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Peer-Reviewed Research Articles

Human Resource Information System of Urdaneta City University: An Assessment Towards Its Enhanced Service Delivery

Sir Charles Andrew V. Lim⁵, Amihan April C. Mella-Alcazar⁹

ABSTRACT

Background and Purpose: Higher education institutions increasingly rely on digital platforms such as the Human Resource Information System (HRIS) to streamline personnel administration and improve service delivery. This study assessed the HRIS of Urdaneta City University using the system quality, information quality, and service quality dimensions of the DeLone and McLean updated information systems (IS) success model. System quality focused on the reliability, ease of use, and accessibility of the HRIS; information quality covered completeness of content, ease of understanding, and timeliness; and service quality was examined through responsiveness, empathy, and assurance. The problems encountered by HRIS users were likewise identified.

Methods: A mixed-method design was employed. A validated researcher-made survey questionnaire using a four-point Likert scale was administered to employees of Urdaneta City University, drawn from a population of 846 administrative and teaching staff, and 390 responses were obtained. A frequency-of-use item served as a filter to identify actual users of the system. Interviews with the personnel of the Human Capital Management Office provided qualitative data. Frequencies, percentages, and weighted means were used to analyse the data.

Results: Respondents assessed the HRIS positively, with overall weighted means of 3.50 for system quality, 3.46 for service quality, and 3.47 for information quality, all interpreted as "agree." However, weak internet connection and ICT infrastructure, slow processing of online services, and limited security and privacy safeguards emerged as the most common problems encountered by users.

Conclusion: The HRIS of Urdaneta City University is reliable, easy to use, and responsive to the needs of employees, supporting more efficient human resource processes. To sustain and enhance service delivery, the University must maintain a user-friendly platform, invest in comprehensive ICT infrastructure and security features, and provide capacity-building activities to strengthen the digital skills of its employees.

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I. INTRODUCTION

In today's rapidly evolving digital world, technology implementation has become essential for enhancing governance and education systems globally. To facilitate seamless communication in public administration and effortlessly manage the distribution of educational content, training programs, and professional development activities, digital transformation tools such as Human Resource Information Systems (HRIS) have become indispensable. These tools provide a consolidated platform that promotes efficiency and transparency in the organisation and enables the successful creation and delivery of information for employees. The higher education sector has seen enormous growth in recent years and continues to expand (Altbach et al., 2019), and a sound technology-based administration is needed to sustain institutions in a globally competitive environment (Al Mubarak & Hamdan, 2023).

HRIS are software tools designed to help organisations manage employee data and streamline various human resource processes, storing information such as personal details, employment history, payroll data, and benefits administration (Bondarouk & Brewster, 2016). From the automated payroll systems of the late 1950s and the mainframe-based record-keeping of the 1960s and 1970s (Marler & Parry, 2016), HRIS evolved through client-server systems in the 1980s (Fisher & Howell, 2020), analytical tools and employee self-service portals in the 1990s and early 2000s (Johnson et al., 2016; Malik & De Silva, 2021), and into today's cloud-based solutions offering enhanced security, scalability, real-time data access, and automated workflows (Fenech et al., 2019). Modern systems also include advanced analytics that help organisations align their human resource strategies with broader business goals (Stone & Deadrick, 2015). HRIS has thus

transformed from simple payroll systems into comprehensive platforms that play a vital role in strategic human resource management (Abolade, 2020).

At its core, an HRIS centralises employee data, making essential information such as demographics and job classifications easy to access and manage (Lee & Chen, 2020). Key features such as recruitment and onboarding streamline hiring by managing job postings, tracking applicants, and facilitating the transition of new hires (Parsa & Shadabi, 2023). By serving as a centralised repository of employee data (Ferrell, 2021) and automating repetitive tasks such as onboarding, payroll processing, and benefits enrollment, HRIS reduces the administrative burden on human resources staff and allows them to focus on strategic initiatives (Kwan, 2019).

In the Philippines, HRIS are becoming essential for organisations, offering advantages that improve efficiency, compliance, and employee satisfaction (Bernardo, 2021). These systems consolidate employee information—personal details, payroll, benefits, and performance records—in one centralised location, reducing reliance on multiple spreadsheets and minimizing errors (Cabrera, 2018). With constantly changing labour laws, HRIS helps organisations remain compliant by automating compliance tasks and securely storing sensitive employee data (Robinson, 2020), while self-service portals lighten the workload of human resources teams and boost employee engagement (Green, 2019). HRIS adoption likewise generates cost savings (Taylor & Lee, 2023) and offers scalability that is especially beneficial as organisations grow (Patel & Wong, 2020).

At Urdaneta City University, the Human Capital Management Office oversees human resource functions, including the use of the HRIS. The system centralises employee information,

automates payroll, tracks employee data, and supports performance evaluation, while self-service portals allow faculty and staff to access their own information. These functions support the University's goal of providing quality education and help create a more efficient and productive academic environment. However, to fully unlock these advantages and ensure that the system operates at its optimal capacity, the HRIS must be assessed in terms of three factors: system quality, service quality, and information quality.

Service quality is a construct drawn from the SERVQUAL model (Parasuraman et al., 1988), which measures service quality along five dimensions: reliability, responsiveness, empathy, assurance, and tangibles. Responsiveness captures the willingness to assist clients and deliver timely service; reliability is the capacity to deliver the promised service accurately and dependably; empathy describes considerate, customised care; assurance focuses on employees' expertise, civility, and capacity to inspire confidence and trust; and tangibles cover the appearance of physical facilities, equipment, staff, and communication materials. System quality, meanwhile, refers to the features and functionalities of the system, which should be comprehensive and easy for users to engage with, while information quality concerns the integrity and usability of the data the system offers—information that is readable, intelligible, accurate, current, pertinent, and adequate to fulfil job needs (DeLone & McLean, 2003). Enhancing HRIS performance for better service delivery is a primary goal of Urdaneta City University.

1. Theoretical and Conceptual Framework

This study is anchored on the Technology Acceptance Model (TAM) and the Information Systems (IS) Success Model. TAM, developed by Davis (1989), explains how users come to accept

and utilise new technologies by emphasising perceived usefulness and perceived ease of use, helping organisations identify key factors that influence technology adoption. The IS Success Model of DeLone and McLean (1992) examines the correlations among six IS success indicators: system quality, information quality, IS use, user satisfaction, individual impact, and organisational impact. The updated model (DeLone & McLean, 2003) modifies these into information quality, system quality, service quality, ease of use, user satisfaction, and perceived net benefits.

As illustrated in the conceptual framework (see Figure 1), the HRIS is evaluated through three interrelated dimensions: information quality, system quality, and service quality, which collectively influence the overarching outcome of enhanced service delivery. Information quality pertains to the characteristics of the data produced by the HRIS, indicated by completeness of content, ease of understanding, and timeliness; a system that generates comprehensive, clear, and timely information supports informed decision-making and efficient human resource operations. System quality measures the overall performance and functionality of the HRIS, indicated by reliability, ease of use, and accessibility; a reliable and accessible system that is easy to operate enhances productivity and reduces operational errors. Service quality refers to users' perception of the service performance associated with the HRIS, indicated by responsiveness, empathy, and assurance. These three quality dimensions function as mediating variables between the HRIS and enhanced service delivery, which refers to improvements in human resource services such as faster processing times, greater accuracy, streamlined workflows, and improved user satisfaction.

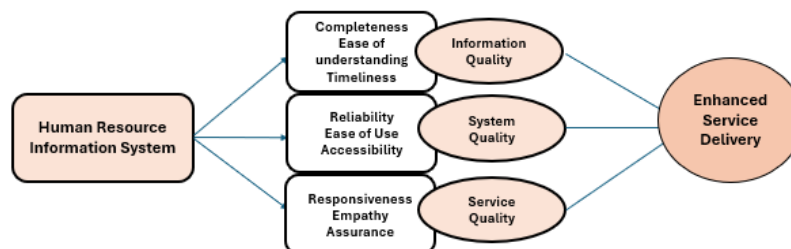


Figure 1: Conceptual Paradigm of the Human Resource Information System of Urdaneta City University Towards Its Enhanced Service Delivery

2. Objectives of the Study

This study assessed the Human Resource Information System of Urdaneta City University towards enhanced service delivery among its employees. Specifically, it sought to: (1) determine the respondents' assessment of the HRIS in terms of system quality, service quality, and information quality; (2) identify the issues and challenges encountered by the respondents in utilising the HRIS; and (3) propose recommendations to improve HRIS service delivery to the employees of Urdaneta City University based on the findings of the study.

II. LITERATURE REVIEW

1. The Role of HRIS in Higher Education Institutions

HRIS plays a critical role in streamlining human resource processes in universities. Smith and Brown (2015) highlight how HRIS enhances efficiency by automating administrative tasks, reducing errors, and improving decision-making, while Patel et al. (2021) emphasise its role in improving service delivery by ensuring accurate data management and facilitating better communication among university employees. HRIS provides centralised access to employee data, reducing paperwork and redundancy; Jones and White (2014) found that HRIS significantly improves employee data management by ensuring updated and accurate records, and Garcia and Torres (2020) report that universities using HRIS experience fewer data inconsistencies and enhanced record accessibility. Automating payroll within HRIS ensures timely salary disbursement and compliance with labour laws (Henderson, 2016), with Martinez and Lopez (2022) underscoring the importance of data security in payroll management. HRIS also facilitates performance evaluation: automated appraisals increase transparency in employee assessment (Adams, 2017), and HRIS-enhanced performance management contributes to improved productivity and motivation (Kim et al., 2023). Recruitment modules streamline hiring and reduce biases (Foster & Grant, 2015), with automation of resume screening, interview scheduling, and onboarding reducing hiring times in universities (Nguyen & Lee, 2022).

2. Challenges in HRIS Implementation

One of the primary challenges in HRIS implementation is technological limitations, as many institutions struggle with outdated infrastructure that hinders adoption (Baker, 2013), although advances in cloud computing now provide scalable solutions that allow universities to overcome these barriers (Chen & Zhang, 2021). Resistance to new systems is another common issue: employees often resist HRIS due to lack of familiarity and fear of job displacement (Brown & Wilson, 2012), while comprehensive training and user involvement during implementation significantly improve acceptance (Garcia et al., 2020). Data security and privacy remain crucial concerns (Kumar, 2010), with advancements in encryption and multi-factor authentication enhancing HRIS security and preventing unauthorised access (Singh & Sharma, 2023).

3. HRIS and Enhanced Service Delivery in Higher Education

HRIS contributes to enhanced service delivery in universities by automating human resource processes, streamlining recruitment, and improving employee engagement (Guthrie, 2020). Institutions that successfully implement HRIS benefit from self-service portals where employees independently access payroll, benefits, and leave applications (Marler & Fisher, 2013); automated workflows that reduce paperwork and administrative overhead (Jackson et al., 2019); data-driven decision-making that improves workforce planning and faculty management (Podsakoff et al., 2020); and improved compliance with labour regulations (Becker & Huselid, 2018). Successful implementation, however, requires continuous system updates, user training, and proper change management (Delery, 2021). Jackson et al. (2019) found that HRIS implementation resulted in faster response times, better analytics, and improved engagement, and a study of human resource digitalisation in Southeast Asian universities reported a 40% reduction in processing times and a 30% increase in service efficiency (Podsakoff et al., 2020). HRIS further enables real-time tracking of employee performance, workforce analytics, and compliance monitoring (Huselid, 2020), while organisations using AI-driven HRIS report significant improvements in recruitment efficiency and employee retention (Parry & Strohmeier, 2019).

4. System Quality and HRIS Effectiveness

System quality refers to the technical and functional aspects of HRIS, including usability, security, reliability, and adaptability. High system quality enhances user satisfaction and operational efficiency, while poor system quality can lead to workflow disruptions, data inconsistencies, and employee resistance (DeLone & McLean, 2016). Delery (2021) found that HRIS with user-friendly interfaces and automated features significantly improved workflow efficiency in universities, and Kavanagh et al. (2019) emphasised that system security and data integrity are critical to maintaining institutional compliance with labour laws and data protection regulations. Institutions with outdated systems, in contrast, report processing delays, security vulnerabilities, and inefficiencies in record management (Parry & Strohmeier, 2019).

5. Synthesis

The reviewed literature indicates that HRIS significantly improves human resource operations and service delivery in higher education institutions through automation, data-driven decision-making, and enhanced analytics (Becker & Huselid, 2018; Guthrie, 2020). System quality is a critical determinant of effectiveness, where usability, security, and adaptability influence user satisfaction and organisational performance (DeLone & McLean, 2016). Institutions with well-integrated HRIS experience faster response times, better self-service options, and improved regulatory compliance (Parry & Strohmeier, 2019), while continuous upgrades, user training, and workflow integration are needed to maximise benefits and reduce resistance (Podsakoff et al., 2020). As Urdaneta City University assesses its HRIS, it is crucial to focus on enhancing system quality, implementing automation, and strengthening digital human resource capabilities to optimise service delivery and institutional efficiency.

III. METHODS

1. Research Design and Instruments

This study used a mixed-method approach to examine the variables in assessing the Human Resource Information System of Urdaneta City University, combining quantitative and qualitative

techniques with a survey questionnaire and interviews as the main instruments. The researcher-made questionnaire gathered data in three areas: (1) the profile of the respondents in terms of civil status, sex, age, employment status, highest educational attainment, length of service, position/rank, and frequency of using the HRIS, with frequency of use serving as a filter question to identify employees who actually use the system; (2) the assessment of the HRIS in terms of information quality, system quality, and service quality, using four-point Likert-type items where 4 is the highest ("strongly agree") and 1 is the lowest ("strongly disagree"); and (3) multiple-response items identifying the issues and challenges encountered by the respondents. The questionnaire underwent validation by an expert reviewer from the Human Capital Management Office to ensure that the items adequately capture the intended concepts. For the qualitative data, interviews were conducted with the personnel in charge of the Human Capital Management Office.

2. Population and Sampling

The respondents were employees of Urdaneta City University who are users of the HRIS, drawn from a population of 846 administrative and teaching staff. The Cochran formula was used to determine the sample size:

$$n = Z^2 p(1 - p) / e^2 = (1.96)^2 (0.50)(0.50) / (0.05)^2 = 384.16 \quad (1)$$

where n is the sample size, Z is the z -score based on the confidence level, p is the population proportion assumed to be 0.50, and e is the margin of error at 0.05. The sample was then adjusted for the finite population of 846:

$$n_a = 384.16 / (1 + (384.16 - 1)/846) = 264 \quad (2)$$

A sample of 264 was selected using stratified sampling, a probability technique in which the population is divided into subgroups based on employee type and status (see Table 1). The researchers then used convenience sampling to administer the instrument, distributing the survey questionnaire face-to-face; a total of 390 employees answered the questionnaire.

Table 1: Population and Sample Respondents of Urdaneta City University

Employees	Population	Sample
Administrative Staff	301	94
Regular	92	29
Casual	209	65
Teaching Staff	545	170
Regular	263	82
Part-time	282	88
Total	846	264

Of the 390 respondents, the majority were single (57.4%), female (49.0%), aged 21–30 years old (45.9%), casual in employment status (50.2%), college graduates (59.2%), and had served the University for one to five years (55.1%). In terms of position, administrative aides (26.3%), instructors (13.8%), and clerical staff (9.2%) comprised the largest groups. On the frequency of use of the HRIS, 20.8% answered “always,” 15.9% “often,” 37.2% “sometimes,” and 20.0% “rarely,” while respondents who indicated that they never use the system were excluded from the assessment portion of the questionnaire through the filter question.

3. Data Analysis

Descriptive statistics—frequencies, percentages, and weighted means—were used to treat the data gathered on the system quality, information quality, and service quality of the HRIS and the problems encountered by its users. Mean ratings were interpreted as follows: strongly agree (3.51–4.00), agree (2.51–3.50), disagree (1.51–2.50), and strongly disagree (1.00–1.50).

IV. RESULTS AND DISCUSSION

1. Assessment of the HRIS in Terms of System Quality

Table 2: Respondents’ Assessment of the Human Resource Information System in Terms of System Quality

System Quality Indicators	Mean	Verbal Interpretation	Rank
1. The HRIS is easy to use.	3.54	Strongly Agree	1
2. The HRIS is user-friendly.	3.53	Strongly Agree	2
3. The HRIS is accessible on any type of device, such as a mobile phone, desktop, and tablet.	3.46	Agree	3
4. The HRIS is always reliable.	3.45	Agree	4
Overall Mean	3.50	Agree	

Table 2 shows the respondents’ assessment of the HRIS in terms of system quality. Generally, respondents agreed on the system quality of the HRIS, with an overall mean rating of 3.50 (agree). Indicator 1, “The HRIS is easy to use,” got the highest mean rating of 3.54 (strongly agree), and respondents also conveyed that the HRIS is

user-friendly (3.53, strongly agree). Accessibility across devices obtained a mean rating of 3.46 (agree), while “The HRIS is always reliable” got the lowest mean rating of 3.45, still interpreted as agree.

System quality refers to the features and functions of the system, which should be complete and convenient so that users can interact with it. The results indicate that the HRIS is easy to use and user-friendly. Government agencies must focus on developing a user-centric approach to online systems (Rubaii-Barrett & Wise, 2008): if online services are concise, reliable, and accessible, people will adopt them. The HRIS facilitates the

centralisation of employee data, which streamlines record management and expedites administrative duties, while self-service portals allow faculty and staff to quickly access their own information, improving their engagement and overall experience.

2. Assessment of the HRIS in Terms of Service Quality

Table 3: Respondents' Assessment of the Human Resource Information System in Terms of Service Quality

Service Quality Indicators	Mean	Verbal Interpretation	Rank
1. HRIS employees give prompt service to users.	3.47	Agree	1.5
2. Keeping users informed of the time when the service will be performed.	3.43	Agree	4
3. HRIS employees understand the specific needs of the users.	3.47	Agree	1.5
4. HRIS has operating hours convenient to users.	3.45	Agree	3
Overall Mean	3.46	Agree	

The respondents' assessment of the HRIS in terms of service quality is presented in Table 3. In general, respondents conveyed their agreement on the service quality of the HRIS, with an overall mean of 3.46 (agree). They agreed that HRIS employees give prompt service to users and understand the specific needs of the users, with these two indicators acquiring mean ratings of 3.47 each. Respondents likewise agreed that HRIS operating hours are convenient to users (3.45) and that users are kept informed of when the service will be performed (3.43).

These results indicate that HRIS personnel are responsive in giving services to users, showing their willingness to help and provide prompt service. Providing quality services is essential because the success of an organisation lies in the satisfaction of its clients, and customer satisfaction depends on observations and views about service quality. Kant and Jaiswal (2017) and Kumar (2018) found a significant correlation between customer satisfaction and service quality, while Ali and Amir (2020) reported that service quality is positively correlated with customer satisfaction, with responsiveness as the determinant that most greatly influences satisfaction. Clients prefer a

welcoming environment in which service providers, such as HRIS personnel, are keen on assisting them during the service process. Relatedly, Annamdevula and Bellamkonda (2012) developed HiEdQUAL to measure service quality in Indian higher education institutions and found that teaching and course content, administrative services, academic facilities, campus infrastructure, and support services significantly influence students' overall perception of service quality.

3. Assessment of the HRIS in Terms of Information Quality

Table 4: Respondents' Assessment of the Human Resource Information System in Terms of Information Quality

Information Quality Indicators	Mean	Verbal Interpretation	Rank
1. The HRIS provides sufficient information.	3.44	Agree	4
2. The information content of the HRIS meets the user's needs.	3.46	Agree	2
3. The information in the HRIS is easy to understand.	3.51	Strongly Agree	1
4. The HRIS provides up-to-date information.	3.45	Agree	3
Overall Mean	3.47	Agree	

The respondents' assessment of the HRIS in terms of information quality is shown in Table 4. On average, respondents agreed on the information quality provided by the HRIS, with an overall mean of 3.47 (agree). Among the indicators, "The information in the HRIS is easy to understand" got the highest mean rating of 3.51 (strongly agree). "The information content of HRIS meets the user's needs" obtained a rating of 3.46 (agree), and respondents also agreed that the HRIS provides up-to-date (3.45) and sufficient (3.44) information.

The information quality of the HRIS centres on the system's completeness of content, ease of understanding, and timeliness. With an HRIS, management and staff may access all the information they require in one location, including organisational charts, policies and procedures, pay and benefits, employee histories, performance reviews, and leave records. Employees experience more seamless transactions when the system's information is complete and easy to understand.

4. Problems Encountered in Using the HRIS

Table 5: Problems Encountered When Using the Human Resource Information System of Urdaneta City University

Problems Encountered*	Frequency	Rank
1. HRIS employees do not have enough knowledge on the services they provide.	45	3
2. Long queues are experienced due to limited personnel.	31	6
3. Slow processing of online services.	46	2
4. Weak internet connection/ICT infrastructure.	94	1
5. The HRIS is difficult to use because users are digitally illiterate.	27	7
6. The links for the online services cannot be accessed.	37	5
7. Limited security and privacy safeguards to protect HRIS users.	43	4

**Multiple response*

The problems encountered by the respondents when using the HRIS of Urdaneta City University are shown in Table 5. Weak internet connection and ICT infrastructure ranked first among the problems encountered, cited by

ninety-four (94) employees, followed by the slow processing of online services (46) and the perception that HRIS employees do not have enough knowledge of the services they provide (45). The slow processing of online services is

attributable to weak ICT infrastructure coupled with slow internet connection.

According to Norris and Moon (2005), the most significant barriers to the implementation of online services are lack of technology and expertise, lack of financial resources, and issues with privacy and security. Insufficient ICT infrastructure and connectivity hinder the provision of online services: strong internet connectivity makes the sharing of information fast and easy, and for the HRIS to work effectively, data must move across departments without interruption. Network resilience enables efficient use and cuts down the time clients need to use the system. Meijer (2015) noted that limited ICT skills and awareness within the public sector are among the human factors behind the failure of e-government programs, and the success of online services also depends on investment in human capital (Ndou, 2004). Another concern of the employees is the limited security and privacy safeguards protecting the HRIS, which ranked fourth. Addressing privacy issues is important to attract more employees to use the HRIS, as low security of ICT infrastructure can hinder the use and adoption of online services.

V. CONCLUSION

The Human Resource Information System of Urdaneta City University is reliable, easy to use, and responsive to the needs of employees, which makes it easier for the human resource department to implement its processes and policies and helps create a more efficient and productive academic environment in the University.

Nonetheless, weak internet connection and ICT infrastructure, limited privacy and protection, and limited digital skills are the problems encountered by the users of the HRIS. Weak internet connection and ICT infrastructure affect the online services of the HRIS by causing delays in loading pages, frequent disconnections, and potential security risks, and employees struggle to access human resource data under such conditions. Likewise, limited privacy safeguards and digital skills discourage users from relying on the HRIS to access their data.

VI. RECOMMENDATIONS

Based on the findings of the study, the following are recommended. First, the University should continue ensuring the provision of an easy-to-use, accurate, and reliable HRIS by maintaining HRIS protocols, as a system perceived to be easy to navigate facilitates user satisfaction. Second, to ensure the success of online initiatives towards enhanced service delivery, the University must capitalise on building a comprehensive ICT infrastructure that will also cater to online services in other offices; the successful use of the HRIS depends on top management support, including personnel, resources, and other relevant assistance, in addition to investments, and partnerships with alumni and the private sector may be tapped to support infrastructure improvement. Third, the privacy and security of the HRIS should be enhanced by adding security features such as digital signatures, encryption, and authentication mechanisms, with sufficient verification and protection measures to ensure that transactions are carried out safely, alongside strict implementation of cybersecurity and data privacy regulations. Finally, education and training must be given considerable attention through capacity-building activities such as training, mentorship, and knowledge-sharing sessions, so that employees can effectively handle new human resource processes and adapt to a changing digital environment.

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Sacred Stone and Silent Narratives: Jaina Antiquities for Bharatiya Jnana Parampara of Purulia District of West Bengal, India

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ABSTRACT

The paper discusses the Jain cultural heritage in the Purulia district and how it will foster the Bharatiya Jnana Parampara. In this regard, researchers explored various historical sites in Purulia that still contain the ruins of a Jaina temple. Basically, researchers have first-hand information, as they belong to the Purulia district, and are motivated to select such a burning issue in the context of the NEP-2020 and Indian Knowledge Systems. In the process, extensive work on Jain sculptural and architectural remains has been recorded in the river valleys adjoining the Chotanagpur plateau region and the present-day district of Purulia, which remains the most important area for the provenance of these remains. Its noticed that the Jaina civilizations nourished and flourish places of Chotanagpur area and this the confluence of the tangible and intangible cultural meets of Manbhum (nowadays known as Jangalmahal forest land) followed by the development in the hills land of West Bengal, it was the Chotanagpur plateau and its adjoining regions (so far as Eastern India is concerned) that witnessed the rapid diffusion of this faith during the 9th to the 11th/12th centuries C.E. Still many ruins exist in the Daul Ghata and other places which show that the once Purulia is the land of Jaina. The archaeological evidence also shows that Jainism and its aesthetic sense still have many educational implications. In this regard, our humble attempt is to integrate Jainism's aesthetic sensibility with the Bharatiya Jnana Parampara. The objective of the present study is to document Jaina practices within the context of Bharatiya Jnana Parampara, align them with contemporary educational practices, and relate the reported specimens to the archaeological context. In this paper, the researchers analysed data to provide a coherent picture of the newly documented Jaina sculptural sites in the Damodar River valley, Purulia district, West Bengal. The present study has investigated the cultural heritage of a region during the early medieval and medieval periods, as well as its regional identity and the contributions of the Jain religious tradition. Using the observational method, the researcher collected data and proceeded to the findings. In the present paper, the researchers discuss the iconographic features of the newly discovered Jaina images in detail. Stylistically, these sculptures are similar to those reported from Santuri in Purulia, Tiluri from Biharinatha in Bankura, and Punchra in Paschim Bardhaman. This may be because, compared with other major Jaina art centres such as Pakbirra, Charra, Suisa, and the Visnupur region, the present study area used a different stone, whose carving produced an aesthetic expression that may be equated with a different art style. The region needs further intensive exploration to reconstruct the history of Jainism in this fringe area of the Chotanagpur Plateau.

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I. INTRODUCTION

India has a long intellectual tradition. Since ancient times, the Bharatiya Jnana Parampara has been enriched by a synthesis of diverse philosophies, religions, and schools of thought. One of the key branches of this Jnana Parampara is Jainism or Jaina philosophy (Majumdar & Bairagya, 2025). It is founded on the principles of human values and morality, Ahimsa Paramo Dharma (non-violence), and self-discipline. Rishabhanatha is revered as the first Tirthankara and the founder of Jaina philosophy. Subsequently, Mahavir organised and expanded this philosophy. The core teaching of Jainism is Ahimsa, which is not limited to refraining from physical harm but also teaches the principle of non-injury towards all living beings through one's thoughts, speech, and actions (Reading, 2019). Equally significant in this philosophy is the concept of Anekantavada – the doctrine of multi-dimensional truth, which posits that truth is not singular. However, it can be perceived in various contexts. This concept enhances a mindset of tolerance and coexistence within society. Conversely, the principle of Aparigraha (non-possession) teaches individuals to lead a life of moderation by renouncing excessive attachment to material comforts and wealth (Chaturvedi, 2012).

In Jain philosophy, the attainment of Moksh (liberation) fosters the cultivation of right faith, right knowledge, and right conduct, which pave the way for an individual's spiritual evolution. These principles play an important role in establishing morality, and discipline is a matter of one's personal life (Abdul & Mondal, 2023). Jainism holds immense significance within the Indian knowledge tradition, having contributed to the development of ethical values, tolerance, critical thinking, and environmental awareness. A perspective of equality towards all living beings, coupled with a deep reverence for nature, constitutes a distinctive hallmark of Jainism, one that remains profoundly relevant in the modern world (Ameta, 2025).

II. JAIN EPISTEMOLOGY

According to Jain philosophy, the true concept of a matter or object is called knowledge. Knowledge arises as a result of the connection between the knower and the known. As mentioned earlier, in Jain philosophy, it is accepted that every living being has a soul and that knowledge is the natural attribute of the soul. Therefore, according to this philosophy, the soul is the real knower. Again, the nature of the soul is consciousness. The non-living or inanimate is devoid of consciousness. Consciousness is self-manifest and also manifests

other objects. If an object does not manifest through consciousness, it must be understood that it is obstructed somewhere. In Jain philosophy, it is said that every living being can be omniscient. However, the soul's omniscient nature is obstructed by past actions. True knowledge can remove that obstruction. In the theory of knowledge within Jain philosophy, knowledge is divided into two parts: indirect knowledge and Direct Knowledge. In other Indian philosophies, sense-based knowledge is called direct knowledge. However, in Jain epistemology, this idea is the opposite. According to this philosophical idea, the existence of inanimate objects in the external world is independent of knowledge, or the mind does not create them. Therefore, the knowledge acquired through the senses or the mind is not direct. This kind of knowledge is identified as indirect knowledge in Jain philosophy. This kind of indirect knowledge is not real knowledge; this kind of knowledge is practical knowledge. Two processes of acquiring such indirect knowledge are mentioned in Jain philosophy: 'Moti' and 'Shruti'. Moti is knowledge obtained through the mind and senses. In the general sense, all the knowledge that can be obtained through internal perception, external perception, memory and inference is called 'Moti Janana'. The knowledge that is obtained by relying on the words of others or on scriptures is called 'Shruti Janana'.

On the other hand, the knowledge that the soul directly perceives without any medium is called Direct knowledge in Jain philosophy. Direct knowledge is real knowledge. There are three types of direct knowledge in Jaina Epistemology: 'Abodhi', 'Manaparjai,' and 'Kebal'. The knowledge of something distant or subtle that is perceived by the senses or mind is called 'Abodhi Janana'. In general terms, it can be called foresight. Knowledge about the mental state of others, which can be obtained through insight, is called 'Manaparjai'. Transcendental knowledge is the 'Kebal Janana'. When all the actions that are obstacles in the path of knowledge are destroyed, when a soul frees itself from the bondage of all actions, only then can he possess knowledge. This knowledge is not bound by the boundaries of space and time.

Jain philosophy is similar to modern educational thought in various aspects. Firstly, a major feature of modern educational theory is its eclecticism. Child-centricity in education is the real

form of this eclecticism. If we review the history of the development of this ideal of child-centred education, we see that it has been shaped by a number of different doctrines. That is, in the field of education, the doctrines previously advanced by various thinkers have been indirectly recognised as partial truths within modern educational theory. This view of modern education is evidenced by the influence of Syadvad or Anekantavada. Secondly, education in the modern sense is the process of developing a child's inherent potential. In Jain philosophy, the soul is said to be the reservoir of infinite knowledge and power, while karma covers it. Only when the obstacles of karma are removed will the soul possess infinite knowledge, and the fulfilment of life will come. In other words, the effort to free oneself from the bondage of karma in Jain philosophy and the effort to develop a child's latent potential in modern education are the same. Thirdly, the rules mentioned as the code of conduct in Jain philosophy, such as right knowledge, right philosophy and right character, on the one hand help the individual to rise to a higher level as a living being, and on the other hand help to maintain overall social welfare and social harmony. Similarly, the co-selection of individual welfare and social welfare can be observed in the aim of modern education. Fourthly, God is not acknowledged in Jain philosophy. According to this philosophy, the one who has won in life is the 'Jin'; these Jins are ideal men and worthy of imitation. The common man can attain liberation by following their lives. The role of the teacher mentioned in modern education is in complete harmony with this principle of Jain philosophy. According to this modern view, the teacher is the embodiment of the student's philosophy of life; he is his friend, philosopher and guide. The teacher's work is not limited to imparting knowledge; his job is to unfold the true philosophy of life before the student through his own way of life. That is, the modern teacher is a personality worthy of imitation. Finally, in Jain philosophy, religion means perfection. In the modern era, all thinkers agree that education is the process of perfecting a person. Therefore, from an educational perspective, this core concept of Jain philosophy regarding humanism is very significant and logical in the modern era.

III. NON-VIOLENCE: GANDHIAN VIEW ON JAIN PHILOSOPHY

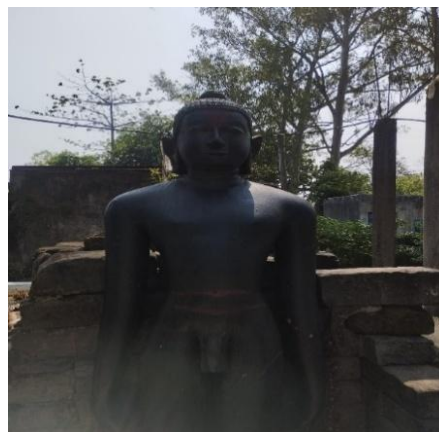
Mahatma Gandhi was one of the greatest advocates of non-violence in the modern world. His philosophy of Ahimsa (non-violence) became the foundation of India's freedom movement against British rule. Gandhi believed that truth (Satya) and non-violence (Ahimsa) were the strongest weapons for social and political change. He used peaceful methods such as Satyagraha, civil disobedience, and non-cooperation to fight injustice. The idea of non-violence in Gandhi's thought was deeply influenced by Jainism. Jainism teaches that all living beings are sacred and should not be harmed in thought, word, or action. The Jain principle of 'Ahimsa Paramo Dharma' (non-violence is the highest religion) greatly inspired Gandhi during his childhood in Gujarat, where Jain culture was strong.

Gandhi expanded the Jain idea of non-violence from a personal religious practice to a social and political philosophy. For him, non-violence was not weakness; it was a form of moral courage and compassion. He believed that hatred and violence could never create lasting peace. His ideas later inspired world leaders such as Martin Luther King Jr. and Nelson Mandela in their struggles for justice and equality. Thus, Gandhi's concept of non-violence reflects a strong connection between Indian spiritual traditions,

especially Jainism, and modern movements for peace and human rights.

IV. HISTORICAL CONTEXT OF JAINISM IN PURULIA

Today's Purulia was once part of the undivided Manbhum district in the Chotanagpur plateau. The Acharanga Sutra, written in the 4th to 3rd centuries BCE, mentions the region of Radh. The present Purulia district was located within this region. At that time, this region was covered in dense forest. Ferocious wild animals and primitive tribal communities, or denotified tribes at present known as PVTGs (Particularly Vulnerable Tribal Groups), lived in this Chotanagpur Plateau. To bring these tribal people to the light of education and to propagate Jainism, Tirthankara Mahavir travelled to this region. Currently, this district is part of the state of West Bengal, with an area of 4147 square miles (approx). The renowned British historian, Colonel Dalton, collected information by observing the entire region and said that from the 9th to the 13th century, almost every village in this district had a huge Jaina temple, also known as a Deul and beautifully carved stone sculptures of the Tirthankaras. The temples of Purulia, which were established in the 9th century, were built by 90 percent of the Jains. The traders played a crucial role in establishing them (Khan & Sinha, 2024).



Picture 1–6: Archaeological evidence found at various sites of Purulia

V. ARCHAEOLOGICAL EVIDENCE AND SITE ANALYSIS OF PURULIA REGION

SL No.	Archaeological site of Purulia district	Archaeological Evidence	Times frame (approximately)
1	Telkupi Village, Ragunathpur-I Block	Famous Jaina Temple	10 th –13 th century
2	Banda Village, Ragunathpur-II Block	Jaina temples and Rostrum (Rekha Deul Architecture)	11 th – 13 th century
3	Para Village, Para Block	Stone sculpture of Jaina Tirthankara murtis	10 th – 13 th century
4	Deulghata, Baram Village, Jaypur Block	Famous Jaina temples	9 th – 10 th century
5	Gajpur, Purulia Barakar Road, Purulia	Yielding excavated stone temple remains and Jaina sculptures	10 th – 11 th century
6	Charra Village, Purulia-II Block	Ruins of Jaina sculptures and temple	11 th – 13 th century
7	Baramesya Village, Manbazar-I Block	Various meditative Jaina Tirthankara stone sculptures	10 th – 11 th century
8	Budhpur Village, Puncha Block	Various stone-carved Jaina sculptures and ruins murtis	11 th – 13 th century
9	Mahadevbera,	Stone sculpture of Jaina tirthankaras (<i>Rishabhanatha</i> & <i>Parshvanatha</i>)	11 th – 12 th century
10	Lauraha Village, Puncha Block.	Stone sculpture of Jaina Tirthankara murtis	9 th – 10 th century
11	Rakshatpur Village, Raghunathpur Block	A meditative Jaina Tirthankara, <i>Rsabhanatha</i> , stone sculpture	10 th – 11 th century
12	Rajnawagarh, Kenda Block.	Jaina Tirthankara <i>Rsabhanatha</i> stone sculpture	Not found
13	Lakhra Village, Puncha Block.	Broken Jaina temple and Stone sculpture of Jaina Tirthankara Mahabir	11 th – 12 th century
14	Sankha Village, Raguthanathpur-I Block	Jaina Tirthankara <i>Rishabhanatha</i> stone sculpture & damaged Jaina temple	9 th – 10 th century
15	Bhabanipur Village, Raghunathpur-II Block	Jaina Tirthankara <i>Rsabhanatha</i> stone sculpture	9 th – 10 th century
16	Chalka Village, Manbazar-II Block	Stone sculptures and murtis	9 th – 10 th century
17	Budla Village, Raghunathpur-I Block	Ruins Jaina Tirthankaras stone sculpture	9 th century
18	Ladhurka Village, Hura Block	Ruins of Jaina stone sculptures	9 th century
19	Podlara Village, Purulia-II Block.	Ruins of Jaina temples (Deul)	9 th – 10 th century
20	Burda, Baghmundi Block.	Ruins of Jaina Tirthankaras stone sculpture	9 th century

21	Pakbirra Village, Pancha Block	Famous Jaina Tirthankara Mahabir stone sculpture, Jaina temples, & various murtis	9 th – 10 th century
22	Tatari Village, Purulia-II Block	The ruins of the Jaina temple are visible at the site	11 th – 12 th century

VI. TANGIBLE AND INTANGIBLE CULTURAL CONFLUENCE

The concept of 'Sacred Stone and Silent Narrative' symbolised the core relationship between tangible archaeological sculpture and its intangible, or abstract, cultural relevance, particularly in the area where Jain traditions and local traditions and customs intersect. Sculptures not only function as visible symbols of religious devotion but also embody core philosophical ideas, environmental awareness, social values, and spiritual practices.

Stone as Living Heritage: Sacred stones or rock-cut sculptures, those found in the Deulghata, Pakbirra region of Purulia district of West Bengal, are not merely non-living objects that were created or used by humans in the Jain period but also serve as primary evidence for understanding ancient daily life activities, technology and religious beliefs. Those sacred stones or sculptures represent a 'living heritage' where ancient Jain icons are often integrated into local worship, becoming part of the 'silent narrative' of the community.

Dual Religious Attribution: In ancient times, particularly in these areas, local communities worshipped Jain icons (e.g., Tirthankaras) as local deities (e.g., Vairab), indicating a syncretic blend of Jain principles and thoughts with local practices.

Environmental Awareness and Spiritual Practice: The Jain tradition of non-violence (Ahimsa) aligns with local roots and rituals of worshipping nature and other living and non-living things, such as the Vata (Ficus) tree, and the maintenance of sacred groves, merging environmental conservation with religious practice.

Cultural Continuity: The 'silent narratives' are expressed through oral traditions, local rituals, folklore, culture, and traditions that are connected to the peoples of those areas. These narratives represent a continuity with past knowledge systems, in which communities, such as the Sarak in the Manbhum region, continue to follow principles

of non-violence even as formal Jain worship has evolved (Majee, 2026).

VII. EDUCATIONAL IMPLICATIONS

Values-based Education: Jain principles such as non-violence and compassion align well with the broader goals of holistic education. By integrating these values into the curriculum, it is possible to foster ethical awareness and a sense of social responsibility.

Place-based and Experiential learning: Jainism and place-based learning are linked by a shared emphasis on experiential, or hands-on, learning, environmental awareness, and the belief that the surrounding environment is a 'moral theatre' where the educational process unfolds. Jain thought and principles encourage the educational process through direct engagement with the surrounding natural environment (Maes, 2021).

Culture-based learning: In the context of Jainism, it is an educational approach embedded in Jain philosophy, primarily Ahimsa (non-violence), Anekantavada (many-sidedness), and Aparigraha (non-possession). This approach focuses on holistic and moral development, combining intellectual knowledge with ethical conduct, often transmitted through family, culture and daily rituals.

Alignment with NEP-2020: The National Education Policy (NEP-2020) places significant emphasis on integrating Indian Knowledge Systems, or 'Bharatiya Jnana Parampara', into the educational process. Through this study, researchers clearly highlighted how local culture and heritage can be effectively leveraged as valuable resources in curriculum design.

VIII. DISCUSSION

The present study explored multiple dimensions to understand the historical, cultural, and educational significance of Jain antiquities and sculpture in the Purulia district. This study reinforces the idea that the Purulia region was an important centre of Jain activity during the early

medieval period. The sculptural and architectural ruins discovered at sites such as Deulghata, Pakbirra, and Punchra indicate the existence of a well-established network of religious and cultural centres. These sites were interconnected through trade routes, pilgrimage paths, and socio-economic and cultural exchanges, which contributed to the propagation and spread of Jainism within the Chota Nagpur Plateau and beyond. An analysis from an art-theoretical perspective reveals that these sculptures unveil a blend of unity and diversity. Although these iconographic forms adhere to the canonical norms of Jain iconography, i.e., the depiction of Tirthankaras in meditative postures, local variations are evident, influenced by local materials and craftsmanship. For instance, the use of local stone has given rise to distinctive craftsmanship and carving styles that set the sculptures of Purulia apart from those of other Jain centres, such as Bishnupur, and even from those of Western India.

This highlights the dynamism of artistic traditions, as they are shaped by interaction with the local environment and culture.

In this context, the concept of 'Sacred Stones and Silent Narratives' becomes relevant. The ruins of sculptures and temples are not merely inert objects; rather, they serve as carriers of thoughts and philosophies, embodying multifaceted forms of historical memory, religious belief, and aesthetics. Their silence is not absence but depth, inviting interpretation and engagement. If we analyse from the perspective of the Indian knowledge system, these ruins, sculptures, and stone cuttings can be seen as repositories of knowledge that rise as a hidden curriculum. Another significant part of this study is the interconnectedness of tangible and intangible culture. Purulia is one of the major areas of the Jangalmahal region, with its rich, vast tribal culture and traditions, which provide a unique backdrop for the interaction between indigenous practices and Jain wisdom. This shared connection is clearly manifested through harmony with nature, living within community, and moral and ethical conduct. These values are highly connected with contemporary issues regarding environmental sustainability and social cohesion.

In terms of educational significance, this study highlights several insights. First, it emphasises the importance of integrating local culture and traditions into teaching methodology. For example,

visiting archaeological sites can serve as a powerful educational tool, offering students the opportunity to connect their theoretical knowledge with the real world. Secondly, the philosophical principles of Jainism, mainly non-violence, pluralism, and self-restraint, can make a significant contribution to the education system and help to develop empathy, critical thinking, and ethical awareness among students. However, this study aligns with the vision of the NEP 2020, which promotes a holistic and multidisciplinary approach to education. By incorporating elements of history, archaeology, philosophy, and the arts, this study demonstrates the relevance of the 'Indian Knowledge System' and how it can be effectively integrated into modern curricula. The present study also revealed that interdisciplinary research significantly bridges the gap between the humanities and the social sciences. Many of the archaeological sites in the Purulia region remain underexplored and face preservation challenges. Due to a lack of adequate knowledge, insufficient funds, and the failure to maintain proper documentation, conducting research and safeguarding important subjects becomes difficult. To preserve and care for this heritage, it is essential that researchers, local communities, and government agencies work together.

IX. CONCLUSION

The exploration of Jain sculptures and antiquities in the Purulia district of West Bengal reveals a rich cultural history and knowledge system that has mostly remained hidden. These sacred stones serve as silent witnesses to a rich cultural past marked by spirituality, craftsmanship, artistic excellence, and ethical and moral values. Through this study, researchers seek to give voice to these silent narratives within the context of the Bharatiya Jnana Parampara. Findings of the study showed that Purulia was not simply a marginalised area but also a significant religious and spiritual centre of Jainism, and during the medieval period, Jain activity was popularised in these regions. Archaeological remains, such as temple ruins and beautifully carved sculptures, show that Jainism once flourished in this region and became an important part of its social and cultural life. The designs and symbols seen in these artefacts follow traditional Jain principles while also incorporating local and traditional influences. This shows that culture was not fixed; instead, it changed and

adapted over time, creating a rich and dynamic expression in architecture and engineering. Beyond their historical significance, these antiquities also have deep cultural, spiritual and educational value. They teach us the importance of non-violence, living in harmony with nature, and leading an ethical life; these are very relevant in today's society. By incorporating this ancient knowledge system in modern education in the context of the National Education Policy-2020, we can help students to develop in a more holistic and balanced way, not just academically but also morally and socially. This study also contributes to the growing discussion on the significance and meaningfulness of Indian Knowledge Systems in 21st-century education. At the same time, it shows that there is an urgent need to preserve, protect and promote these traditions more deeply. Many of these sites remain neglected, and their value for learning and cultural awareness has not been fully recognised.

Future research should take an interdisciplinary approach by bringing together fields such as archaeology, history, anthropology, and education. This will help develop a clearer, more complete understanding of Purulia's rich cultural heritage. In conclusion, the sacred stones of Purulia district are not just witnesses of the past but also living symbols of the Bharatiya Jnana Parampara, which still inspires and guides us today. When we connect with these silent narratives, we not only understand our history but also begin to shape a better future for all by incorporating this knowledge system into education.

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The Eschatology of Light Cones: Cosmological Event Horizons, Existential Risk Mitigation, and the Metaphysics of Divine Judgment in 2 Peter 3:10

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ABSTRACT

Modern physical cosmology, particularly the standard Lambda-Cold Dark Matter (Λ CDM) framework, describes a universe in which accelerated expansion can establish cosmological event horizons and progressively restrict causal communication between sufficiently distant gravitationally unbound regions. In long-term existential-risk analysis, this raises a provocative possibility: distributing civilisation across increasingly independent causal domains could reduce the probability that one localised catastrophe destroys every descendant population. This article examines whether such a physical strategy has any relevance to the eschatological claim of 2 Peter 3:10. Through interdisciplinary textual-critical exegesis, theological metaphysics, philosophy of causation, and a formal comparison of risk models, the study argues that cosmological isolation and eschatological judgment belong to different explanatory categories. Event horizons constrain causal influence within spacetime; they do not constitute metaphysical barriers against a theological claim about the Creator's judgment upon creation. The argument is qualified in two directions. First, Λ CDM is treated as a physical model rather than an unquestionable forecast of the universe's ultimate destiny. Second, divine action should not be described as a measurable faster-than-light signal, because doing so would incorrectly turn a theological doctrine of divine sovereignty into a physical mechanism. The central thesis is therefore not that God "travels faster than light," but that the explanatory scope of light cones is limited to physical causal relations within spacetime. The article compares three readings of 2 Peter 3:10—cosmic dissolution, transformative judgment, and localized/biospheric judgment—and shows that only the third creates a possible conceptual space in which spatial dispersion might matter. The theological conclusion is that eschatological security is not achieved through maximal cosmic distance but through the promise of "new heavens and a new earth" in which righteousness dwells (2 Pet. 3:13).

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I. INTRODUCTION: THE TOPOLOGY OF COSMIC ISOLATION

Existential-risk scholarship asks a question that is both empirical and philosophical: what conditions would allow intelligent life to survive for extremely long periods without being eliminated by a single catastrophe? Nick Bostrom's account of existential risk and Toby Ord's later synthesis emphasise that risks capable of permanently destroying humanity, or drastically curtailing its future potential, differ from ordinary disasters because their consequences are global and potentially irreversible. One implication is that the architecture of civilisation matters. A civilisation concentrated in one planetary or stellar environment is exposed to correlated hazards; a civilisation distributed across multiple sufficiently independent environments may be less vulnerable to a single failure mode (Bostrom 2013; Ord 2020).

Physical cosmology introduces a striking complication. In a universe with sustained accelerated expansion, distant regions can become causally inaccessible to one another. The relevant concept is the cosmological event horizon: a boundary in the causal structure of spacetime beyond which signals emitted now cannot ever reach a specified observer, given the future expansion history of the universe. In a Λ -dominated Friedmann-Lemaître-Robertson-Walker cosmology, the future causal structure can therefore contain regions that become permanently disconnected for purposes of communication and influence (Friedman, Kaiser, and Gallicchio 2013).

This physical picture has been used to motivate a long-term resilience intuition: if intelligent life spreads into many causally separated regions, a disaster confined to one causal domain cannot automatically propagate to every other domain. The argument is compelling only under specified assumptions. It requires that the relevant hazards are physically mediated, that their causal

propagation is bounded by relativistic structure, and that the distributed populations are sufficiently independent. It also requires a probability model in which the risks of different domains do not remain perfectly correlated.

The theological question raised by 2 Peter 3:10 is fundamentally different. The passage does not present the end of the world merely as a very large physical disaster moving through pre-existing space. It announces "the day of the Lord," describes the passing away of the heavens, the dissolution of the elements, and the exposure of the earth and its works, and immediately connects these events to the expectation of "new heavens and a new earth" (2 Pet. 3:10–13). The text therefore concerns not only the fate of matter but the moral and teleological meaning of creation.

The thesis of this article is precise. Cosmological event horizons may be highly relevant to the mitigation of immanent physical risks, but they do not provide a theological defence against an eschatological judgment understood as the sovereign act of the Creator. This is a category distinction rather than an attempt to establish theology by physics. The article does not claim that cosmology proves divine judgment, nor that physics can falsify Christian eschatology. Instead, it asks whether a physical concept—causal isolation—can logically function as a metaphysical refuge from a theological claim. The answer is negative unless 2 Peter 3:10 is first restricted to a localised physical judgment.

II. METHODOLOGY AND INTERDISCIPLINARY BOUNDARIES

This study employs a conceptual interdisciplinary method rather than an empirical experiment. The exegetical component uses lexical, literary, and textual-critical analysis of 2 Peter 3:10–13, with attention to the immediate argument of chapter 3 and its allusions to creation and the flood. The cosmological component treats Λ CDM as

a baseline physical model for discussing accelerated expansion, causal horizons, and the future accessibility of distant structures. The philosophical component distinguishes physical causation, probabilistic risk, and theological dependence. These domains are placed into dialogue but are not collapsed into one another.

Three methodological cautions are essential. First, a cosmological event horizon is not a wall in space. It is a feature of the causal structure of spacetime determined by the metric and its future evolution. Thus, expressions such as “regions behind the horizon” should not be interpreted as literal membranes. Second, the claim that civilisation-wide extinction probability tends to zero requires assumptions of independence that are not guaranteed. A common cosmic mechanism, correlated technological failure, or a shared vulnerability could make the risks across separated populations strongly dependent. Third, the phrase “divine non-locality” must be used carefully. Classical Christian theology affirms divine omnipresence and providence, but it does not entail that God is a physical signal propagating superluminally. The relevant claim is metaphysical: God is understood as Creator and sustainer of spacetime rather than as an object located at one coordinate inside spacetime.

The paper therefore uses a comparative causal vocabulary. “Horizontal causality” denotes ordinary physical relations among events in spacetime. “Vertical causality” is a metaphor for the ontological relation of creation to its Creator. The metaphor is not a proposal for a second physical force. It marks a difference in explanatory level. A light cone constrains what physical event can influence another physical event under relativistic dynamics. It does not, by itself, settle whether the universe is contingent, why there is a physical order at all, or what theological judgment would mean if God exists.

III. TEXTUAL AND EXEGETICAL ANALYSIS OF 2 PETER 3:10

1. The Day of the Lord and the Narrative Logic of 2 Peter 3

Second Peter 3:10 should not be isolated from verses 5–13. The author responds to scoffers who infer from the apparent stability of creation that the promised coming of Christ will not occur.

The response is explicitly cosmological: the heavens and earth existed by God’s word; the ancient world was judged through water; the present heavens and earth are reserved for fire; and the Lord’s apparent delay is interpreted not as failure but as patience. The sequence culminates in the “day of the Lord” and the expectation of a new creation. The rhetorical point is therefore not to satisfy curiosity about a physical mechanism but to overturn the inference that present stability guarantees future stability.

The expression “like a thief” emphasises unexpectedness rather than a physical mode of transmission. In the New Testament, the thief image is associated with suddenness and the failure of human prediction. The metaphor should therefore not be translated into a claim that the eschatological event violates relativity by sending a signal at infinite speed. The author’s theological point is that the day arrives according to divine timing, not according to the expectations of the scoffers.

2. Stoicheia: Elements, Cosmic Structures, or Powers

The noun *stoicheia* is semantically flexible. In Greek usage, it can refer to elemental constituents, basic components, or foundational principles. In some early Christian contexts, it can also be associated with cosmic powers. In 2 Peter 3, however, the term occurs alongside “heavens” and “earth” and is linked to fire, dissolution, and the coming new creation. It is therefore reasonable to understand it as part of the cosmic order, although the precise referent should not be equated anachronistically with modern subatomic particles.

This qualification is important for interdisciplinary work. If *stoicheia* is simply translated as “subatomic particles,” the ancient text is made to predict modern particle physics, a conclusion that the linguistic evidence does not warrant. Conversely, if it is interpreted so broadly as to mean only abstract moral principles, the physical imagery of heavens, earth, fire, and dissolution is weakened. A more defensible approach recognises that the text uses ancient cosmological language to speak about the instability of the present created order under divine judgment (Bauckham 1983).

3. The Textual Variant: Heuresetai and Katakausetai

The final clause of verse 10 presents a significant textual-critical problem. Critical Greek editions preserve a reading built around heuresetai, “will be found” or “will be disclosed,” while the textual tradition also reflects the alternative reading katakausetai, “will be burned up.” The difference is theologically significant because “burned up” naturally suggests destruction, whereas “found/disclosed” can support a reading in which the earth and its works are exposed before divine judgment. The critical tradition also reflects uncertainty around a small negative particle in the clause, demonstrating that the textual history is more complex than a single universally fixed wording (Metzger 1994).

The variant should not be overstated. A textual preference for heuresetai does not by itself prove that Peter teaches renovation rather than destruction. Nor does katakausetai by itself require absolute annihilation. Interpretation must be controlled by the entire paragraph. Verse 13 is particularly important: the future is described as “new heavens and a new earth” in which righteousness dwells. The language can accommodate continuity and discontinuity simultaneously. Something genuinely new is promised, yet the promise is framed in relation to creation rather than as a simple escape from creation.

The textual-critical observation strengthens the article’s central category distinction. Whether the verse is read primarily as destruction or disclosure, the event is not described as a hazard that travels from one galaxy to another through ordinary physical propagation. The judgment concerns the created order as a whole and is framed by divine promise, moral accountability, and new creation.

4. Fire as Physical Image and Theological Sign

Fire in biblical and Second Temple Jewish literature can signify destruction, purification, revelation, or judgment. In 2 Peter 3, the imagery is explicitly connected to divine judgment and ethical transformation. Verse 11 asks what kind of people believers ought to be if all these things are being dissolved, and verse 13 turns immediately to righteousness in the new creation. The ethical

conclusion demonstrates that the cosmological language functions as theological exhortation.

Consequently, the modern concept of heat death should not be simply identified with Peter’s fire. Heat death is a thermodynamic scenario concerning the long-term approach toward a state of diminished free-energy gradients under a particular cosmological model. Peter’s fire is a theological image embedded in an eschatological narrative of judgment and renewal. Similar language of cosmic finality does not establish identity of mechanism.

IV. Λ CDM COSMOLOGY, EVENT HORIZONS, AND EXISTENTIAL-RISK MITIGATION

1. Accelerated Expansion and Causal Horizons

The standard Λ CDM model describes a universe containing ordinary matter, dark matter, radiation, and a component represented by a cosmological constant Λ . Under the familiar late-time Λ -dominated scenario, the expansion of the universe accelerates. The precise future depends on the actual dark-energy physics, so the discussion here is conditional: if the late-time expansion remains sufficiently close to a positive cosmological constant, the universe develops a future causal structure in which some distant events can never communicate with a given worldline.

This is a statement about causal reachability, not about local motion exceeding the speed of light. General relativity permits the proper distance between sufficiently separated comoving regions to increase at an effective rate greater than c because the expansion is described by the spacetime metric. Local observers do not thereby violate special relativity. The event horizon is instead determined by whether a future-directed light signal emitted at a given time can ever reach a specified observer.

The long-term astrophysical consequences are substantial. Gravitationally bound systems remain bound because local gravitational attraction dominates the expansion at those scales, while sufficiently separated structures recede from one another as the cosmic scale factor evolves. Over enormous timescales, the observable universe accessible to a given civilisation can therefore become much smaller than the full spatial extent of

the universe. Cosmological isolation is thus a genuine physical phenomenon within the relevant class of models (Nagamine and Loeb 2003; Friedman, Kaiser, and Gallicchio 2013).

2. The Probability Model and Its Limits

The intuitive risk-mitigation argument can be represented as follows. Let N be the number of sufficiently isolated civilizational nodes and let p_i be the probability that node i is destroyed by a specified class of local hazards during a defined interval. If the destruction events are independent, the probability that every node is destroyed is approximately

$$R_N = \prod_{i=1}^N p_i.$$

If every p_i is bounded by some $p < 1$ and the independence assumption remains valid, then R_N approaches zero as N grows. This mathematical result captures the intuitive advantage of redundancy. It does not establish that extinction becomes literally impossible. The model becomes unreliable if hazards are correlated or if the populations share a common vulnerability.

For example, a civilisation could distribute itself across galaxies yet remain dependent upon a common technological architecture, a shared artificial-intelligence substrate, a common physical constant, or a single cosmological process. A hazard that acts across all nodes would not be mitigated by spatial dispersion. Even ordinary local risks can become correlated through common decision-making, common information systems, or synchronised technological development. The proper conclusion is therefore conditional: spatial distribution reduces the risk of hazards whose causal domains are genuinely local and statistically independent (Bostrom 2013; Ord 2020).

This qualification is important because the theological comparison is strongest when the physical claim is stated accurately. The paper does not need to claim that cosmological isolation solves existential risk. It needs only the weaker proposition that causal isolation can reduce some classes of physically mediated global hazards. Once that proposition is accepted, the theological question becomes whether the same isolation can protect against divine judgment.

V. THREE HERMENEUTICAL MODELS OF 2 PETER 3:10

1. Model A: Absolute Universal Annihilation

Under an annihilationist reading, 2 Peter 3:10 describes the dissolution of the present cosmic order in a comprehensive sense. The heavens pass away, the elements are dissolved by heat, and the earth and its works are subjected to judgment. If the entire spacetime order is included in the referent, event-horizon insulation offers no refuge. The event horizon is itself a feature of the spacetime geometry whose ultimate fate is at issue.

The logical structure is straightforward. An event horizon can prevent a physical signal from travelling between two regions only while the relevant spacetime structure continues to define those regions and their causal relations. If the eschatological event includes the transformation or dissolution of that structure, then the horizon cannot function as an independent shelter. It would be analogous to attempting to use the geometry of a map as protection against the destruction of the map itself.

Yet “annihilation” must be used cautiously. Christian eschatology frequently speaks not only of destruction but also of resurrection, renewal, restoration, and new creation. A strict doctrine of absolute non-continuity between old and new creation raises questions that 2 Peter 3 itself does not fully resolve. Model A therefore represents the strongest case for incompatibility between cosmic isolation and eschatological security, not a dogmatic assertion about the exact metaphysical mechanics of the end.

2. Model B: Transformative Refinement and Judicial Exposure

Model B emphasises *heuresetai* and the ethical context of verses 11–13. The earth and its works are exposed before divine judgment, while the present order undergoes purifying transformation. On this reading, the issue is not merely that matter is destroyed, but that creation is brought under divine disclosure. Hidden works become visible; moral reality can no longer be concealed by distance, technology, or historical circumstance.

This model is especially significant for cosmic dispersion. Spatial distance is relevant to communication between physical agents, but moral

accountability in Christian theology is not fundamentally a communication problem. A civilisation ten billion light-years away may be causally inaccessible to another civilisation, yet the theological claim of divine omniscience does not depend upon a signal from one civilisation reaching another. The distinction is between epistemic access within a physical system and divine knowledge of that system.

The argument must again avoid physicalizing theology. It is not necessary to say that God observes every civilisation by sending faster-than-light information packets. Such a statement would treat God as an extremely advanced observer inside the universe. Classical theism instead claims that God knows creatures as their Creator and sustains their existence. Thus, the relevant theological relation is not a superluminal communication channel but ontological dependence.

3. Model C: Localised or Biospheric Judgment

Model C restricts the language of 2 Peter 3:10 more narrowly to the terrestrial or phenomenological world known to the ancient audience. On this reading, "earth" and "heavens" describe the human cosmic environment rather than every galaxy or every causally disconnected region of the modern universe. Such a reading may preserve the rhetorical and ancient cosmological horizon of the text without requiring the author to make a modern claim about the global spacetime manifold (Moo 1996).

If Model C is adopted, the possibility of a genuine tension with future spacefaring civilisation emerges. Suppose descendants of humanity establish populations outside the Solar System and those populations become causally isolated from Earth. If the judgment described by the text is strictly local to Earth's biosphere, spatial dispersion could, in principle, protect distant populations from that particular physical event. The conclusion would not be that cosmic isolation defeats Christian eschatology, but that a localised interpretation limits the scope of the eschatological event.

Model C therefore represents the strongest counterpoint to the thesis of this paper. It also reveals why exegesis must precede metaphysical argument. The cosmological conclusion cannot determine the biblical meaning. If the text means local judgment, then local judgment is what the text

means regardless of whether future humans live in other galaxies. The interdisciplinary comparison becomes a test of interpretive consequences, not a method for selecting the interpretation.

VI. FORMAL METAPHYSICAL COMPARISON: HORIZONTAL AND VERTICAL CAUSALITY

The central conceptual distinction can be formalised. Let a physical universe be represented by a spacetime manifold M equipped with metric g_{ab} . A physical hazard H is a process whose effects propagate through the causal structure defined by g_{ab} . If H cannot travel outside the relevant causal future of its origin, then a sufficiently isolated node may be physically insulated from H . In schematic form:

$H_A \rightarrow J+(A)$, where $J+(A)$ denotes the causal future of A .

A second node B lying outside the causal future of A cannot be physically influenced by H_A through an ordinary causal path originating at A . This is the mathematical intuition behind light cones. The event horizon extends the principle over cosmological time: some events remain permanently outside the causal reach of a worldline.

The theological relation is different. Let C denote the created order and G the Creator. In classical Christian metaphysics, C is contingent upon G not merely at an initial moment but in its continued existence. This is commonly expressed through *creatio continua* or divine conservation. The relation can be represented conceptually as:

$C = \text{contingent}(M, g_{ab}, \text{matter}, \text{laws}, \text{history})$
 $\rightarrow G$ as sustaining ground.

This notation does not describe an empirical equation. It marks a metaphysical dependence relation. If God is the sustaining ground of spacetime, then separating one physical region from another does not separate either region from God. The causal independence of A and B relative to one another does not entail ontological independence of A and B from their Creator.

This yields the key proposition: physical causal independence does not entail metaphysical independence. The event horizon can block the propagation of a physical hazard from A to B without establishing that B is beyond the scope of a

theological claim about divine judgment. The distinction is analogous to the difference between “cannot receive a physical signal from X” and “does not depend for its existence upon Y.” These are not equivalent propositions.

The formal risk model can therefore be separated into two layers. For a purely naturalistic model, let R_N be the probability that all N isolated populations are destroyed by a class of local hazards. Under suitable independence assumptions, R_N decreases as N increases. For an eschatological model, however, the relevant event J is not a hazard transmitted from one node to another. Instead, J is a theological predicate concerning the created order as a whole. The probability statement cannot legitimately be written as $P(J_B \mid \text{distance from } A)$ in the same way as a physical risk. Distance is simply not the relevant variable.

This does not mean that theology supplies a hidden empirical force that bypasses relativity. It means that the physical model and the theological model answer different questions. Relativity describes constraints on physical causal propagation within spacetime. Theology, when making a doctrine of judgment, speaks about the relation between God and creation. A category mistake occurs when the second claim is forced into the causal grammar of the first.

VII. COSMOLOGICAL ISOLATION AND THE LOGIC OF EXISTENTIAL RISK

The comparison with existential-risk theory becomes especially interesting when total extinction is distinguished from the destruction of a civilisation. A distributed civilisation may survive a local disaster while losing communication with other populations. Conversely, a civilisation may become physically dispersed but culturally or technologically fragile. Spatial redundancy is therefore not sufficient; resilience requires independence across multiple dimensions, including energy sources, ecological systems, information architectures, reproductive capacity, and governance.

This insight parallels the theological argument in an unexpected way. The physical strategy of dispersion assumes that security can be produced by reducing shared causal dependencies. The theological message of 2 Peter 3:10–13 challenges

the assumption that ultimate security is a property of spatial architecture. The text directs attention instead to moral and covenantal reality: patience, repentance, holiness, righteousness, and the promise of new creation.

The difference can be expressed through two optimisation objectives. The existential-risk engineer seeks to minimise correlated physical failure: minimise shared exposure, maximise redundancy, and establish independent survival nodes. The eschatological theologian asks a different question: what is the proper orientation of finite creatures toward the Creator and the promised consummation of creation? One objective is resilience under natural hazards; the other is reconciliation and faithful existence before divine judgment.

These objectives need not conflict in practical life. Christian theology does not require negligence toward physical risk. Building resilient societies, protecting human life, reducing catastrophic risks, and exploring space can be understood as forms of stewardship. What the eschatological argument denies is that technological resilience can become metaphysical salvation. A civilisation may escape a supernova, a pandemic, or a planetary catastrophe without escaping the theological problem of creaturely accountability.

The distinction is particularly relevant to contemporary visions of multiplanetary civilisation. If humanity establishes settlements on Mars, moons, asteroids, and eventually distant stars, the moral imagination of civilisation will increasingly be shaped by distance. The farther populations are separated, the less practical control one community can exert over another. The universe may become politically and informationally plural. Yet a Christian account of divine judgment would not necessarily become plural in the same sense. The multiplication of physical nodes does not imply the multiplication of ultimate authorities.

There is also a philosophical issue concerning probability. Existential-risk models often work with expected probabilities over future hazards, while eschatological theology includes an event whose timing is explicitly described as uncertain. The “thief” metaphor undermines confidence in predictive control. A civilisation may extend its planning horizon to millions or billions of years, but

the text's theological warning is not that humanity lacks sufficient computational power. It is that the future is ultimately governed by divine promise rather than by human mastery.

VIII. STOIC EKPYROSIS AND CHRISTIAN ESCHATOLOGY

The comparison with Stoic ekpyrosis clarifies the distinctive structure of Christian eschatology. Stoic cosmology, in its classical form, was associated with periodic cosmic conflagration followed by renewal in a cyclical order. The cosmos was understood through an immanent rational principle, and cosmic destruction belonged to the rhythm of the universe itself. The fire was therefore internal to the cosmological process.

Second Peter's vision is structurally different. The "day of the Lord" is not simply the next phase of a recurring physical cycle. It is an eschatological event tied to divine judgment, moral accountability, patience, promise, and a new creation in which righteousness dwells. The temporal structure is linear and teleological. Creation has a direction toward consummation rather than merely repeating an eternal cycle (Neyrey 1980).

This distinction also affects existential-risk thinking. If cosmic destruction were a periodic physical process governed by discoverable laws, a sufficiently advanced civilisation might attempt to forecast or manipulate the process. The Christian eschatological event is not presented as a technological problem. Its unpredictability and theological meaning resist reduction to engineering. The appropriate response in the text is ethical formation rather than technological escape.

The contrast should not be exaggerated into a claim that Stoic thought was simply "scientific" and Christianity simply "supernatural." Ancient Stoic cosmology was itself metaphysical, theological, and physical at once. The more precise difference concerns the source and purpose of cosmic transformation. Stoic conflagration belongs to the internal rational order of the cosmos; 2 Peter's judgment is anchored in the Lord's sovereign action and culminates in a promised order characterised by righteousness.

IX. DISCUSSION: WHAT THE LIGHT-CONE ANALOGY CAN AND CANNOT ESTABLISH

The interdisciplinary argument produces four principal findings. First, cosmological event horizons are relevant to existential-risk mitigation only under a restricted class of hazards. They can reduce the ability of physical disasters to propagate between causally separated regions, but they do not guarantee independence or eliminate common-cause risks. Second, the future of the universe is model-dependent. The familiar Λ CDM scenario provides a coherent baseline for discussing causal isolation, but it should not be treated as a metaphysical prophecy about the ultimate destiny of the cosmos. Third, the textual and theological structure of 2 Peter 3:10–13 does not describe the eschaton as an ordinary physical hazard moving through space. Fourth, the strongest challenge to the paper's conclusion is a localised reading of the passage, because such a reading could in principle allow distant offworld populations to escape a geographically restricted judgment.

A major novelty of the analysis lies in reframing the issue from "Can God cross the event horizon?" to "What kind of causal relation is being claimed?" The first question is misleading because it imagines God as a physical agent travelling across spacetime. The second question is philosophically cleaner. If divine action is understood as an ontological relation between Creator and creation, then the causal structure of spacetime cannot function as a metaphysical boundary against God. If, alternatively, the theological claim is interpreted as a physical event occurring only within a restricted region, then ordinary causal horizons become relevant. The dispute is therefore not between theology and relativity as rival physics theories; it is between different accounts of what the eschatological claim means.

A second contribution concerns the use of "non-locality." In contemporary physics, non-locality has technical meanings associated with quantum theory and correlations, and those meanings should not be casually transferred to theology. Divine omnipresence is not quantum entanglement. The phrase "vertical causality" in this article is intentionally metaphysical. It identifies a dependence relation that is not measured by spatial distance. This distinction prevents the paper from making a category error of its own.

A third contribution concerns the relation between judgment and disclosure. If heuristics are given substantial interpretive weight, the end is not merely the destruction of a physical container but the unveiling of the moral reality of creation. In this model, the strategy of hiding from catastrophe by moving farther away is transformed into a theological question about whether distance can hide works from divine judgment. The answer, within the logic of the passage, is no. The ethical emphasis of verses 11–14 confirms that the eschatological question is not “Where can we hide?” but “What kind of people ought we to be?”

A fourth contribution concerns the concept of salvation. Existential-risk mitigation seeks to preserve future human value by preventing extinction. Christian salvation, however, is not reducible to biological or civilizational persistence. A civilisation could survive indefinitely and still fail to satisfy the theological meaning of redemption. Conversely, the promise of new creation suggests that the Christian hope is not simply survival of the present technological order. The eschatological horizon is transformed creation, not merely indefinite extension of the status quo.

This distinction has practical implications for theology and science communication. Christian theology should not use speculative cosmology as proof of biblical prophecy. Likewise, scientific cosmology should not be used to dismiss theological claims merely because a physical mechanism cannot be found for them. A responsible interdisciplinary approach recognises methodological boundaries. Cosmology asks how the universe behaves under specified physical laws and models. Exegesis asks what a text communicates in its linguistic, literary, historical, and canonical context. Metaphysics asks what kinds of causal or ontological relations are possible. The dialogue becomes fruitful when each discipline is allowed to make the claims appropriate to its own method.

X. CONCLUSION: THE LIMITS OF PHYSICAL SAFETY

The prospect of cosmic isolation creates one of the most intriguing intersections between contemporary cosmology and existential-risk theory. In a universe with sustained accelerated expansion, sufficiently distant regions can become

causally disconnected. If intelligent life spreads across such regions, the probability of total extinction from strictly local and independent hazards can decline substantially. This is a meaningful insight into physical resilience, although its quantitative strength depends on assumptions about independence, correlation, and the future cosmological model.

The theological claim of 2 Peter 3:10 is categorically different. The “day of the Lord” is presented as an eschatological event in which the present heavens and earth are subjected to divine judgment, followed by the expectation of new heavens and a new earth. Whether the passage is interpreted as cosmic annihilation, transformative exposure, or a more localised judgment, its theological significance cannot be reduced to the propagation of a physical hazard through spacetime.

The decisive point is therefore not that divine action is “faster than light.” Such language would misunderstand both relativity and classical theism. The decisive point is that a light cone defines physical causal accessibility within spacetime, whereas divine sovereignty, in Christian metaphysics, concerns the relation of the entire created order to its Creator. A causal horizon can separate two civilisations without separating either civilisation from God. Spatial distance is therefore a powerful physical variable but not an ultimate metaphysical refuge.

The localised reading remains a legitimate interpretive challenge. If 2 Peter 3:10 is restricted to the ancient author’s terrestrial and visible cosmic horizon, future interstellar civilisations would raise questions that the original text could not have explicitly addressed.

But that result would be an implication of a particular hermeneutic, not a deduction from cosmology. The text itself culminates in a new creation where righteousness dwells, suggesting that its deepest concern is not the geography of destruction but the moral and theological transformation of creation.

The final implication is both scientific and theological. Science can extend the radius of human survival, but it cannot by itself answer the question of ultimate meaning or judgment. Technology can distribute life across light cones, but it cannot turn creaturely existence into metaphysical

independence. The farther humanity travels into the cosmos, the more clearly the distinction may become visible: physical distance can separate communities from one another, but it cannot by itself answer the question of what creation is for.

Thus, the eschatology of light cones should be understood as a conceptual boundary marker. Event horizons describe the limits of physical communication; 2 Peter 3 describes the limits of human presumption. The former asks how far a signal can travel. The latter asks whether distance can secure the creature against divine judgment. Within the theological worldview of the text, the answer is no. Ultimate safety is not achieved by escaping across cosmic distance, but by the promise of a creation in which righteousness dwells.

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XII. DECLARATIONS

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The Effect of a Multi-Cultural Environment on the Language Used to Discuss Environmental Sustainability

Edward Hogshire⁵, Labidi Bouabdallah⁶

ABSTRACT

This research aims to provide a comprehensive analysis of the language dynamics and choices within sustainability discourse in the United Arab Emirates (UAE). By examining the impact of multiple languages, including Arabic, English, and other languages spoken in the UAE, it seeks to understand how sustainability concepts are effectively communicated in this multilingual context. Additionally, the study investigates the influence of cultural nuances on the comprehension and communication of sustainability within the UAE. Furthermore, this research aims to identify and analyse the language choices and communication strategies employed by the UAE government in promoting sustainability. It delves into distinct language choices and communication strategies that aptly reflect the UAE's cultural context and its visionary approach towards sustainability. It also sheds light on the intricate interplay between sustainability, multilingualism, and cultural diversity. The research explores how technological advancements and smart solutions are incorporated into sustainability discourse and considers their role in addressing environmental challenges in the UAE. By examining these aspects, the study highlights the need for effective communication strategies that cater to the linguistic diversity present in the country, ensuring that sustainability messages are accessible to all stakeholders. Strategies currently in use, such as the utilisation of simplified language and visual aids, are showcased as effective measures to overcome linguistic barriers and enhance inclusivity in sustainability communication. Overall, this research contributes to a better understanding of the language dynamics and communication strategies utilised in promoting sustainability in the UAE and similar regions around the world. It provides valuable insights for policymakers, organisations, and communication professionals seeking to enhance sustainability discourse in multilingual and multicultural contexts.

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I. INTRODUCTION

The United Arab Emirates (UAE) is renowned for its rapid economic progress, modernisation, and multicultural and linguistically varied population. As the UAE continues to develop as a global hub for commerce, trade, and tourism, it faces increasing environmental concerns, making sustainability a crucial issue for its future. However, the UAE's multilingual/multicultural context, in which numerous languages and cultures coexist and interact, complicates sustainability semantics. The country has made considerable strides to achieve sustainability. These efforts have included and continue to include semantic analysis. The UAE's multilingual and multicultural environment makes this analysis of its sustainability efforts necessary. This research aims to examine the language used in sustainability discourse in the UAE, particularly in the context of its multilingual and multicultural environment. By analysing the semantics of sustainability discourse, this study seeks to contribute to the current literature and shed light on the linguistic and cultural features of sustainability communication in the UAE.

II. RESEARCH OBJECTIVES

- To examine the language dynamics and choices in sustainability discourse in the UAE.
- To explore the impact of multiple languages, including Arabic and English, as well as other languages spoken in the UAE, in the communication of sustainability concepts.
- To investigate the influence of cultural nuances on the understanding and communication of sustainability in the UAE.
- To identify the different language choices and communication strategies currently used by the UAE government in promoting sustainability.

- To analyse the incorporation of technological advancements and smart solutions in sustainability discourse in the UAE.
- To highlight the need for the effective use of simplified language and visual aids to overcome linguistic barriers and enhance inclusivity in sustainability communication.

III. RESEARCH QUESTIONS

- What are the language dynamics and choices in sustainability discourse in the UAE?
- How do multiple languages, including Arabic, English, and other languages spoken in the UAE, impact the communication of sustainability concepts?
- What are the distinctive language choices and communication strategies employed by the UAE government in promoting sustainability?
- How does the incorporation of technological advancements and smart solutions manifest in sustainability discourse in the UAE?
- How does the use of simplified language and visual aids enhance inclusivity in sustainability communication in the UAE?

IV. METHODOLOGY

This research employed a descriptive approach. Government communications and public discourse with distinct language patterns, cultural references, and communication strategies were analysed.

V. INSTRUMENTS AND MATERIALS

- Sustainability documents and reports
- Government communications and campaigns related to sustainability.

VI. RESULTS

The research aimed to provide insights into the language dynamics and cultural influences on sustainability discourse in the UAE. The findings reveal distinctive language choices, such as the blend of Arabic and English terminology, emphasis on technological advancements, and reflection of social and cultural values in sustainability communication. The analysis contributes to a deeper understanding of sustainability communication in the UAE's multilingual and multicultural context.

VII. RECOMMENDATIONS AND SUGGESTIONS FOR OTHER THESES

Further research can investigate the impact of sustainability discourse on behaviour change and its effectiveness in promoting sustainable practices among different linguistic and cultural groups in the UAE. Comparative studies could also be conducted to analyse sustainability discourse in other multilingual and multicultural contexts to identify common patterns and differences.

Cultural and Linguistic Influences

A comparison of the English used by the United Arab Emirates government to promote sustainability with the English used in other English-speaking countries reveals distinctive language choices and communication strategies that reflect the cultural context of the United Arab Emirates as well as its vision for sustainability. The combination of Arabic and English terminology is a feature that stands out in the language that is used in the United Arab Emirates' communication about sustainability. Because Arabic is the country's official language and is widely spoken by the local population, including Arabic terminology in communications about sustainability is a means to represent the cultural context of the UAE and make the messaging relevant to the local audience (Al-Fallay & Abdul-Haq, 2018). For example, in the UAE, the term "green economy" is frequently used to refer to sustainable economic growth. This term aligns with the UAE's aim of economic diversification and environmental care (UAE Ministry of Climate Change and Environment, 2019). The utilisation of popular phrases like this one helps incorporate regionally specific cultural values and points of view into the language used to promote sustainability in the UAE.

The English that the government of the UAE uses to promote sustainability is characterised by a blend of Arabic and English terminologies, an emphasis on technological advancements, a reflection of social and cultural values, and the use of simplified language (Al Marzooqi & Abdullah, 2016). These characteristics are all intertwined in promoting one course. These idiosyncratic language choices and communication tactics reflect the UAE's culture, its goal for sustainability, and its efforts to promote inclusivity in sustainability communication.

The UAE's emphasis on social and cultural values is another unique English feature of the language employed in its communications about sustainability. For example, the United Arab Emirates strongly focuses on social cohesiveness, family values, and the preservation of legacy and customs. Terms like "community," "family," and "heritage" are widely used to underscore this cultural emphasis (UAE Ministry of Climate Change and Environment, 2019). This demonstrates how important cultural context and societal norms influence sustainability communication in the UAE.

In order to account for the wide range of languages and dialects represented within the population, the UAE's communication regarding sustainability uses a great deal of streamlined vocabulary. This was well seen in Al-Amir & Abu-Hijleh (2013), where they examine the corporate reporting of progress in enhancing sustainability using English. Here, simplified language is commonly utilised to guarantee that a larger audience easily understands messages about sustainability. This language often includes shorter phrases, everyday vocabulary, and visual aids. This strategy is used in an attempt to overcome communication barriers caused by linguistic differences and to increase inclusiveness in sustainability communication (UAE Government, 2021). For instance, using infographics, visuals, and symbols in sustainability campaigns can assist in explaining complicated ideas in a way that is aesthetically appealing and easy to grasp, so making sustainability information accessible to a broader audience.

Because the population in the UAE is so linguistically diverse, using a simplified form of English is required in all sustainability-related communication. Although English is widely used in the UAE for official communication, commercial transactions, and educational purposes, the level of

English varies widely. Therefore, the language used in sustainability communication must be simplified to ensure that a wide variety of audiences can easily understand the messages. This is especially true for those who do not use English as their first language. According to Munir (2020), the UAE government has effectively focused on simple, motivating terms. This language has helped inspire people to start eco-friendly projects, helping to further the UAE's sustainability agenda.

Advertising and marketing materials related to the environment are important in moulding public perception and behaviour toward sustainability. When such materials from the United Arab Emirates and an English-speaking nation are compared linguistically, clear distinctions in language use are revealed (Al Buraiki, 2019). These differences in language use reflect the multilingual and multicultural environment of the United Arab Emirates as well as the cultural nuances that influence sustainability communication.

The UAE and any country whose native language is English have substantial linguistic differences, one of which is the usage of code-switching and transliteration in environmental advertising and marketing materials. In the UAE, it is a widespread practice in sustainability communication to employ code-switching, which refers to moving back and forth between English and Arabic to accommodate the audience's diverse linguistic needs (Siemund et al., 2021). However, code-switching is rare, if not unheard of, in the environmental language used to describe sustainability in countries where English is the native language.

The cultural environment and values expressed in sustainability communication represent yet another linguistic distinction. Messages regarding sustainability in the UAE are frequently expressed from the perspective of the country's Islamic values and cultural beliefs. For example, the concept of "Himma," which translates to "ambition" in Arabic, is frequently used in communication about sustainability to highlight the significance of individual and collective efforts toward sustainable living (Siemund et al., 2021). This aligns well with the Islamic cultural value of personal responsibility and community engagement. In addition, the Arabic word "barakah," which translates to "blessings," is frequently applied in campaigns to encourage responsible resource consumption and waste reduction. These

campaigns draw inspiration from Islamic teachings that emphasise moderation and discourage excess. These cultural allusions are almost wholly exclusive to the UAE and demonstrate the impact of local values and beliefs on communication regarding sustainability (Bsoul et al., 2022).

Environmental advertising and marketing materials in native English-speaking countries and the United Arab Emirates also have distinct tones and styles. The UAE uses a more direct and authoritative tone in sustainability communication. This is a reflection of the focus that is placed on legislation and laws in pushing sustainability activities. For the purpose of invoking a sense of promptness and activity, statements related to sustainability may, for instance, make use of imperative verbs such as "Save Water" or "Reduce Waste." In contrast, environmental advertising and marketing materials in native English-speaking nations may take on a more compelling and emotional tone and use techniques such as emotional appeals, narrative, or humour to engage and motivate consumers. For instance, in order to attract people's attention and encourage them to modify their behaviours, materials could show images of animals or nature that are endearing, create feelings of guilt or responsibility for the destruction of the environment, or employ humour (Haytko & Matulich, 2008). Similarly, the use of green advertising techniques with clichés and catchy semantics is common there, according to Haytko & Matulich (2008).

Technological Terminology

The English that is utilised in the UAE's communication regarding sustainability frequently places emphasis on technological advancements and smart solutions (Al-Fallay & Abdul-Haq, 2018). This is in line with the UAE's goal to become a global leader in smart cities and innovative technologies. Commonly used phrases to indicate the incorporation of cutting-edge technologies into environmentally conscious policies and procedures include "smart city," "smart grid," and "smart mobility" (UAE Government, 2021). These phrases align well with the UAE's objective for the country to become a knowledge-based economy and show the UAE's focus on maximising the benefits of technological advances to achieve sustainable growth (Al-Fallay & Abdul-Haq, 2018).

The UAE and countries whose primary language is English also differ in their employment

of scientific jargon and technical phrases when communicating about sustainability issues. In countries where English is the primary language, environmental advertising and marketing materials make use of scientific terminology, statistics, and arguments based on evidence to bolster claims of sustainability and enhance credibility (Bsoul et al., 2022). For instance, in order to portray the sense of urgency and significance that is associated with sustainability, the materials may make use of phrases such as "carbon footprint," "biodiversity," or "climate change," and they may also quote scientific studies or figures. In contrast, the UAE's environmental advertising and marketing materials rely more on simple and accessible language (UNESCO, 2013).

Effective Strategies

Using plain/everyday language is a good strategy for simplifying English when communicating about sustainability. This strategy entails adopting language that is straightforward and easy to understand while avoiding jargon, technical phrases, and complex sentence structures (Barton, 2010). Using this technique will ensure that messages regarding sustainability are communicated in a manner that is uncomplicated and simple to comprehend. For example, using common words and phrases, such as "reduce," "reuse," and "recycle," rather than technical jargon like "waste management hierarchy," is one way to make information about sustainable practices more approachable and understandable to the general audience (U.S. Environmental Protection Agency, n.d.).

Visual aids such as infographics, photos, and symbols are frequently utilised to simplify communication around sustainability. Through visual aids, complicated ideas can be communicated in a way that is both aesthetically pleasing and straightforward, making information regarding sustainability more accessible to a larger audience (National Geographic, n.d.). Even for individuals with a limited command of English, it is possible to convey the information successfully. For example, visual aids are used to better explain ideas, such as alternative forms of energy or methods for reducing water consumption (National Geographic, n.d.).

Another method for simplifying English in sustainability communication is to utilise shorter phrases and more commonly known language. It is

much simpler to comprehend shorter sentences. Shorter sentences also help avoid confusion and incorrect interpretation. To ensure that the language used in communicating about sustainability is understood by as many people as possible, especially those whose command of the English language is poor, it is essential to use everyday vocabulary (Radwan & Khalil, 2021). This everyday vocabulary needs to be used in short, concise sentences that make sense to everyone.

Government Campaigns

The UAE communicates its sustainability language in many different forms, using both English and Arabic through several mediums and across various platforms. These mediums and platforms are constantly changing, and although the words also change, the semantics remain very similar.

Signage is an important tactic in the UAE (Hopkynset al., 2022). Signs with important environmental conservation messages are typically erected in public places such as parks, beaches, and nature reserves. These signs are typically written in both Arabic and English, showing how semantics can be applied to sell an agenda (Hopkyns et al., 2022). These posters use simple language to advise people to reduce their adverse effects on the environment by recycling, limiting their water use, and taking advantage of public transit.

Along with the use of signage, the government of the UAE has also launched educational initiatives to promote sustainable practices. One such example is the initiative "Clean Up UAE," which urges individuals to clean up rubbish and waste accumulated in public areas. Another initiative worth mentioning is the "Green Drive UAE" program, which motivates people to incorporate more environmentally responsible behaviours into their daily routines (Al Marashi, 2023). These campaigns make use of the same bespoke language to educate folks on the need to protect the environment and urge them to take action in this regard.

The government of the United Arab Emirates also uses these same techniques in their social media to promote sustainable practices. The Ministry of Climate Change and Environment uses social media platforms like Twitter, Instagram, and Facebook to disseminate information regarding sustainability projects and encourage individuals to

engage in sustainable habits. Social media allows them to engage a younger audience, as well as promote sustainability on a broader scale.

Another place where the UAE's sustainability is noticed is by hosting environmental events. Earth Hour, World Environment Day, and the Abu Dhabi Sustainability Week are examples of events that bring attention to environmental concerns and encourage the adoption of environmentally responsible behaviours. These events frequently incorporate activities centred around language, such as speeches, panel discussions, and educational workshops, all of which further highlight the significance of sustainability. Again, the same bespoke, simple everyday language is frequently used.

VIII. CONCLUSION

The necessity of preserving the natural environment and using sustainable practices is also frequently brought up in government-led discourse in the UAE. The United Arab Emirates Vision 2021, which describes the country's goals and aspirations for the future, places a significant emphasis on maintaining a sustainable economy and safeguarding the environment. Again, the language is simple, authoritative, and easy to understand. The United Arab Emirates can instil in the minds of its residents and stakeholders the significance of maintaining a sustainable environment because of the language used to communicate these values (Bsoul et al., 2022). The UAE's multilingual and multicultural environment has a substantial impact on the language used to discuss environmental sustainability. This is seen in the government's communication tactics, the language comparison of environmental advertising/marketing materials, and the simplification of English used in sustainability communication. The use of code-switching and transliteration, the simplification of the English language, and the incorporation of cultural and religious values reflect the unique linguistic diversity and cultural context of the UAE. These have all shaped the language employed in sustainability communication initiatives in the country.

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