

Ancient Tamil Governance Analytics: Mining the Uthiramerur Inscriptions for Democratic Insights

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Ancient Tamil Governance Analytics: Mining the Uthiramerur Inscriptions for Democratic Insights

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ABSTRACT

Purpose: Using data analytics and digital humanities, this paper investigates the governance records of Uthiramerur, a tenth-century Tamil village. The Uthiramerur assembly (sabha) is notable for its use of the *kuṭavōlai*, a palm-leaf ballot, for drawing lots. The records primarily exist as stone inscriptions placed during the reign of Parāntaka Chola I (c. 919 – 921 CE). The palm-leaf ballots, by contrast, were ephemeral. The inscriptions of Uthiramerur were treated as data, and the construction of the electoral algorithm and design of the committees (variyaṁs) along with the rules of disqualification and constructive finance were made formal and amenable to analysis. This paper places Uthiramerur in relation to the broader epigraphic corpus of Tamil Nadu, and, following Karashima and Subbarayalu, argues that a design framework of governance principles (i.e. sortition, term limits, eligibility, and audits) may be inferred by the corpus. In this paper, the limitations and potential of data mining are honestly addressed.

Methodology: This paper uses qualitative research. The research was primarily conducted by using critical key word searches to collect data from the Google Search Engine, Google Scholar and AI-based GPTs. The inferred data was analyzed and interpreted as per the objectives of the paper.

Analysis/Results: Formal modeling shows design and structural controls against faction, financial abuse, collusion, and entrenchment, such as an eligibility filter combined with sortition, rotated committees, and audit-based accountability.

Originality / Value: The paper reformulates the noted Uthiramerur regulations as organized, minable data, connects one village to the broader Tamil epigraphic corpus, and assesses what can be gained through the computational analysis of ancient records.

Type of Paper: Exploratory Research

Keywords: Uthiramerur; Kuṭavōlai; Chola village governance; Digital epigraphy; Data mining; Sabha and variyaṁ

1. INTRODUCTION :

Tamil Nadu boasts long-standing attainment of local self-governance. The village republics of ancient Tamil Nadu had numerous community groups that completed construction and improvement work in their villages. The Uthiramerur inscription (Kancheepuram district) is evidence of local self-governance from this period (Chakravarty (2026). [1]). This tradition peaked in the 10th and 11th Centuries AD, during the rule of the Cholas. Village Councils collected taxes, improved the quality of life, and administered justice in the villages. The Village Councils, in turn, had working relationships with the rulers of Chola Empire (Ranjan, R. (2014). [2]). The Chola Village Councils used the secret ballot system, known as "Kuda Olai Murai," to elect guiding members of the Councils (Kumaravelu & Thiyagarajan (2021). [3]). This tradition of local self-governance declined with the coming of feudalism as a result of the Chola Empire's collapse. Local self-governance came to an end in the 19th Century with the onset of British colonial rule. While the British colonial rule did not establish self-governance in India, the British were the first to introduce self-governance in India for purposes of their own administration (Idiculla (2020). [4]).

The inscriptions of Uthiramerur, in the Kanchipuram district of Tamil Nadu, are among the most studied governance documents of pre-modern India (Chakravarty (2026). [1]). Engraved on the walls of the Vaikuṇṭha Perumal temple during the reign of Parāntaka Chola I, they record in extraordinary detail how the assembly of this brahmadeya village constituted its administrative committees through a lottery of palm-leaf tickets known as the kuṭavōlai. Generations of historians, from K. V. Subrahmanya Aiyer to K. A. Nilakanta Sastri (Spencer (1984). [5]), have read these records as narrative testimony to early local self-government. This paper proposes a different lens. It asks what happens when the Uthiramerur corpus is treated not as a story to be read closely but as structured data to be mined: a set of eligibility predicates, ward partitions, committee assignments, fiscal parameters, and exclusion rules amenable to formal analysis. Building on the quantitative epigraphy of Karashima and Subbarayalu and on the broader practice of distant reading, the study reconstructs the governance system as an analysable design (Karashima (2011). [6]). A source-critical caution is observed throughout: the surviving corpus is lithic, and the palm leaf survives only as the procedure it once enacted.

2. REVIEW OF LITERATURE :

This study draws on several strands of scholarship: the foundational epigraphic reading of the South Indian corpus, the authoritative accounts of Chola governance, institutions, and the debate over the medieval state and economy, the quantitative tradition that turned Tamil inscriptions into analysable data, and the digital-humanities methods that frame the present approach. Ten principal works are reviewed below.

(1) Subrahmanya Aiyer (1917). [7] pioneered the systematic reading of South Indian lithic records, reconstructing ancient Dekhan polity from inscriptions when the field was young. His careful, source-critical method established the epigraphic foundation on which all later study of the Uthiramerur governance corpus rests, modelling the cautious interpretation this paper seeks to extend.

(2) Nilakanta Sastri's (1955) [8] monumental survey remains the standard authority on Chola history and administration, synthesising vast epigraphic evidence into a coherent account of the dynasty's institutions. His treatment of village assemblies and local self-government furnishes the historical scaffolding on which this paper's formal analysis of the Uthiramerur system is built.

(3) Mahalingam's (1967) [9] detailed study of South Indian political institutions remains a standard reference on the structure and working of the medieval polity, including the village and supra-village assemblies. Its careful institutional analysis of the sabha and its committees provides the administrative detail against which the Uthiramerur regulations can be precisely situated.

(4) Stein's influential "segmentary state" model (1980). [10] reread the Chola polity as a network of locally powerful corporate bodies bound by ritual rather than bureaucratic sovereignty. By making self-governing assemblies central to the question of how the Cholas were governed, it frames the wider stakes of any close analysis of Uthiramerur.

(5) Champakalakshmi (1996) [11] reconstructs the long arc of South Indian urbanisation, weaving trade, religious ideology, and temple economy into an integrated account of social change. Her work situates the self-governing village within the wider economic and ideological order, supplying the broader context that keeps the Uthiramerur case from being read in isolation.

(6) Three-volume concordance indexed by machine the names recurring across thousands of Chola inscriptions transforming Tamil epigraphy into a quantitative discipline. It is the direct methodological ancestor of the present study: the first demonstration that the inscriptional record could be structured, counted, and mined, rather than only read narratively (Karashima et al. (1978). [12]).

(7) Karashima (1984). [13] brought statistical method to South Indian epigraphy, analysing inscriptions in their thousands to trace long-term change in landholding and society. His insistence that history be grounded in the systematic, quantitative study of the inscriptional record directly authorises the data-minded approach this paper takes to the Uthiramerur corpus.

(8) Distilling thirty years of epigraphic research, Subbarayalu (2012) [14] quantifies land measurement, classification, and revenue to attempt the first systematic estimate of a pre-Mughal Indian state's income. The volume exemplifies governance analytics avant la lettre, supplying the regional fiscal framework against which this paper reads Uthiramerur's village-scale administrative provisions.

(9) Moretti's (2013) [15] essays argue that a literature is best understood through aggregate patterns—graphs, networks, quantitative models—rather than the close reading of individual texts. Though drawn from literary history, his concept of “distant reading” supplies the methodological rationale for treating the Uthiramerur corpus as structured, analysable data rather than narrative.

(10) Giridhar and colleagues (2019) [16] train a convolutional neural network to recognise ancient Tamil characters from temple inscriptions, linking it to an OCR engine to digitise the script. Their work points towards a future in which the epigraphic corpus becomes machine-readable at scale, the precondition for genuine large-scale governance analytics.

Table 1: Review of literature on title of the Paper

S. No.	Title/Topic	Summary/ Outcome	Reference
1	Deciphering Ancient Tamil Epigraphy	Prevalent from the 3rd to 8th century CE, the Vatteluttu script is crucial for early South Indian history, yet thousands of inscriptions remain untranslated. To address this, researchers developed a deep learning framework using advanced preprocessing and a Siamese CNN-RNN architecture trained on 1,800 segmented character images. Achieving 98% accuracy across 28 characters, the model proves the viability of automated transcription for preserving and analyzing ancient heritage.	Arjunan, et al. (2025) [17]
2	Ancient Tamil inscription recognition using detect, recognize and labelling, interpreter framework of text method	Tamil inscriptions dating back to the third century BCE offer vital insights into ancient South Indian governance, religion, and society. Because existing recognition algorithms focus on nineteenth-century Tamil, they fail to process the complex fonts and styles of this earlier era. To solve this, the study introduces the DR-LIFT framework, specifically engineered to capture intricate features like curves and loops in third-century inscriptions. Tested on early Tamil scripts, the framework achieves high precision with a 99% recognition accuracy and a 98.8% recognition rate.	Murugan, B., & Visalakshi, P. (2024). [18]
3	<i>Patterns of rural development in Tamil Nadu</i>	This thesis investigates the spatial processes driving regional contrasts in rural development across post-Independence Tamil Nadu. Integrating theoretical approaches with empirical analysis, the study evaluates the state's physical, social, and economic environment alongside village-level changes in key agricultural and consumer variables. Using a stratified random sample of villages across Tamil Nadu, the research tests hypotheses linking rural development to various forms of accessibility, exploring how different definitions of accessibility influence spatial development patterns.	Bradnock, R. W. (1977). [19]
4	Accounting approaches to	Tracing accounting in Tamil civilization from the Sangam period (300 BCE–300 CE) through the	Chinnasamy, T. (2026). [20]

	the study of historical Tamil events	Chola and Pandya dynasties (9th–14th centuries CE), this study analyzes archaeological, literary, epigraphic, and administrative evidence. Discoveries at key sites, alongside temple inscriptions and literary texts like the <i>Thirukkural</i> , reveal early urban trade networks, structured taxation, treasury controls, and organized auditing practices. By examining merchant guilds and global trade connections alongside modern digital adoption, the research underscores the historical continuity and global significance of indigenous Tamil accounting traditions.	
5	Cartographies of warfare in the Indian subcontinent: Contextualizing archaeological and historical analysis through big data approaches	Warfare leaves enduring behavioral traces through defensive architecture, yet premodern military infrastructure remains understudied at scale. By synthesizing archaeological data, historical records, and citizen-science reports, this study compares Early Historic (c. 3rd century BCE–4th century CE) and precolonial medieval (9th–17th centuries CE) fortified sites in the Indian subcontinent. Using a big-data aggregate approach, the analysis reveals a strategic shift in military architecture from Early Historic urban defense to medieval territorial offense and defense.	Smith, M. L., & Newton, C. (2024). [21]
6	The Dravidian Model: How Tamil Nadu Balances Growth and Social Justice.	Global societies continue to grapple with deep-rooted inequalities that restrict access to resources based on caste, gender, and ethnicity. Rooted in entrenched historical structures, these disparities have long dictated social hierarchy and stability, particularly in India, where a rich cultural legacy remains closely intertwined with caste dynamics.	Prabhakar, K. (2025). [22]

3. OBJECTIVES OF THE STUDY :

The study pursues four objectives; each developed across two sub-chapters:

- (1) To assemble and source-critically evaluate the Uthiramerur governance corpus and convert it into a structured, analysable dataset.
- (2) To data-mine the kuṭavōlai electoral mechanism and the committee (variyaṁ) architecture as formal procedures.
- (3) To quantify the administrative, fiscal, and accountability provisions encoded in the assembly's regulations.
- (4) To assess the comparative and contemporary relevance of the findings and to reflect critically on the method itself.

4. METHODOLOGY:

This paper uses qualitative research. The research was primarily conducted by using critical key word searches to collect data from the Google Search Engine, Google Scholar and AI-based GPTs. The inferred data was analyzed and interpreted as per the objectives of the paper [23-30].

5. CONSTITUTING THE CORPUS :

5.1 The Uthiramerur Corpus: Provenance and the Stone–Palm–Leaf Relationship:

Any analytics begins with a clear account of its data. The Uthiramerur governance corpus consists chiefly of two long inscriptions of Parāntaka Chola I, dated to his twelfth and fourteenth regnal years—approximately 919 and 921 CE—engraved on the walls of the maṇḍapa of the Vaikuṇṭha Perumal temple. The village, an agrahāra styled Uttaramerur-chaturvedimangalam, was a settlement of learned Brahmins whose corporate body, the sabha, administered local affairs with considerable autonomy. The

fourteenth-year record amends and refines the twelfth-year one, so that the corpus is, in effect, a small body of regulation together with its first revision—a feature of direct interest to any analyst, since it preserves an explicit instance of institutional learning.

A point of method must be stated plainly, because the framing of this study invites it. The Uthiramerur governance records that survive are epigraphic: they are lithic documents incised in Tamil, with Grantha characters for Sanskrit terms. They are not palm-leaf manuscripts. The palm leaf enters the corpus not as a surviving artefact but as the very instrument of the procedure it describes. The assembly's committees were selected by writing eligible names on small palm-leaf tickets (*ōlai*), placing them in a pot (*kuṭam*), and drawing them by lot. These ballots were ephemeral and have not survived; what endures is the stone record that legislated their use.

kuṭa-ōlai (*kuṭam* “pot” + *ōlai* “palm-leaf ticket”)

the pot-and-palm-leaf ballot by which the Uthiramerur assembly selected its committees

Understood this way, the popular characterisation of these records as a “palm-leaf corpus” in fact names the *kuṭavōlai* tradition—the procedural world of the *ōlai* ballot—as documented and fossilised in stone. This is not a pedantic distinction. It governs what the data can and cannot tell us. We possess the rules of the ballot in remarkable detail, but none of the ballots, no register of who was actually drawn, and no run of results across years.

The corpus is therefore prescriptive rather than statistical: it encodes the design of a governance system far more fully than its operation. Recognising this at the outset disciplines every later claim, and it is the first contribution that a data-minded reading can make to a much-quoted but often loosely characterised source (Ranjan (2014). [2]).

The scholarly history of the corpus reinforces this reading. K. V. Subrahmanya Aiyer (1917) [7], among the first epigraphists to subject the Dekhan's lithic records to systematic analysis, drew from “the dry bones of lithic records” a reconstruction of ancient polity that remains foundational; Nilakanta Sastri (1955) [8] later incorporated the Uthiramerur evidence into his comprehensive account of Chola administration. Both worked, necessarily, from the stone. The corpus they transmitted to us is thus already an interpreted object—an edited text with a century of commentary attached—and any analytics inherits that editorial layer. A responsible dataset records not only the readings but their provenance and their disputed points, so that downstream analysis can distinguish what the stone says from what scholarship has inferred.

It is also important to delimit the corpus correctly. Uthiramerur preserves many inscriptions across several centuries and three temples, touching on land grants, irrigation, and temple affairs; the governance regulations proper are a defined subset of these. For the present purpose the corpus is bounded as the two Parāntaka I constitutional records together with directly related amendments and the village's self-governing resolutions, with the wider Uttaramerur and Chola material serving as comparative context rather than core data. Drawing this boundary explicitly is itself an analytic act: it determines the unit of study and guards against the common error of treating every Uttaramerur inscription as if it spoke to the electoral system. The corpus, properly constituted, is small, dense, prescriptive, and exceptionally well documented—an ideal object for formal modelling precisely because its scope is so clearly drawn (Nilakanta Sastri (1955). [8]).

5.2 From Epigraph to Dataset: Digitisation and Encoding:

As per digital epigraphy, transforming the Uthiramerur regulations to study them as data consists of a series of stages. The first is the capture and the transcription. The standard editions of the South Indian Inscriptions provide reliable readings. Additionally, some recent work in the field of computer science has developed the first steps to automate the process of recognizing ancient Tamil graffiti on temple walls. For example, Giridhar, Dharani, and Guruviah (2019) [16] trained a convolutional neural network by cropping and isolating images of the Tamil characters from tenth to twelfth century inscriptions, and uploaded them to an OCR engine to digitize the Tamil script. While these works represent the idea of making the epigraphic record available to the machines at an unprecedented scale, for a small and carefully edited corpus like the Uthiramerur record, the expert transcription will continue to remain the accurate and reliable foundation.

The second, structuring. A close reading yields prose; a data-reading yields field. Uthiramerur Regulations break down in pagination into the spatial partition of the village into wards (*kuṭumbu*); the eligibility predicates a candidate must satisfy (property, residence, age, learning); the roster of

committees (variyaṃ) to be filled; the term of service and the cooling-off interval; and the disqualification clauses that exclude defaulters and their kin.

Contextual enrichment comes at the third stage. Uthiramerur is a good example. Its analytic potential can only be understood when placed in the much larger Tamil epigraphy context. As early as the 1970s, the first concordance of Chola inscriptions, developed by Karashima, Subbarayalu, and Matsui, [12] showed that epigraphy could be treated as a quantitative discipline. This was demonstrated by the accurate indexing and counting, through the application of computing technologies, of names, titles, and different expressions of revenue used in tens of thousands of inscriptions. Other extensions of this work include Subbarayalu's [14] quantification of Chola land revenue and Heitzman's networked endowments and visualization. Within this framework, the Uthiramerur regulations transform from an isolated curiosity to a distinctly articulated and documented design. Against this documented design, the fragmented and sparse evidence from the other assemblies can be placed and examined. In brief, the corpus is constructed in three stages: read the inscription, design the inscription, and contextualize the inscription among the other inscriptions.

Encoding standards are important because text markup impacts future queries. Digital epigraphy standards allow a structured markup of text in a way that separates the text from metadata and provides provenance and semantic annotations for uncertain readings in a digitally processable format. For Uthiramerur, this involves tagging the text and its elements, such as tagging 'clause' as an eligibility predicate and tagging a phrase as a property threshold, a name-slot as a committee, and a sentence as a disqualification. Consistent transliteration is imperative, since analysts must normalize IAST of Tamil and Grantha Sanskrit so that the same word is rendered in the same way each time, which addresses the consistency problem the Chola inscription concordance addressed manually.

This concordance is important as the methodological forbearer to the project as a whole. By indexing every single name found in the Chola inscriptions, Karashima, Subbarayalu, and Matsui [12] effectively transformed a formerly chaotic compilation of epigraphy into a structured resource. This new resource made possible for the very first time many types of statistical inquiries concerning epigraphy, such as the frequency of particular titles or the ways in which names exhibited regional and temporal patterns. The encoding of Uthiramerur, while being at village scale and of a finer semantic level, is the same operation. Now, instead of just querying names, we can also query modeling regulations. The regulations are now represented as typed fields and relations, therefore it is now possible to draw and see and even analyze the regulations as a structure, and even compare them to other structures in the vast corpus. The transformation, of a temple wall from a captured wall to a resource, is remarkable, especially considering they have recorded the various levels of transformations that now exist on the wall.

6. MINING THE ELECTORAL MACHINE :

6.1 The Kuṭāvōlai as Algorithm: Eligibility, Wards, and Sortition:

The kuṭāvōlai reads as a procedure. Its algorithmic nature is striking. It specifies inputs (qualified pools), partitions (the wards), selection (the draw), and various requirements (eligibility and exclusion). The village is split into thirty wards and the regulations specify, ward by ward, who can stand. Eligibility is defined as a conjunction of states. A candidate must have a minimum set of tax-paying land, own a house on his plot, fall in a certain age band, and have a certain level of Vedic learning, the property requirement being of a lower threshold for those of greater scholarship. Within analytical language, this is a filter—a Boolean qualification function which is placed upon every adult male of the ward.

After the pool of candidates is determined, selection is done by lot and not by vote. The names of the candidates are inscribed on palm leaves, ward by ward collected in a pot, publicly mixed, and drawn—traditionally by a young boy—in front of the full assembly. This sortition has a unique analytical nature. It is, in every sense, expected to be impartial, offers resistance to factional efforts and bribes (a canvass is impossible), and widely distributes office throughout time. The modern computational social science also has a good understanding of the fairness related properties of selection by lot, and the design of Uthiramerur incorporates many of them.

The system's brilliance is in combining a rigorous eligibility criterion with a random selector. The filter ensures both competence and a stake in the outcome of the process, since only those who have both education and property are eligible. The lottery makes the competition disappear, which in turn eliminates the factionalism and the fraudulent behavior that are the by-products of a voting system. As

a modern-day way of looking at this, the only eligible participants in the process were Brahmin men who were educated, land-owning, and of the higher caste, and the parallel assembly, the ūr, was excluded. A data-based approach will not mask nor will it detract from the degree of sophistication of the system. The kuṭavōlai system is a constrained lottery.

The eligibility criteria are a formal expression of a trade-off, and it is worthwhile to examine them closely. Property and education are seen as interchangeable qualifications. If the candidates were of higher education, the property requirement could be relaxed. This is a sophisticated qualification system designed to differentiate between the learned and wealthy, while excluding the uneducated and poor. This trade-off is expressed in the various criteria, which include age, independent living, and a number of disqualifying factors. Each criterion is easily verifiable, and for this reason, the system is easily administered.

In addition to being a ceremony, the public lottery was also a design element. Presenting the lottery in front of the village with the tickets shown to the audience and drawn by an impartial child, made the process credible. The ticket drawing was a public design element that brought about public verification, and can be thought of as a very early example of a modern-day transparent government.

6.2 Committee Network Analytics: The Variyams, Rotation, and Term Structure:

The output of the kuṭavōlai was not a single council but a set of functional committees, the variyams, each charged with a domain of administration. The records name several—among them an annual or supervisory committee, a committee for the management of tanks and irrigation, a garden committee, and committees concerned with justice and with gold or finance. The system thus resembles a portfolio of standing sub-bodies, each populated from the same qualified pool but tasked with a distinct function. Represented as a bipartite graph linking members to committees, the design exhibits a deliberate division of labour overlaid on a common eligibility base.

Temporal structure is where the design is most instructive. Service was annual, and the regulations impose a cooling-off rule: a member who had served was barred from selection for a defined interval of subsequent years. In analytic terms this is a rotation constraint that prevents any individual from monopolising office and forces the qualified pool to circulate through the committees over time. Such a rule, combined with sortition, produces over a run of years a wide and relatively even distribution of office across eligible households—precisely the kind of pattern a longitudinal dataset would reveal, were the annual draws preserved. That they are not the central evidentiary limit, noted earlier; the rotation rule is legible in the design even though its realised effects are not.

Embedding Uthiramerur in the wider corpus sharpens the picture. The committee terminology and the practice of assembly self-regulation recur, with local variation, across Chola-country inscriptions, and the corporate bodies of the period—the ūr, the sabha, the nāṭṭār—have been mapped in detail by Subbarayalu and others [14-15]. Against that background, Uthiramerur is best read not as a unique invention but as an unusually complete specification of a widely diffused institutional form. Network analysis of the committee system, even on a single village, models how functions were separated, how membership was constrained, and how turnover was engineered—three properties that together constitute a recognisably engineered system of governance rather than an ad hoc council.

The internal differentiation of the committees deserves emphasis. The regulations do not create a single undifferentiated council but a structured portfolio in which distinct domains—general supervision, irrigation, gardens, justice, and finance—are assigned to distinct bodies, each with its own membership drawn from the common pool. Some committees were evidently more demanding than others, and the rules adjust qualifications and numbers accordingly. Modelled as a bipartite graph in which one set of nodes is candidates and the other is committees, the system displays a deliberate allocation of scarce qualified labour across functions, with the most consequential portfolios subject to the tightest constraints. This is recognisably a problem of assignment under constraint, and the framers solved it by specifying, for each committee, both its competence requirements and its size.

The revision between the twelfth- and fourteenth-year records is, from an analytic standpoint, the single most valuable feature of the corpus, because it captures the institution correcting itself. Within two years the assembly returned to its own constitution and amended it—adjusting provisions in the light of experience. This is documented institutional learning of a kind rarely preserved from the ancient world, and it tells us that the design was not handed down as immutable but treated as revisable engineering.

For the analyst it provides a rare second data point on the same system, allowing the direction of change—generally towards tighter accountability—to be read off directly.

Embedding the committee system in the wider corpus completes the picture. The *variyaṃ*, the *sabha*, the *ūr*, and the supra-local *nāṭṭār* recur across Chola-country inscriptions and have been mapped in detail by Subbarayalu [14], so that Uthiramerur's committees can be read as an unusually complete specification of a widely diffused institutional grammar rather than a local peculiarity. Network analysis even of this single village models three properties at once—functional separation, constrained membership, and engineered turnover—and it is the conjunction of these three that warrants describing the assembly as a system rather than a council. The committees were not an ad hoc division of labour but a structured, revisable, constraint-governed architecture for administering a community.

7. QUANTIFYING ADMINISTRATION AND ACCOUNTABILITY :

7.1 Fiscal and Resource-Management Analytics:

Beyond elections, the Uthiramerur committees administered the material life of the village, and here the analytic interest shifts to fiscal and resource data. The assembly managed common funds, temple endowments, land revenue, and—critically in a delta agrarian economy—the tanks and channels on which cultivation depended. A dedicated tank committee (*eri-variyaṃ*) attests to the centrality of irrigation, while the broader Chola revenue apparatus situated such village-level management within a graded fiscal order. The quantification of that order is the achievement of Subbarayalu [14], who reconstructed land measurement, classification, assessment, and the revenue terms of the Chola state from inscriptional evidence, producing the first systematic attempt to estimate the revenue of a pre-Mughal Indian polity.

For Uthiramerur specifically, the regulations imply rather than tabulate the fiscal system: they presuppose taxable land as the very basis of eligibility, and they entrust committees with the handling of resources whose mismanagement carried penalties. A data-minded reading extracts these implicit parameters—the property thresholds, the resource domains assigned to each committee, the obligation to render accounts—and treats them as the village-scale instantiation of the macro-fiscal structures Subbarayalu and Hall reconstructed for the kingdom as a whole. Hall's study of trade and statecraft, in particular, shows how local corporate bodies articulated with wider commercial and revenue networks, so that the village committee was a fiscal actor nested within a larger economy (Subbarayalu (2012). [14]).

The methodological point is that fiscal analytics on an ancient corpus is necessarily inferential and comparative. Uthiramerur does not give us a ledger; it gives us the rules under which ledgers were kept and audited. By reading those rules against the quantified regional picture, the analyst can characterise the village's fiscal design—resource committees, property-based eligibility, mandatory accounting—without pretending to a precision the source does not support. The value lies in reconstructing the architecture of fiscal responsibility, not in inventing figures the stone never recorded.

Water management deserves particular emphasis, for in the Kaveri-fed agrarian order of the Chola country the tank and the channel were the infrastructure on which all wealth depended. The dedicated tank committee (*eri-variyaṃ*) institutionalised collective responsibility for this common resource, assigning to a specialised body the maintenance, allocation, and repair of irrigation work whose failure would have been catastrophic. As a data domain, irrigation governance is among the richest the corpus implies: it links the committee structure to the fiscal base, since the productivity of taxable land—the very basis of eligibility—depended on the works the committee maintained. The system thus folds back on itself, with the resource that funded the assembly managed by the assembly it funded (Murugan & Visalakshi (2024). [18]).

The temple economy is a second major domain. As a *brahmadeya* organised around its temples, Uthiramerur administered endowments, gifts, and the resources attached to worship, and the management of such religious endowments was a principal arena of medieval South Indian local governance. Heitzman's database-driven study of endowment and lordship showed how gifts of land and gold wove temples, donors, and corporate bodies into transactional networks that can be reconstructed and mapped from inscriptional data. Uthiramerur's committees were nodes in exactly such a network, and the village's fiscal life is intelligible only as part of this larger circuitry of temple, land, and revenue that Champakalakshmi and Hall analysed at the regional scale (Champakalakshmi, (1996). [11]).

The methodological lesson bears repeating in this fiscal setting. Uthiramerur supplies the rules under which resources were managed and accounts rendered, not the accounts themselves; its fiscal analytics is therefore inferential and comparative, reading the village's implicit parameters against the quantified regional picture that Subbarayalu reconstructed. The proper deliverable is the architecture of fiscal responsibility—resource committees, property-based standing, and mandatory accounting—rather than invented figures the stone never carried. Characterising that architecture precisely and refusing to manufacture a precision the source cannot bear, is itself the analytic achievement.

7.2 Accountability Analytics: Disqualification, Kin-Exclusion, and Anti-Corruption Design:

The most arresting feature of the Uthiramerur regulations, to a modern analyst, is their elaborate machinery of accountability. The eligibility rules are matched by an equally detailed set of disqualifications, and these encode a theory of how committees fail. Those who had served on a committee and had not submitted their accounts were barred, as were their close relatives; persons who had committed specified offences, and again their kin, were excluded; and the regulations reach explicitly to degrees of relationship, disqualifying near relatives of those who had defaulted or transgressed. The fourteenth-year revision tightens several of these provisions, evidence of deliberate institutional adjustment.

Modelled formally, these clauses constitute an exclusion function operating alongside the eligibility filter: a candidate passes only if he satisfies the positive predicates and triggers none of the negative ones. Two design principles stand out. The first is audit-conditioned office: failure to render accounts is itself disqualifying, making transparency a precondition of continued participation. The second is kin-liability, which extends disqualification to relatives of defaulters. By modern norms the latter is collective rather than individual responsibility; analytically, however, it is a recognisable anti-collusion device, raising the cost of malfeasance by spreading its consequences across a family and thereby discouraging the use of relatives as proxies (Murugan & Visalakshi (2024). [18]).

Taken together with the cooling-off rule and the lottery, the disqualification clauses reveal a governance system preoccupied with the prevention of capture. Sortition blocks electoral faction; rotation blocks entrenchment; audit-conditioned eligibility blocks unaccountable handling of funds; and kin-exclusion blocks collusive proxying. These are, in effect, four complementary controls against four distinct failure modes. Reading them as a connected control architecture—rather than as a list of quaint rules—is exactly what a data-minded approach contributes. It allows Uthiramerur to be described in the language of institutional design: a system whose accountability provisions were not incidental but structural, and whose framers had evidently reasoned about how power and money are abused.

It is worth drawing out the implicit theory of failure that these clauses encode, because their specificity is their most remarkable quality. The framers did not legislate against wrongdoing in the abstract; they identified particular failure modes and wrote a targeted exclusion for each. The committee member who handled funds and failed to account for them is the corrupt or negligent administrator; the relative of such a defaulter is the proxy through whom an excluded man might re-enter; the offender against the community is the disqualified wrongdoer. Each disqualification answers a specific way in which the system could be subverted. To recover this structure is to read the regulations as the product of practical reasoning about institutional vulnerability—reasoning that the fourteenth-year revision then refined.

Comparison with modern governance vocabulary is illuminating provided the differences are respected. Audit-conditioned office corresponds closely to the contemporary principle that those who handle public money must account for it as a condition of continued trust; the obligation to render accounts is, in effect, a transparency requirement with teeth. Kin-exclusion, by contrast, departs sharply from the modern norm of individual responsibility, extending liability across a family. Yet read functionally rather than morally, it is an anti-collusion device of considerable sophistication: by making relatives share the consequences of a member's default, it raises the cost of using kin as fronts and discourages the familial capture of office. The analyst notes both the resemblance and the divergence without collapsing the one into the other.

Assembled into a single view, the controls form a coherent architecture aimed at four distinct threats. Sortition defeats electoral faction, since a lottery cannot be canvassed; rotation defeats entrenchment, since office must circulate; audit-conditioned eligibility defeats the unaccountable handling of funds; and kin-exclusion defeats collusive proxying. Four mechanisms, four failure modes—a near-systematic mapping of controls onto risks. Describing the regulations in this way, as a connected control system

rather than a list of antique provisions, is the distinctive contribution of a data-minded reading. It shows that accountability at Uthiramerur was structural rather than incidental, and that its framers had thought hard about how power and money are abused and how a community might guard against both [8].

8. COMPARISON, RELEVANCE, AND METHOD :

8.1 Comparative Governance Analytics: Uthiramerur in Context and the Modern Resonance:

Set within the comparative landscape of Chola-country governance, Uthiramerur is exceptional less for its institutions than for the completeness with which they are recorded. Assembly self-government, functional committees, and corporate management of land and water were widespread features of the Tamil macro-region, analysed at length by Nilakanta Sastri, Mahalingam, and Champakalakshmi, and debated in the larger argument over the character of the Chola state [8-9]. Burton Stein's influential "segmentary state" model, in particular, reread such local corporate bodies as the real loci of power in a polity whose central authority was more ritual than administrative—a thesis that makes village assemblies like Uthiramerur central rather than peripheral to the question of how the Cholas were governed (Stein (1980). [10]).

Comparative analytics, then, treats Uthiramerur as a well-specified reference case against which sparser records elsewhere can be read. Where another inscription mentions a *variya*m or a *kuṭavōlai* only in passing, the Uthiramerur specification supplies the probable structure behind the reference. This is a standard move in corpus-based humanities: use the richly documented instance to interpret the thinly documented many. The danger—generalising one village's detail to a whole region—is real, and the comparative claim must remain calibrated to the evidence.

The contemporary resonance is unmistakable and has been widely invoked: Uthiramerur is regularly cited in connection with India's modern decentralisation and the revival of the panchayat, and the village is celebrated as an early monument of local self-rule. A data-minded reading both supports and tempers this enthusiasm. It supports it by showing that the design really did embody impartial selection, rotation, and accountability. It tempers it by insisting on the boundary of the qualified pool: this was self-government by and for a propertied, learned elite, not a popular franchise. The honest comparative lesson is that Uthiramerur offers a sophisticated indigenous grammar of accountable office-holding, whose mechanisms remain instructive even where its eligibility premises are not (Murugan & Visalakshi (2024). [18]).

The Stein thesis is worth weighing carefully, because it bears directly on how much interpretive weight Uthiramerur can carry. If, as the segmentary model holds, the Chola "state" was a loose alliance of locally powerful corporate bodies bound more by ritual sovereignty than by administrative reach, then the self-governing assembly is the fundamental unit of the polity and Uthiramerur is a window onto the real machinery of power. Critics of the model, including scholars who emphasise the genuine fiscal and administrative integration that Subbarayalu's revenue studies reveal, would temper that claim, granting the assemblies real autonomy while insisting on a more substantial central apparatus (Subbarayalu (2012). [14]). A data-minded reading does not settle this large debate, but it sharpens the terms: the completeness of the Uthiramerur design shows how much governance capacity resided at the local level, which is evidence the centralist account must accommodate even as the local detail cannot, by itself, establish the segmentary thesis.

Comparative analytics therefore treats Uthiramerur as a calibrated reference case. Where a sparser inscription names a *variya*m or a *kuṭavōlai* only in passing, the Uthiramerur specification supplies the likely structure behind the reference—the standard humanities move of using the richly documented instance to interpret the thinly documented many. The discipline required is to keep the inference proportionate: one village's detailed constitution licenses informed reconstruction elsewhere, not the assumption that every assembly worked identically.

The contemporary resonance is genuine and has been prominent in public memory, the site being widely celebrated as a monument of early local self-rule and repeatedly invoked in connection with the revival of the panchayat. A formal reading both vindicates and qualifies this enthusiasm. It vindicates it by confirming that the design embodied impartial selection, engineered rotation, and structural accountability—features any modern system of local government would recognise as virtues. It qualifies it by insisting on the boundary of the qualified pool: this was accountable self-government by and for a propertied, Vedic ally learned elite, conducted alongside but apart from the assembly of the cultivating community. The honest comparative lesson is that Uthiramerur bequeaths a sophisticated

indigenous grammar of accountable office-holding whose mechanisms remain instructive even where its premises of eligibility are emphatically not to be revived.

8.2 Methodological Reflection: Affordances and Limits of Data Mining the Corpus:

It remains to weigh the method itself. The affordances of a data-minded reading are genuine. Formalising the Uthiramerur regulations as predicates, partitions, and rules exposes their internal logic with a clarity that narrative paraphrase tends to blur; it makes the system comparable, in principle, with governance designs across cultures; and it connects a single village to the vast, increasingly machine-readable Tamil epigraphic corpus whose quantitative study Karashima and Subbarayalu inaugurated and which OCR and network methods now extend [13-14]. Franco Moretti's case for "distant reading"—understanding a literature through aggregate patterns rather than individual texts—translates directly to epigraphy, where the meaning of a single inscription often emerges only against the statistics of thousands (Moretti (2013). [15]).

The limits are equally real and must be stated without flinching. The Uthiramerur core is tiny: two principal inscriptions, prescriptive in nature. There is no record of actual draws, no membership series, no fiscal ledger—so the genuinely statistical questions a data miner would most like to ask cannot be answered from this source alone. "Data mining" here is therefore partly aspirational and partly metaphorical: it is the rigorous structuring of a small prescriptive text and its linkage to a larger corpus, not the discovery of patterns in a mass of village data that does not exist. There are further hazards: the formal recasting of an ancient social institution risks anachronism, importing modern categories of fairness and audit that the framers would not have recognised; and the smoothing tendency of computational reading can flatten the contested, contextual meanings that close philological work recovers.

The mature position is complementarity. Distant and close reading are not rivals but partners: the formal model tells us what to look for, and philology tells us what we are looking at. Applied with that discipline—and with candour about the lithic, prescriptive, elite character of the evidence—governance analytics adds a real instrument to the study of the Tamil past. It will not replace the inscription on the temple wall; it will help us read it more exactly.

Among the affordances, three deserve emphasis. First, formalisation brings reproducibility: when eligibility predicates, ward partitions, and exclusion rules are written as explicit structures, other scholars can inspect, challenge, and re-run the analysis, replacing impressionistic paraphrase with auditable models. Second, structuring brings comparability: a governance design rendered in formal terms can be set beside other designs, ancient and modern, on common ground, as the comparison with sortition elsewhere illustrated. Third, and most consequentially, the approach scales: the OCR and neural-network methods now being developed for Tamil inscriptions, together with the indexing tradition that the Chola concordance founded, promise a future in which the whole epigraphic corpus is query able, and a single village can be analysed against tens of thousands of records rather than in isolation (Murugan & Visalakshi (2024). [18]).

The limits, however, are intrinsic and must be stated without softening. The Uthiramerur core is two prescriptive inscriptions; it records the rules of the ballot but not a single actual draw, no roster of members across years, no fiscal ledger. The statistical questions a data miner would most wish to ask—how office was actually distributed, whether the rules were followed, how outcomes changed over time—cannot be answered from this source. "Data mining" here is consequently as much metaphor as method: it denotes the rigorous structuring of a small text and its linkage to a larger corpus, not the extraction of patterns from abundant village data that simply does not survive. Two further hazards attend the approach. The recasting of an ancient institution in modern formal categories risks anachronism, smuggling in notions of fairness, audit, and conflict of interest that the framers conceived very differently; and the aggregating habit of computation can flatten the contested, context-bound meanings that careful philology exists to preserve.

The resolution is not to abandon the method but to pair it with its complement. Distant and close reading are partners: the formal model directs attention and frames hypotheses, while philological and historical scholarship establishes what the words meant in their own world. Applied with that discipline, and with candour about the lithic, prescriptive, and elite character of the evidence, governance analytics is a real addition to the study of the Tamil past. Its future lies in linked epigraphic databases, shared encoding standards, and machine-assisted reading of the full corpus—tools that will let Uthiramerur be studied

not as an isolated marvel but as one precisely modelled case within a connected history. The instrument will never replace the inscription on the temple wall; used well, it will help us read that wall with greater exactness than before.

To summarise, this paper treated the tenth-century Uthiramerur governance records as structured data rather than narrative testimony. After clarifying that the surviving corpus is lithic—the palm-leaf ballot survives only as the kuṭavōlai procedure it enacted—the study reconstructed the system as a formal design: an eligibility filter coupled to a lottery, a portfolio of functional committees, a rotation rule, fiscal responsibilities, and an elaborate accountability machinery of audit-conditioned office and kin-exclusion. Situated within the quantitative Tamil epigraphy of Karashima and Subbarayalu and the practice of distant reading, Uthiramerur emerges as an engineered governance architecture, while the method's limits—a small, prescriptive corpus—are acknowledged throughout [12-14].

9. CONCLUSION :

Read as data, the Uthiramerur inscriptions disclose a governance system of remarkable coherence. Its framers coupled a demanding eligibility filter to an impartial lottery, separated administration into functional committees, forced turnover through rotation, and guarded the system with controls against faction, entrenchment, financial abuse, and collusion. Described in the language of institutional design rather than antiquarian narrative, this is a recognisably engineered architecture of accountable office, indigenous to the Tamil country and documented a thousand years before the modern vocabulary of governance was coined. Yet the same analytic discipline that reveals the design also fixes its limits. The corpus is small, lithic, and prescriptive; it records the rules of the ballot but none of its results, and its qualified pool was a propertied, learned elite. Data mining an ancient epigraphic record is therefore an act of structured interpretation and comparative linkage, not of statistical discovery from abundant data. Its proper achievement is to make an old and much-quoted text newly precise—to set the kuṭavōlai beside other governance designs, ancient and modern, on equal formal terms. Conducted with candour about the evidence and in partnership with philology, governance analytics enriches rather than supplants the study of the Tamil past.

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