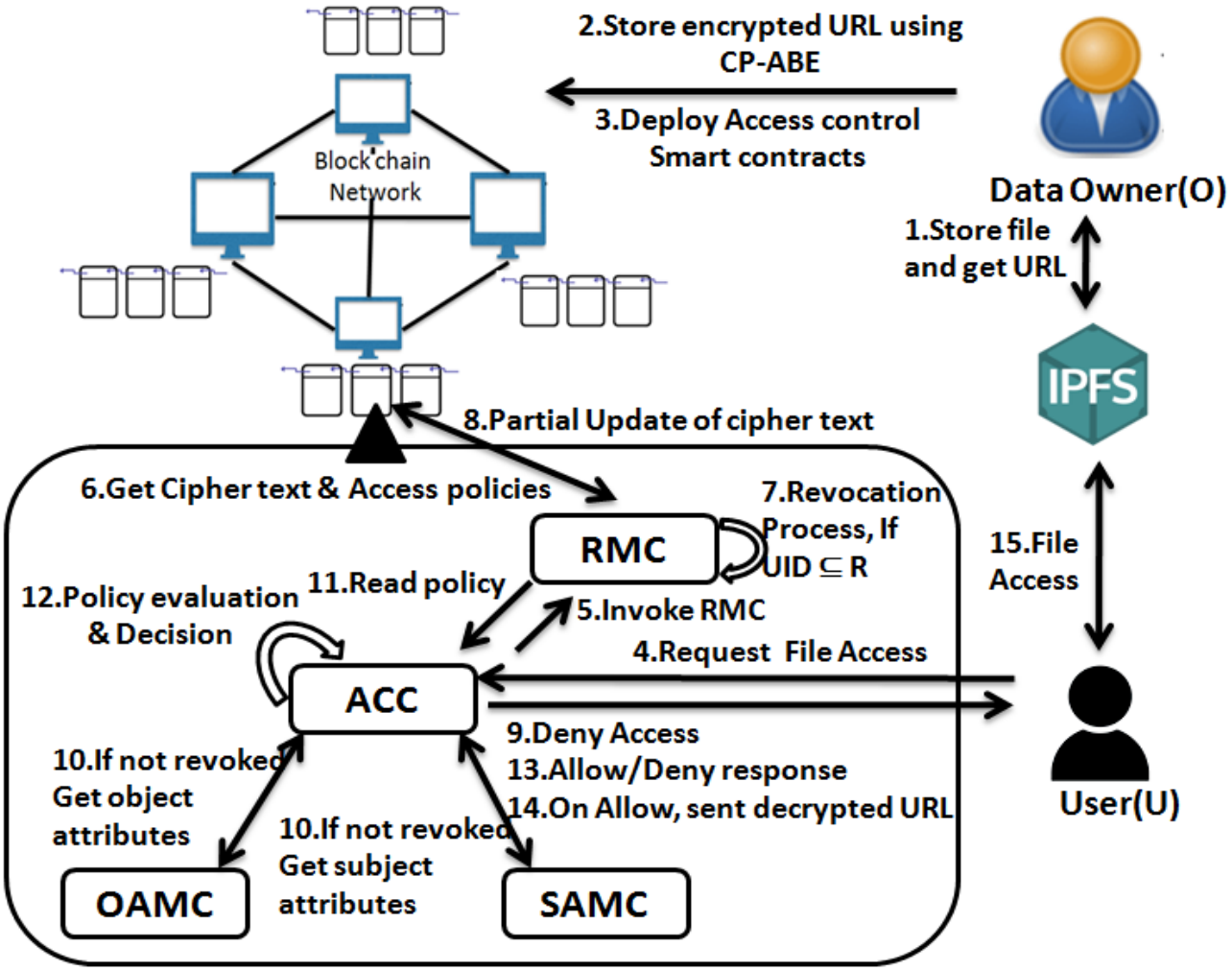
Here OAMC is used to manage attributes related to the object, SAMC is used to manage attributes related to subject, ACC receive requests from user and then it is going to act as PDP (Policy Decision Point) and PEP (Policy Enforcement Point) to make final decisions regarding access, RMC is used to control entire revocation process and also modify updatable components of cipher text such as revocation list and access policies.

5.2 Revocation Module

This module represents the logic that represents sharing and access related aspects. This module has the following steps

- User (U) uses the WebApp and send access request to file Owner (O).
- This request is received by PEP smart contract ACC
- Now PEP forward received access request to PDP which is part of ACC.
- As a Policy Decision Point (PDP), ACC initially invoke RMC.
- Now Revocation Management Contract (RMC) read revocation list(R) and access policies (P) associated with cipher text (CT).
- Now RMC checks whether the user (U) is present in revocation list or not. i.e., if UID $\subseteq$ R
- If user present in revocation list(R), then access request is rejected.
- Otherwise, ACC calls OAMC, SAMC to get object and subject attributes and use access policies (P) to make final access decision.
- If user attributes match access policies(P), then PDP announces decision “Allow” and user(U) is given response with the cipher text that contains URL of file present in IPFS.

FIG. 1: ARCHITECTURE OF SECURE DATA MANAGEMENT MODEL



5.3 Data Sharing Module

This module is used by the file owner (O) to revoke access from User(U). This module has the following steps:

- To revoke access from user(U), data owner sends revocation request along with user id (UID) to ACC.
- This request is received by PEP (Policy Enforcement Point) component of ACC.
- Now ACC invoke RMC (Revocation Management Contract)
- The RMC component invoke the initTree() and updateTree() methods
- Initially initTree() method is invoked to build auxiliary binary Tree(T) out of revocation list(R).
- This binary tree represents all the users who are currently having access to the cipher text of IPFS URL. In this binary tree all the users are represented as leaf nodes.
- After tree initialization, RMC calls updateTree() method to check whether the revocation list(R) contains the UID of the user. Here special algorithms like Cover(R) and Path(i) are used to complete the operation
- If UID $\not\subset$ R, then UID of user is added to revocation list(R) and binary tree is updated to complete revocation process
- Updating revocation list of cipher text represent partial updating, where actual IPFS URL cipher data is fixed
- Now the updated revocation list(R) is updated in the its part of cipher text (CT)
- A special transaction is required to write the updated ciphertext to the blockchain. This is due to the immutable nature of the blockchain, which means that once data is recorded on the blockchain, it cannot be modified or deleted. Therefore, in order to update the ciphertext, a new transaction needs to be created, which includes the revised ciphertext and any associated changes.

The overall architecture that contains aforementioned three models are represented in Fig. 1.

6. EXPERIMENTAL SETUP AND RESULT ANALYSIS

Our model was tested by setting up a local Ethereum blockchain using the Rinkeby testnet. For experimentation purposes, we established this network with ten basic blockchain nodes. The system used for these experiments is equipped with an i5 processor and 16GB of RAM. This configuration ensured that our model could run smoothly and efficiently during testing and evaluation.

We utilized the Ganache software to access the local blockchain network and installed IPFS for decentralized storage. Additionally, we designed a user-friendly WebApp using AngularJS to serve as an interface between users and the blockchain network.

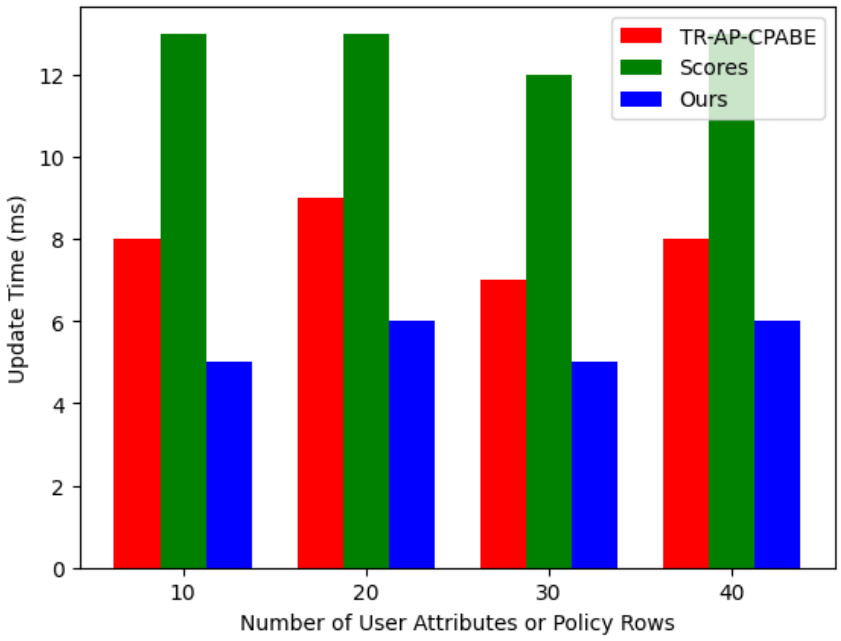
To enable interaction between the WebApp and the blockchain network, we integrated Web3JS within our WebApp, which allows us to communicate with the Metamask extension. Metamask, in turn, facilitates the interaction between our WebApp and the local Ganache blockchain network.

Our secure data management model has been primarily compared to two closely related models, namely the TR-AP-CPABE model [4] and the ReLAC model [1].

6.1 COMPARISON 1: ***Ciphertext updating Time Analysis***

A comparison was conducted among the aforementioned three models regarding the update time of ciphertext, using the metrics of "Number of attributes" and "Update Time." Our model exhibited better performance in this comparison. This is attributed to the fact that our model does not update the existing ciphertext directly in the blockchain. Instead, a modified copy of the ciphertext is created and written into the blockchain as a new transaction.

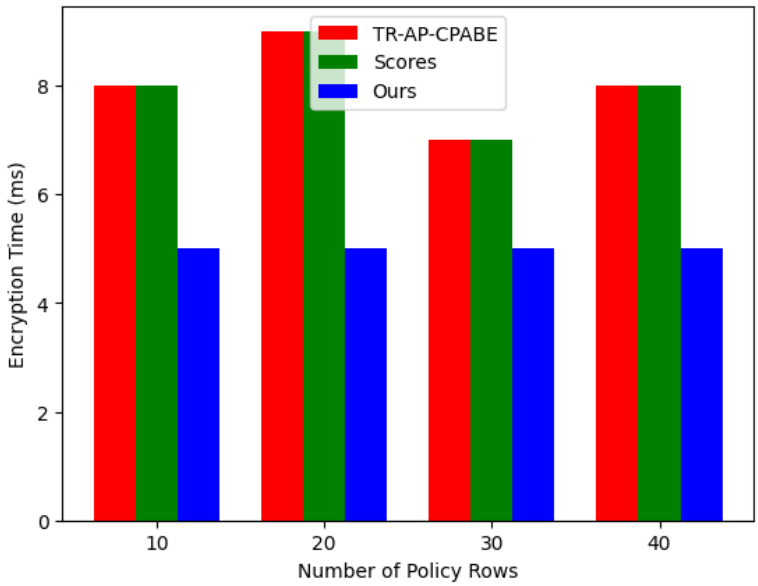
FIG. 2: UPDATE TIME ANALYSIS



6.2 COMPARISON 2: *Encrypt Time Analysis*

In contrast to the TR-AP-CPABE model [4] and the ReLAC model [1], our approach differs in how we handle file encryption. Instead of encrypting the entire file to obtain ciphertext, we store the actual file in IPFS and generate a file URL. This file URL is then encrypted and stored in the blockchain. This approach significantly reduces the time required for encryption compared to the existing models.

FIG. 3: ENCRYPTION TIME ANALYSIS



6.3 COMPARISON 3: *Others*

Our model, implemented in blockchain-based Attribute-Based Access Control (ABAC) with Attribute-Based Encryption (ABE), offers improved trust, privacy, non-repudiation, and decentralization compared to the TR-AP-CPABE model [4] and the ReLAC model [1].

7. FUTURE SCOPE AND RESEARCH DIRECTIONS

Neither the TR-AP-CPABE model [4] nor the ReLAC model [1], including our Secure Data Management Model (SDMM), currently support dynamic access control with temporal dimension and multi-granularity. However, our future goal is to expand our model to encompass both dynamic temporal access control and multi-granularity, incorporating efficient mechanisms for these capabilities.

8. CONCLUSION

In conclusion, our work presents a comprehensive solution for secure sharing of sensitive data by leveraging blockchain technology. We have successfully incorporated Attribute-Based Encrypted (ABE) ciphertext, IPFS file URLs, access policies, and a revocation list within the blockchain framework. By integrating a tree-based revocation mechanism and utilizing Attribute-Based Access Control (ABAC) through smart contracts, such as OAMC, SAMC, ACC, and RMC, we ensure the efficient and seamless execution of necessary operations.

Our system not only secures access policies but also enhances the overall efficiency of the revocation mechanism, enabling effective revocation of access privileges to stop unauthorized usage. Through extensive experimental evaluation and analysis, we have demonstrated the performance of our SDMM when compared to existing approaches.

REFERENCES

1. G. Eason, B. Noble, and I.N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529-551, April 1955. (*references*)
2. G. Xiang, B. Li, X. Fu, M. Xia and W. Ke, "An Attribute Revocable CP-ABE Scheme," 2019 Seventh International Conference on Advanced Cloud and Big Data (CBD), Suzhou, China, 2019, pp. 198-203, doi: 10.1109/CBD.2019.00044.
3. S. Wang, K. Guo, and Y. Zhang, “Traceable ciphertextpolicy attribute-based encryption scheme with attribute level user revocation for cloud storage,” PLOS ONE, vol. 13, no. 9, pp. 1–23, 09 2018.
4. D. Han, N. Pan and K. -C. Li, "A Traceable and Revocable Ciphertext-Policy Attribute-based Encryption Scheme Based on Privacy Protection," in IEEE Transactions on Dependable and Secure Computing, vol. 19, no. 1, pp. 316-327, 1 Jan.-Feb. 2022, doi: 10.1109/TDSC.2020.2977646.
5. S. Wang, K. Guo, and Y. Zhang, “Traceable ciphertextpolicy attribute-based encryption scheme with attribute level user revocation for cloud storage,” PLOS ONE, vol. 13, no. 9, pp. 1–23, 09 2018
6. Y. Yang, R. Shi, K. Li, Z. Wu, and S. Wang, “Multiple access control scheme for EHRs combining edge computing with smart contracts,” Future Gener. Comput. Syst., vol. 129, pp. 453–463, 2022.
7. Z. Wan, J-. Liu, and R. H. Deng, “HASBE: A hierarchical attributebased solution for flexible and scalable access control in cloud computing,” IEEE Trans. Inf. Forensics Secur., vol. 7, no. 2, pp. 743– 754, Apr. 2012.
8. L.-Y. Yeh, P.-Y. Chiang, Y.-L. Tsai, and J.-L. Huang, “Cloudbased fine-grained health information access control framework for lightweight IoT devices with dynamic auditing and attribute revocation,” IEEE Trans. Cloud Comput., vol. 6, no. 2, pp. 532–544, 2018
9. V. Hoang, E. Lehtihet, and Y. Ghamri-Doudane, “Forward-secure data outsourcing based on revocable attribute-based encryption,” in 15th International Wireless Communications & Mobile Computing Conference, IWCMC 2019, Tangier, Morocco, June 24-28, 2019. IEEE, 2019, pp. 1839–1846.
10. S. Tu, F. Huang, S. Zhang, A. Badshah, H. Alasmary, and M. Waqas, “Ciphertext-policy attribute-based encryption for securing IoT devices in fog computing,” in International Conference on Computer, Information and Telecommunication Systems, CITS 2022, Piraeus, Greece, July 13- 15, 2022, G. A. Tsihrintzis, M. Virvou, K. Hsiao, P. Nicopolitidis, and Y. Guo, Eds. IEEE, 2022, pp. 1–7.
11. R. Sarma, C. K. Chaudhary, and F. A. Barbhuiya, “PAC-FIT: an efficient privacy preserving access control scheme for fog-enabled IoT,” Sustain. Comput. Informatics Syst., vol. 30, p. 100527, 2021.
12. C. K. Chaudhary, R. Sarma, and F. A. Barbhuiya, “Rma-cpabe: A multiauthority cpabe scheme with reduced ciphertext size for IoT devices,” Future Generation Computer Systems, vol. 138, pp. 226–242, 2023.
13. S. A. Khowaja, P. Khuwaja, K. Dev, I. Lee, W. U. Khan, W. Wang, N. M. F. Qureshi, and M. Magarini, “A secure data sharing scheme in community segmented vehicular social networks for 6G,” IEEE Trans. Ind. Informatics, vol. 19, no. 1, pp. 890–899, 2023.
14. Y. Lin, X. Wang, H. Ma, L. Wang, F. Hao, and Z. Cai, “An efficient approach to sharing edge knowledge in 5g-enabled industrial internet of things,” IEEE Trans. Ind. Informatics, vol. 19, no. 1, pp. 930–939, 2023.

IMPROVING TECHNICAL EDUCATION THROUGH THE NATIONAL EDUCATION POLICY, 2020: A CRITICAL ASSESSMENT

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ABSTRACT

Education is essential for realizing one's full potential, creating a just and equitable community, and advancing national progress. The key to India's continuous rise and leadership on the global arena in terms of economic growth, social fairness and equality, scientific advancement, national integration, and cultural preservation is to provide universal access to high-quality education. The National Education Policy 2020 which is the First Education Policy of the Twenty-First century proposes that all aspects of the educational structure, including regulation and governance, be revised and revamped in order to create a new system that is aligned with the aspirational Sustainable Development Goal 4, while preserving India's traditions and values. The successful execution of this strategy necessitates a long-term vision, consistent availability of expertise, and coordinated action from all stakeholders at the national, state, institutional, and individual levels. This paper critically analyzes the role of Technical University of Odisha in implementation of the National Education Policy in technical institutions in bringing about a holistic and comprehensive development of technical education. An exploratory and descriptive study was conducted with the help of secondary data analysis on the National Education Policy 2020 from websites and various research articles. The Study emphasized that technical education in Odisha should be multidisciplinary and Information and Communication Technology enabled with emphasis on faculty development and proper governance of technical institutions through well-planned strategic interventions by Technical University along with the active support of the State and Central Government.

KEYWORDS

national education policy, sustainable development goal, technical education.

JEL CODES

I21, I23, I28.

1. INTRODUCTION

With the rapidly changing employment environment and global business setting, it is more crucial than ever for youngsters to not only learn, but also to learn, how to earn. As a result, Modern Education must shift away from old methods of teaching to developing among students' problem solving and decision-making skills to be creative and multifaceted in various disciplines, to innovate, adapt, and absorb new information in fresh and rapidly changing economic sectors. Pedagogy must evolve to make education more immersive, comprehensive, integrated, inquiry-driven, discovery-oriented, learner-centered, discussion-based, adaptable, and pleasurable for students. The Global Education Development Agenda, as expressed in India's adoption of the 2030 Agenda for Sustainable Development Goal 4 (SDG4) in 2015, aims to: "Ensure Inclusive and Equitable Quality Education and Promote Life - long Learning opportunities for All by 2030". The goal must be for India to develop a world-class education system by 2020, with equitable access to high-quality education for all students, regardless of social or economic status. The National Education Policy (NEP) 2020 adopted on July 29, 2020 places a strong emphasis on the development of each individual's creative potential focusing on multidisciplinary education and technical education with better learning outcome.

1.1 TECHNICAL EDUCATION IN INDIA

Engineering Education in India began during the British colonial period and was mostly focused on civil engineering. In 1945, the Sarkar Committee suggested that higher technical institutes modeled after the Massachusetts Institute of Technology should be established in each of India's four regions. As a result, five Indian Institutes of Technology were established in Kharagpur (1950), Bombay (1958), Kanpur (1959), Madras (1960), and Delhi (1961). In 1945, the All India Council for Technical Education (AICTE) was established to govern all technical education in the country (Diploma, Degree, and Post-Graduate). Technical education in India has advanced faster than anywhere else in the world since the early 1980s. Thanks to significant industrialization and economic expansion, that India today has the world's second biggest number of engineering students. The initial objective of government policy since independence has been to provide the engineers needed for the emerging economy. The Indian Institutes of Technology (IITs) and Regional Engineering Colleges, which were later converted to National Institutes of Technology, were established with this goal in mind.

Recently, Indian Institutes of Technology (IITs), National Institutes of Technology (NITs), and selected private engineering institutes have adopted a unique and innovative industry-linked engineering education and training system that follows Strategic plans, policies, and programmes for implementation as per the Eleventh-Five-Year Plan and All India Council for Technical Education Guidelines to meet future technological global challenges. The Ministry of Human Resources Development's National Education Policy which was implemented in 1986 and the subsequent Programme of Action (POA) resulted in development of technical education with a greater emphasis.

The Liberalization, Privatization and Globalization in the nineties gave tremendous impetus for the technical manpower needs both in the domestic and international sector. The boom in the IT Sector, outsourcing and opening of new BPO by the MNCs triggered on the requirement of qualified IT professionals. The investments made by the private sector through Self-Financing engineering colleges stood as a supplement in filling up of the gap in technical manpower requirement. Right from inception, the Indian Institutes of Technology and the National Institute of Technologies have long dominated engineering education in India. The Degree and Diploma Programmes in Engineering, Management, Architecture, Town Planning, Pharmacy, Hospitality Management, and Catering Technology are all important for India's economic development.

1.2 PROBLEMS OF PRESENT TECHNICAL EDUCATION SYSTEM

1. India is an Agrarian based Nation. Even though the industrial developments are taking place in rapid phase, the reality shows that the country is still crippled in the front of the stiff competition from the giant multinationals, and finally the country is being settled down as a consumer-based economy. Thus, the need of the hour is not to be institutionalized as incubators for employment, but as knowledge centres which can generate future employments.
2. In India, the majority of engineering institutes use rote learning as a teaching approach. There is growing recognition that the engineering education system needs to be overhauled. According to reports, only 26 percent of engineering graduates are employable. Several businesses have established their own training colleges to bridge the gap between what the educational system provides and what the market requires. There is also a scarcity of engineers in fields other than basic engineering such as civil, electrical, and mechanical and software engineering. On the prevailing trends and compensation packages, most engineers gravitate towards Software Engineering.
3. Every year the engineering institutions in India pull out professional graduates without any On the Job training and to a cluster of certain specializations where there is a high compensation package as short phenomena. Upon the outbreak of any unprecedented eventuality like the recent recessionary trend in the national and international scenario, the whole system crumbles down and leads to an outbreak of professional unemployment. As these are trained manpower both physically and mentally there will be a resistance from these minds to migrate to other professions, or even they move, they will not be able to compete with the others who are specially trained for that.

2. REVIEW OF LITERATURE

According to National Knowledge Commission (2009) Education is one tool that has to play significant role in building a strong workforce in the country, which gels well with the National Development Objectives. Providing access to knowledge is the most fundamental way of increasing the opportunities of individuals and groups. Therefore, it is essential to revitalize and expand the reach of knowledge in society. The goal of technical education is to play a vital role in human resource development of the country by creating skilled manpower, making them employable, enhancing industrial productivity and improving the quality of life. Technical education covers courses and programmes in engineering, technology, management, architecture, town planning, pharmacy and applied arts & crafts, hotel management and catering technology.

Basant & Chandra (2007) reveal that the Indian experience in developing and regulating technical education had an immense impact on the development of public and private enterprises in the country. The key advantage of this regime has been the development of very diverse capabilities in manpower, thereby helping India diversify its industrial base. On the other hand, Vrat (2009) observes that the current scenario of technical education is a cause for concern, particularly on quality and employability front. It is necessary for the improvement of technical education in India that all stock holders should contribute towards the goal of making India a leader of knowledge of shared perceptions and concerns.

The UNESCO (2012) emphasized that education cannot be confined to what happens in the classrooms; rather it extends to the daily and professional lives as well. In the view of Nagraj (2008) education has to play a role in improving the lives of people in such a way that they live in harmony with other humans as also with the rest of the nature. Mere imparting the skills (that are being imparted globally) does not fulfill this requirement. In the view of Gaur et al. (2009) technology being taught by present technical education system of the country only tells us 'How to do the things' without actually knowing 'what to do', which is far more relevant a question. The vision for future of Indian technical education ought to start with knowing and deciding 'what to do with technical education'. All the streams of technical education shall be developed in a way that helps strengthen the agricultural economy of the country. This is the 'what to do' part on the basis of which 'How to do' which can be worked out.

In the view of Zilahy (2006) Technical Universities have the ability to teach tomorrow's decision-makers about how the inter- relationships between society, economy, and environment impact our fate and our ability to attain long-term prosperity for all human beings on the planet. While universities must prepare their students to deal with problems that arise in hundreds of different and highly specialized professional fields, they must also demonstrate the value of collaboration, understanding, and, more specifically, the benefits and tools of collective problem solving through teamwork.

The depth of the knowledge and skill of the faculty determines the quality of course delivery to the aspirants. Hence, attracting the real talents for the noble profession of teaching is an inevitable task. Manpower pooling to this sector is a troublesome and time-consuming process. As usual, all these so-called institutions depend on national level advertisement. The response of these advertisements is really meager. There are various determining factors that restrain the new blood to enter into the teaching profession and to stay back in that profession for a long tenure. A detailed scrutiny of these aspects would give us a clear picture on the seriousness of the problem. Shevgaonkar, (2011) reported that IITs across the country urgently require 2,500 faculty members to meet the statutory student-to-teacher ratio of 10:1, and each IIT is 30 percent short in staff. Technical institutions should attract, select and retain the best faculties, which will be possible when they are given complete autonomy in matters relating to faculty engagement in terms of recruitment and selection, remuneration, promotion and superannuation. The caliber required for the faculty is the inclination for teaching and quest for innovation and research. In the same line, detailed study has to be made on the student availability to these technical institutions. In order to have quality output from the technical institutions, the quality should be ensured at input level. The major achievements made by IITs, IIMs, IISc., BITS are not alone based on the quality of their deliverables, but major element is the quality and skill of the students they are admitting.

3. IMPORTANCE OF THE STUDY

The goal of education is to produce excellent graduates who are capable of rational thought and action, compassion and empathy, courage and resilience, scientific temper and creative imagination, and values, productive, and contributing citizens who will help to construct an egalitarian, inclusive, and healthy society as our Constitution envisions. In a nutshell, the need of the economy is to design an Industry- Ready Need Based Structure for Professional Education marching towards technological growth through a Well-Defined Strategic Plan.

4. STATEMENT OF THE PROBLEM

The Sustainable Development Goal 4 to ensure 'Quality Education for All by 2030' will become a reality when Technical Institutions of Odisha will successfully implement the New Education Policy 2020. This requires developing well-planned strategic interventions by Technical University along with the active support of the State and Central Government.

5. OBJECTIVES OF THE STUDY

The objectives of the study are as per following:

1. To study the Principles and Techniques of Implementing National Education Policy 2020.
2. To analyze the role of Technical University in implementation of the National Education Policy in Technical Institutions of Odisha.

6. RESEARCH METHODOLOGY

An Exploratory and Descriptive Study was conducted with the help of secondary data analysis on the National Education Policy 2020 from Government websites and various research articles. The knowledge of the principles of National Education Policy and its techniques of application is necessary to implement changes in the current system to make it more effective.

7. RESULTS AND DISCUSSION

The New Education Policy 2020 shall be instrumental for realization of Sustainable Development Goal 4.0 – 'Quality Education for All'. The Policy aims at developing creative potential of each individual focusing on multidisciplinary education with better learning outcomes. Graduates will be well rounded personality critical to 21st century with higher standard of intellectual, analytical thinking, innovation and creativity blended with physical, social, emotional and moral strength.

7.1 PRINCIPLES OF THE NATIONAL EDUCATION POLICY

1. The Technical Institutions will focus on Research and Innovation by setting up Start-Up Incubation Centres, Technology Development Centres in frontier areas of research, greater industry academic linkages, and interdisciplinary research including Humanities and Social Sciences Research.
2. The 4-year B.Tech. Programme may also lead to a Degree 'with Research' if the student completes a rigorous research project in their major area(s) of study.
3. India must also take the lead in preparing professionals in cutting-edge areas that are fast gaining prominence, such as Artificial Intelligence (AI), 3-D Machining, Big Data Analysis, and Machine Learning, in addition to Genomic Studies, Biotechnology, Nanotechnology, Neuroscience, with important applications to health, environment, and sustainable living that will be woven into undergraduate education for enhancing employability of the youth.
4. An autonomous body, the National Educational Technology Forum (NETF) will be created to provide a platform for the free exchange of ideas on the use of technology to enhance learning, assessment, planning, administration. Appropriate integration of technology into all levels of education will be done to improve classroom processes, support teacher professional development, enhance educational access for disadvantaged groups and streamline educational planning, administration and management.
5. Technology-based education platforms, such as DIKSHA/SWAYAM, will be better integrated across school and higher education. Higher Education Institutions (HEIs) will play an active role in conducting research on disruptive technologies and in creating instructional materials and courses including online courses in cutting-edge domains.

6. Recognizing, identifying, and nurturing each student's unique strengths by educating teachers and parents about how to encourage each student's holistic development in both academic and non-academic areas.
7. Flexibility, so that students can choose their own learning paths and programmes, based on their talents and interests.
8. Extensive use of technology in teaching and learning, reducing language barriers, improving Divyang student access, and educational planning and management.
9. Curriculum synergy at all levels of education from early childhood to school education to higher education.
10. Faculty is the heart of the learning process – their recruitment, continuous professional development, positive working environments, and service conditions should be given priority.

7.2 IMPLEMENTATION OF THE NATIONAL EDUCATION POLICY

The efficiency of any policy is determined by how well it is implemented, which necessitates many efforts and activities conducted by multiple bodies in a synchronized and systematic manner. Ministry of Human Resource Development (MHRD), Central Advisory Board of Education (CABE), Union and State Governments, Technical Universities, Education-related Ministries, National Testing Agency (NTA), National Council of Educational Research and Training (NCERT) State Council of Educational Research and Training (SCERTs), schools, and Higher Education Institutions (HEIs) will lead the implementation of this Policy coupled with schedules and a review plan to ensure that the policy is implemented in its spirit and meaning with coherence in planning and synergy across all of these agencies involved in education.

Principles for Implementation

1. Prioritization will be key in ensuring optimal policy sequencing and that the most critical and urgent acts are implemented first, resulting in a strong foundation.
2. Since this Policy is interrelated and holistic, only a full-fledged implementation, rather than a fragmented one, will ensure that the desired objectives are met.
3. Since education is a concurrent subject, rigorous planning, joint monitoring, and collaborative execution between the Center and States will be required.
4. The timely infusion of necessary resources - human, physical, and financial - at the Federal and State levels will be critical to the Policy's successful implementation.

7.3 ROLE OF TECHNICAL UNIVERSITY IN IMPLEMENTATION OF NEP 2020

The Biju Patnaik University of Technology (BPUT) is a Public State University located in Rourkela, Odisha, India established on 21st November 2002, was named after Honorable Sri Biju Patnaik, the former Chief Minister of Odisha. The main objective of the University was to ensure a high quality of students graduating from the Technical Institutions through a common curriculum and uniform evaluation in the field of Engineering, Management, Pharmacy and Architecture. The University has 137 colleges both constituent and affiliated with around more than one lakh students every year under its governance offering Graduate and Post Graduate Courses. The University was established with a Vision to be World Class Brand Name for providing technical manpower needed in Industry and Academia and to create wealth and prosperity in the society through application of technical knowledge. The University is working vigorously towards achieving its objectives of making the places of teaching intellectually stimulating and emotionally pleasurable for the students and faculty, ensuring proficiency in students in their domain of study as well as in soft skills (IT and Communicative English) and establishing world class centres in Higher Studies and Research.

7.4 STEPS FOR IMPLEMENTATION

Subject-wise Implementation Committees of Experts in collaboration with other relevant Ministries will be established at Central and State levels for developing comprehensive implementation plans in accordance with the above principles to achieve the objectives of the Policy in systematic way. Yearly joint reviews of the policy's implementation, in accordance with the targets specified for each action, will be done by designated teams comprised of representatives from the Ministry of Human Resource Development (MHRD) and the States and the results will be shared with Central Advisory Board of Education (CABE). The full policy will be operative in the decade 2020-40, after which another comprehensive evaluation will be conducted. The Biju Patnaik University of Technology need to execute the New Education Policy Mandates in the following steps in Technical Institutions of Odisha to bring about a holistic and comprehensive development in their Technical Education System.

A PROFESSIONAL EDUCATION SHALL BE MULTIDISCIPLINARY WITH THE AIM OF DEVELOPING IN STUDENTS

1. Analytical, and Critical Thinking
2. Creative and Innovative Thinking
3. Thorough Conceptual, Technical and Soft Skills Enhancement
4. Managerial and Leadership Abilities of students
5. Making students Industry - Ready to meet job market requirements
6. Up skilling and Lifelong Learning
7. Internship for Students
8. Innovation and Entrepreneurship
9. Faculty Involvement in Industry

B INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ENABLED EDUCATION PUSH

1. Online study materials shall be developed and used to move progressively to blended learning
2. Tools like Artificial Intelligence, Machine learning, Data Science and Augmented Reality Tools shall be used to enhance learning and develop skills of 21st Century.

C FACULTY FOCUS

1. The NEP aims at recruiting the best and bright teachers by ensuring a better standard of living, respect, decency, and autonomy at all levels. Better career progression with quality control and accountability for teachers
2. Only appointment of tenure track faculty
3. Less teaching loads
4. Professional Training and Development Opportunity
5. Training for teachers at all levels
6. Faculty immersion in Industry

D GOVERNANCE OF TECHNICAL INSTITUTIONS

1. Each Technical Institution shall be governed by an Independent Governing Body with reputed Educationist as its member. Government will not have any representation.
2. Recruitment and Promotion of Faculties shall be based on Merit
3. The Governing Body shall select the Leader – Chairman and Director and Faculty Members

8. FINDINGS

The Indian Technical Education System is currently confronting a number of issues like lack of having access to cutting-edge engineering education that follows international best practices, non-availability of well-paying research and development employment that contribute to proper innovation and technology development and as a result of globalization and the emergence of global communities, organizations are becoming more global, and Indian engineers must figure out how to adapt to the issues posed by the global economy and gain familiarity with global project management. This is possible when technical education will be multidisciplinary, Information and Communication Technology (ICT) enabled with emphasis on faculty development and proper governance of technical institutions.

9. SUGGESTIONS

The Country's Policy Makers can give a thought on changing the age old Technical Education System focusing on improving the quality of teaching supplemented by diversification from traditional methods of teaching to modern methods of Case Study Analysis, Student-Participation Programmes, development of Career and Corporate Values among students, developing Soft Skills, Managerial Skills and Leadership Skills and Professional Ethics in students with the aim of making students Industry – Ready to meet the growing demands of the modern business environment.

The employment opportunity for Engineering and Management Graduates in Odisha is meager and there is very little scope for career development for them in Odisha due to very few good companies. As a result, graduated engineers are migrating to big cities outside Odisha to make their career, leading to brain drain in Odisha. So, this issue needs to addressed by Biju Patnaik University of Technology (BPUT) to Odisha Government to request Multinational companies to set up more branches to stop this trend and help in economic development of Odisha through skilled and knowledgeable Engineers and Managers of our State.

10. CONCLUSION

Industry, Government, and Academicians can collaborate to develop a well-designed strategy for Transformation of Technical Education in India. We need a system in place to identify essential areas and disciplines that need to expand, as well as policies and institutions to help them do so. A high-level Think - Tank is needed to assess Odisha's higher engineering and science education system and provide guidance for future progress. It's critical to comprehend current trends in numbers, placements, employability, and research output, as well as compare performance against other Indian universities. Understanding reality should serve as the foundation for policy adjustments that ensure that the engineering education system continues to fulfill the evolving needs of business and society.

11. LIMITATION AND SCOPE FOR FURTHER RESEARCH

The Study is limited to only Technical University of Odisha for its role in implementation of National Education Policy. In future a comparative study can be made on technical universities of other States to get a comprehensive knowledge of the application of this policy in development of technical education in India

REFERENCES

1. Basant, R. and Chandra, P. (2007): "Linking Technical Education to Business Growth: A Case Study on Building Technical Skills in India: A Case Study on Building Technical Skills in India" *Rakesh Basant Indian Institute of Management Draft October 2006*.
2. Karkare,S., Rawat,S., and Mali, A. (2013): "New Dimensions in Higher Technical Education for Sustainability Development of Technical Education in India" *43rd ISTE National Convention*, 1-24.
3. Nagraj, A., (2008), "Jeevan Vidya – An Introduction*". R. Gupta, (ed.),* Amarkantak.
4. National Knowledge Commission. (2009): "Report to the Nation" New Delhi.
5. Raghunadhan, T., and Sequeira, A H. (2014), "A Need Based Approach for Technical Education in India", *International Journal of Business and Innovation*, Vol.1, No.3, pp.43-57.
6. Shevgaonkar, R K. (2011): "India Education Review: The World Bank 2005" *GDP growth and Patent Applications* available at http://www.indiaeducationreview.com
7. UNESCO (2012): "Education for Sustainable Development" Paris, France: UNESCO.
8. Vrat, P. (2009), "Role of Technical Education in Emerging Indian Society: Opportunities and Challenges", *RITES Journal*, (July).
9. Zilahy,G.(2006), "Toward sustainability: the role of higher education" *Clean Technologies and Environmental Policy,* Vol. 8, No. 1, pp. 1-2.

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