Geomatics Data Modelling for Integrated Heritage Information System to boost the Archeological Research in Sri Lanka

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Abstract: *Traditional surveying and mapping had been extensively used worldwide for understanding heritage and archaeological features in location-based studies, research analysis, documentation, and quantitative interpretations. Mapping of heritage site locations, integrated with geomatics visualization tools, has evolved into an art of documentation that vividly portrays reality in the minds of readers. In the realm of modern technology, Geomatics has emerged as a challenging force, enabling visualization, analysis, documentation, digital restoration, and imaginative exploration through artificial intelligence, virtual reality and augmented reality tools. Even though, Sri Lanka has more than 250,000 archeological sites exist from the pre-historic era, detailed documentation has yet been done for a few archeology reserves only. The scope of this research focuses to design and develop a Heritage Geomatics Model (HGM) to facilitate the Cultural Heritage Information System (CHIS) that can be used at any country domain. Research is conducted to classify and integrate heritage, archeology and geomatics parameters to elaborate an integrated model. Conceptual design and feature classification are extensively discussed with relational modeling of geomatics and archeology perspectives. Need of conceptualizing and maintenance of National Heritage Land Domain (NHLD) will also be elaborated with prospective system architecture. In summarizing, the main objective of this research is the integration of heritage and archeology invents with the geomatics parameters to formulate a modular approach as national endeavor. Visualizing of historical artifacts through modern geomatics tools LiDAR, Photogrammetry, Remote Sensing and Drone photography will be systematically formulated through the system. The research paper will benefit the researchers and archeology authorities to initiate a comprehensive Heritage Information System (HIS) integrated with the national land Information System aligned with Land Administration Domain Model (LADM) ISO 19152.*

Keywords: Geomatics, Heritage, Archeology, Data-Model, Integration

1. Introduction

Sri Lanka, situated at latitude 7° and longitude 80°, spans about 65,610 square kilometers, inherits a documented civilization with roots tracing back 2,500 years. Moreover, archaeological findings unearthed in various regions offer compelling evidence of an ancient civilization dating back more than 5,000 years B.C., adding depth to the island's historical narrative and emphasizing its enduring cultural legacy.

Since the documented history from 543 BC, Sri Lanka, being the most neighboring country to India, had been ruled by seven dynasties under 211 kings. The civilization and traditional culture manifest a revolutionary change from 3rd century BC with embracing of Buddhism as the main religion on arrival of King Ashoka's son, the Arahant Mahinda. Therefore, obviously the longest dynasty in Anuradhapura (437 BC - 1029 AD) for 1466 years with the crown of 132 kings, a marvelous development in construction architecture found today as ruined, is reserved as national cultural heritage over the country. Across the seven dynasties, monuments and structures associated with Buddhist culture and religious sites, including Buddha statues and cave temples, are widespread over the country.

Thereafter, since the year 1505, Sri Lanka fell under successive European invasions, enduring occupations by the Portuguese, Dutch, and finally, the British until 1948. Consequently, the island was ruled over four centuries under European influence, leaving a mark on its cultural landscape. As a result, Sri Lanka's heritage reflects a tapestry woven with European customs, traditions, and architectural marvels, illustrating a fascinating convergence of cultures spanning the past five centuries.

1.1 National Heritage of Sri Lanka

With concerning the long-run civilization context detailed above, Department of Archeology estimates that there are over 250,000 cultural heritage sites in Sri Lanka from the prehistoric period and also evidence over 500,000 heritage monuments are found and most of them are yet to be investigated for basic ground study. Being the longest period of Anuadhapura dynasty (377BC to 1017AD), country had been entrusted as international trade center operated through ancient '*Maritime Silk Road*[1] '.

National Archeology as the main source of the country's heritage; the Department of Archeology, has been conducting investigations over the country with its utmost capacity and the investigations made at individual cases are documented at analogue basis and in some case as digital record of inventory.

1.2 Research Scope

In concerned with Architectural Archeology concepts, while using the modern geo-informatics technics for respective data capturing, processing and archiving, The research team mostly

[1] *The Maritime Silk Road is the maritime section of the historic Silk Road that connected South Asia, East Asia, the Indian subcontinent, the Arabian Peninsula, eastern Africa, and Europe; ref. Wikipedia*

concentrates with the utmost needs of developing a Heritage Data Model at simple and extendable scope for national forum while realizing the need of detailed heritage data model documentation for individual cases at thematic domains.

Therefore, this paper elaborates to design a conceptual model for Cultural Heritage data model in general view of national forum, and wish to discuss with relevant authorities for reviews and willing to take further steps to develop an interactive heritage information system for Sri Lanka.

1.3 Literature Review

The intentional effort to protect cultural heritage for future generations is referred to as preservation or conservation. These practices are actively supported by cultural and historical ethnic museums, along with cultural centers, though the terminology may vary in meaning across different dialects. Preserved heritage has become a major force in the global tourism industry, adding significant economic value to local communities. The safeguarding of cultural property is regulated by various international treaties and national laws, with key organizations such as the United Nations, UNESCO, and Blue Shield International leading these efforts.

The integration of geomatics and heritage information systems has proven to be a transformative approach in archaeological research worldwide. According to Liu, B. et al (2024), "Geographic Information Systems (GIS)-based technologies are increasingly crucial in the domain of cultural heritage conservation, facilitating the construction of dynamic information management systems and serving as robust platforms for research and display." This is especially relevant in Sri Lanka, where rich archaeological resources require modern management techniques. As stated by Croce et al, 2019 "Integrated geomatics survey techniques, consolidated as eligible means for the representation of the shape and geometry of existing elements, thus constitute a fundamental resource to be used as a basis for the analyses of restoration, conservation and maintenance of cultural heritage." Moreover, the role of advanced technologies, such as artificial intelligence, has also been highlighted in heritage data modeling. These insights suggest that developing a Geomatics-based Heritage Information Model (HIM) in Sri Lanka could revolutionize archaeological research by improving data management and analysis.

2. Research Objectives

It has been learned throughout that national cultural heritage information system is one of the vital instrument for national growth in education, tourism and research directives. However, respective information base has not yet been conceptualized in Sri Lanka. Therefore this

research paper aims to conceptualize respective needs in concern with the following general and specific objectives;

General Objective: Designing of Cultural Heritage documentation criteria at national forum in Sri Lanka in support of user friendly geomatics information base.

Specific Objectives

1. Designing of Sri Lanka cultural heritage information system criteria and conceptual design architecture.
2. Designing of Cultural Heritage data model at national forum in order to structure the Cultural Heritage Database in Geospatial data domain.

3. Methodology

Designing a Cultural Heritage System is a complex and multifaceted task that demands careful consideration and collaboration. Engaging a team of professional consultants with diverse expertise is essential to ensure the system's success. These consultants should include experts in cultural heritage, digital technology, user experience design, and geospatial data scientists.

However, in concern with the geospatial data domain, geomatics technology at modern context plays a major role in visualizing the cultural artifacts at dynamic and interactive perspectives that would excitedly grasp attention of every individual. As geomatics researchers and spatial data scientists; authors of this publication, personally intrigued to conceptualize the needs for heritage data modelling so that the responsible parties of heritage and archeologists are expected to collaborate in further consultation to deal with.

In respect of archeological and cultural heritage aspects, we gathered necessary information by reading and consulting the professional experts in Sri Lanka and the Beijing University of Civil Engineering and Architecture (BUCIA) China. Modelling and Designing of respective heritage entities and features are attributed in most general scope so that further discussions may be incorporated in customizing towards an advance application model. UML designing techniques will be considered as secondary step to design the system logical model.

4. Conceptual Design of Heritage Information System (HIS)

As experienced in decades back, culture and heritage which learned both individually and also as a coupled word; cultural Heritage, were tremendously attributed by the art of science in order to document in textual format with a few paper based visuals. Against the modern complementary state-of-the-arts privileges, the proceeding subjects are enormously exhibited in magical phenomena. Rather using of specific data capturing, processing and visualizing

techniques, geospatial data structuring and modeling would stimulates easy access to digital restoration to unveil the hidden heritage in history. In this context, respective geospatial data modelling should be undergone in decisive manner.

In concern with Sri Lanka national framework, it is rather complicated to define the respective entities and parameters that suits for national heritage information system. Artifacts that represent the tangible, intangible or natural heritage will be considered as entities in HIS. In Sri Lanka, these artifacts are mandatorily responsible to the Department of Archeology.

4.1 Heritage Information Modelling (HIM)

Archaeology is the study of the material remains of generations past. Ranging from the discovery of stone tools made by early humans to the discovery of palaces and cathedrals, archaeological investigations have played a central role in shaping our understanding of how we see the world. Linking to the architectural field, archaeology also examines the construction techniques of buildings, however, the link to architecture is not only limited to that. Archeology like architecture, examines the ways in which past societies were organized, and how they transformed the topography and landscape. Architectural Archeology, as a tool in cultural heritage, provides such science at geomatics context. Figure-1 below, illustrates the architectural archeology framework in geomatics forum.

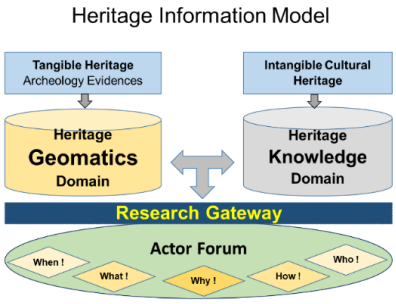

Figure-1: Heritage Information Modelling

In the modeling of heritage information, two key structured domains play crucial roles in ensuring the consistency and sustainability of the proposed Heritage Information System (HIS): the Heritage Geomatics Domain (HGD) and the Heritage Knowledge Domain (HKD). These domains provide the foundational framework that supports accurate data integration and preservation. The following sections describe each domain in detail, highlighting their importance and functions.

4.2 Heritage Geomatics Modelling (HGM)

Heritage geomatics modeling involves organizing geospatial data into various formats, depending on how the data is acquired, processed, and visualized. Figure-2 presents an architecture for geomatics data modeling within the context of heritage information. The following sections will explore the functions of Geomatics Data Modeling (GDM) in detail.

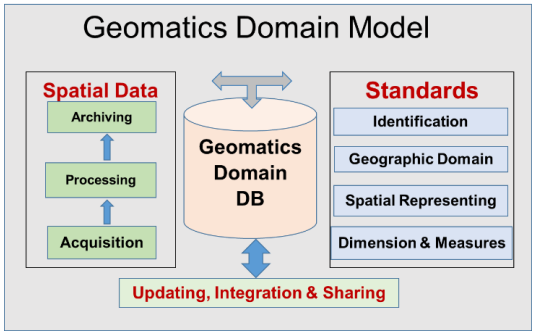

Figure-2: Heritage Geomatics Modelling

Data acquisition is the first step of an information system from which the system will generate the necessary information as formulated. It is obvious that various type of data acquisition technologies avail in the modern world. The HIS should privilege with both the conventional and modern data formats. Therefore the system standards and specifications should be modelled in order to acquire the data in different formats. When defining geomatics data standards, it is crucial to thoroughly consider key terms such as identification, geographic domain, spatial representation, dimensions, and measures. These elements are essential for ensuring the accuracy, reliability, and ongoing maintenance of the system, thereby supporting consistent updates, integration and long-term functionality.

4.3 Heritage Knowledge Modelling (HKM)

Cultural Heritage Knowledge Context involves understanding and preserving the tangible and intangible cultural assets of a community. It encompasses practices, traditions, languages, and artifacts that form the identity and history of a group. According to Smith (2006), cultural heritage is not just about the past but is actively constructed in the present, reflecting current social values and power dynamics. Additionally, Harrison (2012) argues that heritage is a process that involves continuous reinterpretation by different stakeholders, emphasizing the importance of inclusive and participatory approaches in heritage management. This dynamic perspective is critical in acknowledging the evolving nature of cultural identity and the role of community engagement in safeguarding heritage for future generations. Figure-3 shows an

illustration of the comprehensive elements of Heritage Knowledge Model and the subsequent sections specify the corresponding details.

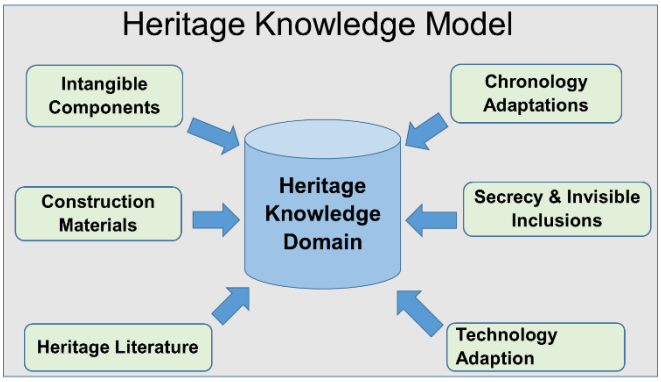

Figure-3: Heritage Knowledge Modelling

4.3.1 Intangible Heritage Components

Most religious traditions passed down through generations are closely tied to intangible heritage. Even when associated with tangible heritage artifacts, there are numerous customs that have been adapted over time as widely recognized cultural practices. These practices and beliefs should be distinctly modeled within the Heritage Knowledge Domain to facilitate the connection to geomatics features. By doing so, a semantic bridge can be established, enabling a clearer understanding of the relationships between intangible traditions and their physical counterparts.

4.3.2 Structure Materials

The materials used in ancient architecture often differ from those used in modern times, and in some cases, are much stronger. These materials are sometimes identical across various structures and artifacts. Therefore, it is important to classify structural materials within the knowledge domain as a distinct feature.

4.3.3 Heritage Literature

Every artifact is associated with specific or widely accepted literature that should be classified within the knowledge domain. As noted in historical literature, which has been meticulously documented in Sri Lankan history books, it becomes easier to collaborate with written digital records and model these facts logically. By integrating traditional documentation with digital history, we can enhance our understanding and preservation of historical knowledge.

4.3.4 Chronology Adaptations

Many historical artifacts have undergone restoration in different eras using specific materials, which means their original state may not be fully preserved today. Heritage monuments, sites, and artifacts are frequently subject to ongoing research and new discoveries. As a result, local and international institutions, such as UNESCO and various universities, conduct extensive studies and publish numerous articles, declarations, and validations (Jokilehto, 2006; Avrami et al., 2000). It is crucial to document these records in a traceable and accessible manner to ensure continuity in research. With hundreds of thousands of heritage sites in a country, a comprehensive Heritage Knowledge Model should provide easy access to these essential declarations. Classification in this context would significantly enhance modern research and investigations.

4.3.5 Secrecy and Confidentiality

Certain artifacts may be associated with sensitive evidence that requires confidentiality to ensure their protection. These facts and figures should be meticulously classified to maintain their integrity and prevent unauthorized access. It is essential that access to this classified information is strictly controlled and managed by the respective institutions responsible for the artifacts' preservation and research. By implementing secure classification systems and maintaining authority over access, these institutions can safeguard the cultural and historical significance of the artifacts while enabling appropriate research and educational activities under controlled conditions. This approach helps balance transparency with the need for protection in heritage management.

4.3.6 Technology Adaption

Construction technologies vary across different eras, each characterized by distinct materials and mechanisms. For instance, ancient structures may have utilized stone and manual craftsmanship, while later eras introduced brick, concrete, and advanced engineering techniques. By classifying artifacts based on the specific construction technologies and materials used, it becomes possible to establish connections with corresponding geomatics features. This classification allows researchers to map and analyze the technological evolution of constructions in relation to their geographic and environmental contexts. It also aids in understanding the spatial distribution and historical development of construction practices, providing valuable insights for heritage conservation and restoration efforts.

5. National Heritage Land Domain

Heritage artifacts and archaeological monuments are inherently linked to their geographic locations, making it essential to identify the land associated with each site. As highlighted by Bennett (2007), "the spatial context of heritage sites is a critical factor in their preservation and management." Once identified, these lands should be integrated into the national administrative framework, with a clear definition of the associated rights, restrictions, and responsibilities (RRR). As suggested by Williamson et al. (2010), "the RRR framework is crucial for ensuring that land management policies adequately reflect heritage values." When land falls within the heritage domain, the corresponding RRR should encompass specific heritage-related information, facilitating informed decision-making and protection efforts.

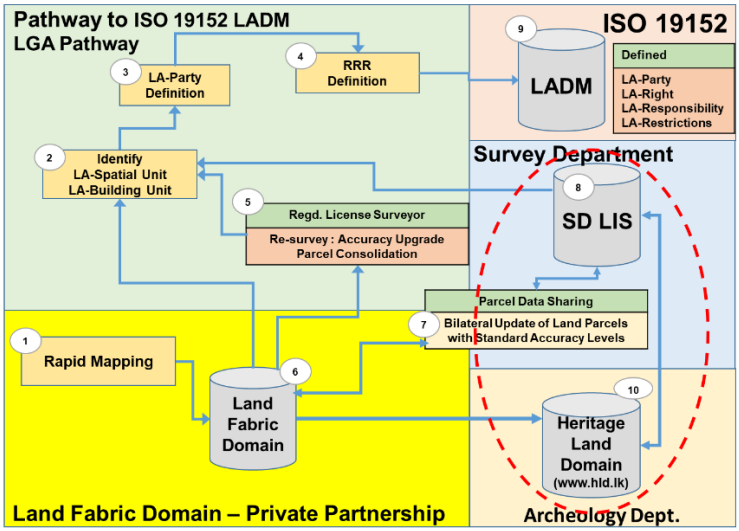

Figure-4: Land Domain Structure for Sri Lanka *(Wijenayake, 2023)*

The system architecture, as depicted in Figure-4, presents several key functions outlined in the publication titled “Structured Land Domain Modeling for Sustainable Land Administration in Sri Lanka,” published in the Journal of Real Estate Studies (Wijenayake, 2023).

Process-1; Rapid Mapping concept enables the Land Parcel Surveying, based on Spatial units and Building units, in order to facilitate the Land Fabric Domain. The process aims to accurately surveyed land plots and structures using cutting-edge techniques, ensuring the highest accuracy while minimizing time and cost.

In Wijenayake's 2023 illustration of the Land Domain Structure, the item "Localized Land Domain" (item-10) is replaced in this review with the "Heritage Land Domain" (HLD), emphasizing its importance within the context of this technological review. In this paper, the Archaeology Department of Sri Lanka is identified as the responsible authority for the HLD,

although the government may designate another entity as necessary. The feature classification for the HLD should adhere to the data structure outlined in the heritage information model, which is discussed in detail in the following sections.

As shown in the Figure 4, the Heritage Land Domain (HLD) should be integrated with the Survey Department of Sri Lanka's Land Information System (SD-LIS). This integration will enable bilateral updates, ensuring compliance with the national land administrative framework, which must be strictly adhered to.

6. Feature Classification for Heritage Information Model (HIM)

The eight feature classes, essential for a heritage information system within the geomatics domain, are critical for ensuring sustainability. These classes provide the foundation for accurate representation, management, and preservation of cultural heritage sites and artifacts. See the table-1 for respective feature classification.

The feature classes of a heritage information system must be studied further to define their specific attribute fields. By detailing attributes such as recognition status, ownership, spatial boundaries, historical events, and Multi-media chamber, the system can capture comprehensive information, supporting decision-making and long-term preservation. Defining these fields ensures that the heritage data is enriched and organized, providing a deeper understanding of each site's cultural, historical, and geographical significance. This detailed structure ultimately strengthens the system's capability to manage heritage assets sustainably and adapt to evolving conservation needs and policies.

Table-1: Feature Classification for Heritage Information Model

Feature Class	Description
1. Identification	A unique code or name that distinguishes each heritage site or object from others in a system.
2. Feature Type	Categorizes the type of heritage feature, like buildings, monuments, artifacts, or landscapes, to define its form in geomatics domain.
3. Chronological Events	Records important historical events or time periods related to the heritage site, like foundation, construction or restoration etc.
4. Heritage Recognition	Refers to official acknowledgment by authorities (government, UNESCO) of the site's cultural or historical significance.
5. Spatial Representation	Represents the geographic shape of the exact feature of the heritage site using location coordinates and respective spatial entities; point, line, polygon etc.

Feature Class	Description
6. Ownership Type	Specifies the heritage site ownership party, such as government, private, or community. *This field may be linked to the national Land Information System.*
7. Actor Forum	A group of people or stakeholders involved in managing or preserving the heritage site to facilitate the authority to access the system.
8. Multi Media Chamber	In order to integrate various media types; Stereo Photos, Multi-view images, Video Clips, VR, AR, AI tools effectively.

6.1 Classification of Heritage Feature Identification

Heritage feature identification must be thoroughly documented using several important attribute fields to ensure the accurate representation and differentiation of the same heritage item across various contexts. This detailed approach allows for consistent tracking, management, and preservation of heritage features within the system. Table-2 highlights a set of crucial fields that must be included to accommodate these different identifications, ensuring that all essential aspects of the heritage item are properly recorded and easily retrievable.

Table-2: Heritage Feature Identification attribute fields

Identification	Description
1. Heritage ID	A unique identifier assigned to a heritage site or object, used for tracking and cataloging within heritage management systems.
2. Archeology ID	A specific identifier for archaeological sites or artifacts, facilitating accurate documentation and research in archaeological databases.
3. Reference Codes	Reference Codes: Alphanumeric codes linking heritage items to specific documents, regulations, or records for cross-referencing and management.
4. Name Heritage	The official name given to a heritage site or object, reflecting its cultural or historical significance within the local or national context.
5. Name Archeology	The designated name for an archaeological site or artifact, often based on its location or historical period.
6. Name Public	The commonly known name of a heritage site or object, recognizable by the general public and often used in tourism or education.
7. Name History	A historical name associated with the heritage site or object, often derived from historical texts or local traditions.

8. Name Globally Known	The internationally recognized name of a heritage site or object, widely acknowledged across different countries and cultures.

6.4 Classification of Heritage Feature Type

The classification of Heritage Feature Types is essential for the effective management, documentation, and preservation of heritage assets. Each type, such as Heritage Sites, Structures, Monuments, Buildings, Statues (both movable and immovable), and Artifacts, represents a distinct category that requires specific conservation approaches. By categorizing heritage features, authorities can implement tailored preservation strategies, ensure accurate legal protection, and enhance public awareness. This classification also aids in the systematic tracking and recording of heritage items, supporting sustainable cultural heritage management. Table-3 shows a list of seven attribute fields recommended to maintain in heritage information system.

Table-3: Heritage Feature Type attribute fields

Feature Type	Description
1. Heritage Site	A significant historical, cultural, or archaeological importance, protected due to its unique value to heritage conservation.
2. Structure	A constructed element, often historical, like bridges or towers, representing architectural or cultural heritage from a specific era.
3. Monument	A structure or site commemorating a person, event, or significant cultural history, made of stone or metal need for preservation.
4. Building	A significant edifice, such as a house or temple, with historical or architectural importance, contributing to cultural heritage.
5. Statue	A three-dimensional sculpture representing a person or concept, often historical, typically displayed as cultural heritage.
6. Statue Movable	A smaller, portable sculpture of historical or cultural significance, often preserved in museums or private collections. *(Boolean expression as True or False)*
7. Artifact	A physical object of cultural or historical interest, usually found in archaeological contexts, represent of material culture the past.

6.3 Classification of Heritage Chronological Events

Documenting of chronological events in a heritage information system is crucial for preserving the historical and cultural context of heritage items. The Foundation Story and Discovery provide insights into the origins and initial recognition of the asset. Exploration records formal investigations, while Disaster Records track damage from natural or human-made events. Modifications reflect any changes or restorations, ensuring historical accuracy. Public Notification marks when information was shared, promoting transparency and engagement with the public. Table-4 shows a list of attribute fields comes under Chronological events which are recommended to maintain in heritage information system.

Table-4: Heritage Feature Chronological Events

Chronological Events	Description
1 Event Date	Date: DD-MM-YYYY
2. Event Type	Foundation Story Discovery Exploration Disaster Records Modification Public Notification Others (key words)
3. Event Details	Detailed description

6.4 Classification of Heritage Recognition

Documentation of heritage recognition from local and international bodies is crucial because it establishes formal acknowledgment of a site's historical, cultural, or architectural significance. This recognition helps protect and preserve heritage sites, ensures their proper management, and promotes awareness and respect. It also facilitates funding and support for conservation efforts and enhances the site's global visibility and value. Table-5 shows a list of attribute fields comes under heritage recognition as important to maintain in heritage information system.

Table-5: Feature class. Heritage Recognition

Heritage Recognition	Description
Status of Recognition	Current heritage designation by national or international authorities.
Year	The year the site was officially recognized as a heritage site.
SL Govt.	Recognition status granted by the Sri Lankan government.
UNESCO	UNESCO World Heritage Site designation status.
Others	Recognition from other regional or international organizations.
Publication Reference	Sources or references documenting the heritage recognition.

Detailed classification of the other feature classes; Spatial Representation, Ownership Types, Actor Forum, and Multi-media chamber as listed in Table-1, should be accomplished subsequently to ensure the sustainability of the heritage information system. This process will provide a comprehensive understanding of how these features interact within the heritage framework, facilitating effective management and decision-making. The classification will further enable adaptive strategies for conservation and development, aligning with both local and international preservation standards. The three remaining classifications, Spatial Representation, Ownership Types, and Actor Forum, should follow similar proceedings, ensuring consistency and integration across the heritage system.

7. Research Directives for Sri Lanka Heritage Exploration

With regard to the ongoing research on 'Geomatics Data Modelling for an Integrated Heritage Information System to Enhance Archaeological Research in Sri Lanka,' there is significant potential for further exploration, particularly with the involvement of younger generations. Their contributions will be essential in transforming the proposed Heritage Information Model (HIM) into a reality, functioning system. This aligns with the vision of the HIM, aiming to integrate technological advancements in heritage conservation.

Possible research directives in Sri Lankan archaeology, referring to over 2,500 years of history, could include:

1. Ancient Urbanization: Study of early cities like Anuradhapura and Polonnaruwa to understand urban planning, architecture, and governance structures.
2. Buddhist Heritage: Investigation of ancient Buddhist monasteries, stupas, and religious artifacts to trace the evolution of Buddhism and its cultural impact.

3. Trade Networks: Exploration of Sri Lanka's role in ancient Indian Ocean trade routes, focusing on port cities like Mantai and Galle.
4. Hydraulic Civilization: Research on ancient irrigation systems and tanks, examining their technological sophistication and role in sustaining large populations.
5. Cultural Interactions: Study of foreign influences, such as South Indian, Roman, and Chinese, on Sri Lankan culture, economy, and politics.
6. Prehistoric Settlements: Exploration of cave dwellings and early settlements to understand the island's prehistoric human activities and survival strategies.
7. Royal Dynasties and Warfare: Examination of royal inscriptions, fortifications, and battle sites to understand political history and military strategies.
8. Material Culture: Research on pottery, metalwork, and other artifacts to reconstruct daily life, craftsmanship, and trade.
9. Colonial Impact: Study of European colonial influences (Portuguese, Dutch, and British) on Sri Lankan society, architecture, and culture.
10. Environmental Archaeology: Investigating the relationship between ancient civilizations and their environment, focusing on how they adapted to climatic changes and natural disasters.

These research initiatives have the potential to offer deeper insights into Sri Lanka's rich archaeological and historical heritage, which would significantly contribute to the enhancement and development of the Heritage Information Model (HIM).

8. Concluding Remarks

"Geomatics Data Modelling for an Integrated Heritage Information System" marks a crucial starting point for systematic heritage documentation in any country. It enables accurate spatial data collection, analysis, and management, promoting effective preservation of cultural assets. This approach ensures that historical sites are documented, safeguarded, and sustainably managed for future generations.

The heritage data model conceptualized in this paper should be further integrated with cutting-edge technologies, such as artificial intelligence (AI) and machine learning, to enhance its functionality. For example, AI can automate the classification and tagging of cultural artifacts, while machine learning algorithms can improve the efficiency of search and retrieval processes.

Further discussions and collaboration among the relevant stakeholders are essential to establish a comprehensive and integrated data classification for heritage and geomatics data modeling.

This would ensure efficient management, preservation, and accessibility of cultural heritage information at various sectors.

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