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A study on the built heritage and visual perception towards the fading Imageability of the rural settlement of Narasinganpettai, Thanjavur in Tamil Nadu India

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ABSTRACT

Increasing urbanization has a significant effect on the loss of heritage value of any rural settlements. Over the years due to the changing technology and trends, the characters that define the identity is fading away, losing its historic value and significance. Rural India is fast losing its historic fabric and identity. In this context, perceiving the heritage of a settlement which is fading slowly and reestablishing its identity becomes a virtue. The Imageability of any settlement is the unique defining character that gives the settlement its identity. This Imageability is defined by the settlement pattern, the quality of the streets, and the elements of built heritage. The aim of this paper is to establish the defining characteristics, understand the Imageability of the rural settlement of Narasingampettai village at Thanjavur district, physical elements, morphological evolution that has taken place over the years and its effect on the alteration of the image of the settlement. A heritage pocket was identified and around 160 houses were observed and documented insitu and a questionnaire survey for a random stratified sample of 150 people was conducted. The data is statistically analyzed to ascertain the characteristics of the built heritage, identify the unique architectural elements, and evaluate the visual perception. The results show a high dependency on the built heritage for imageability. The results of which could be used for evaluating and re-establishing its identity states that amongst the three factors: age of the building, predominant building materials and the architecture style, the third factor has the highest impact on determining the imageability of the settlement. Several architectural elements collectively contribute to the style of a building and to preserve the image of such buildings, traditional elements can be preserved or recreated using contemporary materials.

Key words: *Imageability, Built heritage, Visual perception, Multinomial regression, Tamil Nadu, Rural India.*

Introduction

The imageability of any settlement is the unique defining character that gives the settlement its identity and is defined by the settlement pattern, quality of streets and most prominently the built heritage. Human settlement and environment can be referred to the unity of nature, humanity and space, which could be formed under a certain geographical environmental background (Zhou Jiaxing, 2021). The heritage value of the built environment contributes to the sustainability of a community's culture. An Individual or a group of building, structures, monuments or instillations or remains can be considered

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a built heritage when it is strongly associated with architectural, cultural, social, political economic and military history (Wicklowcounty Report, 2010). Unfortunately, many such spaces have lost their historic significance in the process of urbanization and to keep up with the trend of the changing world. A crucial stage in historical preservation is identifying the characteristics of chosen values and various levels of significance in the constructed heritage. These identified characters also define the Imageability of the built heritage. The current study focuses on the physical factors that affects the innate elements like building and appearance (material, façade design) and enhance the imageability of the settlement choosing the concept of heritage in its fundamental definition, stimulates a certain sense of belonging, evoke feelings, and create a lasting impression to their past and a strong image for places. The historical settlement of Narasinganpettai possesses strong characters in the form of architectural, social and cultural values. Unfortunately to upkeep with the changing world these elements have slowly started deteriorating in some case even vanished. This paper aims to identify the unique architectural elements and spaces, understand its significance and impact on the imageability.

Review of literature

Kevin lynch defines Imageability as the measure of how a physical object, word or environment evoke a clear image in the mind of a person observing it. He also argues that cities contain a set of crucial physical elements that people use to understand the environment, orient themselves inside of it, and assign it meaning (Kevin Lynch, 1960). These crucial elements possess strong cultural, social or architectural values. Amongst this, the architectural elements are strongly associated with the visual perception of a town. The existences of an architectural element correspond to a significant change in visual perception level (Kiruthigan and Thirumaran, 2017). Imageability can be measured objectively or subjectively. Objective measurement is carried out by measuring the physical environment's quality in association with design criteria in shaping the image of a place and contrasting to this subjective measurement uses the user's perception (Jenny Ernawati, 2020). A lot of study made on the heritage of built environment in Indian rural villages speaks on the climatic value and thermal comfort of the habitants. The most important value of a vernacular heritage house is the socio- cultural value and the effect of this on the fading Imageability of the settlement. Initially only heritage sites were credited as historic and had heritage values. (Hearn, 1990 and Ruskin, 1885). Riegel, (1996) was among the first to classify heritage values into historical and contemporary. Built heritage can be defined as the set of buildings which have an undeniable socio-historic value in the communities they are present in. South India heritage settlements had an influence of the caste systems which was reflected in the planning pattern and spatial planning of the houses. A more inclusive style of planning was adopted which adhered to the traditional values and reflected secularism. The Hindu south Indian families widely practiced a jointl family system, which had to include the need of every gender, generation and activity of the people. These houses were multifunctional and were designed to the everyday need, occupation and special functions and festivals (Himani Bhasin, 2016).

Study area background

The factors considered while selecting the study area was that it had to be a heritage settlement at least a 100 years old, with vernacular houses that has been inhabited for at least more than three consecutive generations. The other important factor was that a good mix of heritage house and reconstructed new age homes present in the same neighborhood so as to understand the changing quality and its effect on the Imageability of a rural setup. The chosen study location is the rural settlement of Narasingampettai which is located in Thiruvidaimarudur taluka of Thanjavur district in Tamil Nadu, India. It lies at a latitude of 11.1018559 N and longitude of 79.6522058 E which is situated 7km away from sub-district headquarter Thiruvidaimarudurtahsildar office and 65km away from district headquarter Thanjavur (Villageinfo.in, n.d 2022). The total geographical area of village is 375.75 hectares. Narasingampettai has a total population of 5,342 peoples, out of which male population is 2,655 while female population is 2,687. Literacy rate of Narasingampettai village is 83.92% out of which 87.50% males and 80.39% females are literate (Census Data 2011). There are about 1,346 houses in Narasingampettai village. Narasinganpettai thrives on farming, river Cauvery and Manjalaar supply water for farming. This village also thrives on silk handloom saree weaving, a

large population is found to be weavers (Map of Narasingampettai Village in Thiruvidaimarudur, District- Thanjavur Tamil Nadu - India, n.d.) World famous Narasinganpettai Naadaswaram is made here and has earned the geographical indication tagunder musical instrument 15 (Tamil Nadu's Narasingapettai Nagaswaram Got GI Tag, 2022).

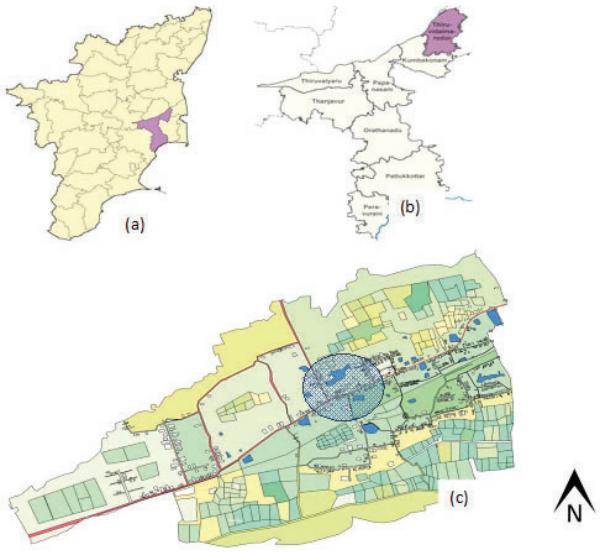

Fig. 1(a). State map of Tamil Nadu showing Tanjavur District, (b) District map of Tanjavur showing Thiruvadaimaruthurtaluk, (c) Map of Narasinganpettai village

Origin and genesis

A settlement's location and development is influenced by its surroundings. The location or the site for a village is actually the chosen spot where the village is established (Singh, 2022). Three important factors define the settlement and the pattern which are namely the geographical setting, the functional/ occupational aspect and the form or shape of the settlement. The pattern of settlement is in such a way that it has expanded in the land parcel between the two rivers Kaveri and Veera Cholan in a linear and clustered fashion and is observed to expand in the similar pattern.The village is segregated based on caste living in clusters spread along a linear access route. Further in the clusters it can be observed that the houses are present on both the sides of a linear path. Another interesting feature of this village is the presence of a small temple at the important nodes or at the end of primary roads of the village making it a landmark feature. With the depletion of heritage homes due to various factors, many home owners go in for demolishing and re-constructing a new house in the old site. Also with the increase in population and changing construction trends, the village is observed to expand vertically as well.The unique identity of the streets is the heritage homes as old as 100 years and the unique sky line. The residence in the street is predominantly row houses which are on both the side of the street. Although some of these heritage homes are now rapidly replaced with modern homes and planning of these modern homes affect the quality of the street.

Methodology

This study employed both a quantitative and a

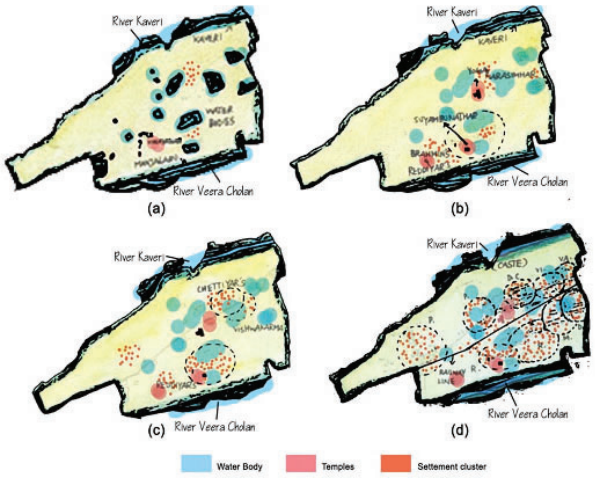

Fig. 2. Showing (a) Water bodies and initial settlement (b) Settlement during the 'MedivalChola' period around 800CE (c) Settlement during the 'Vijayanagara' empire 14th century CE (d) Settelment during and after the 'British Empire' 19th and 20th century CE

Fig. 3. Vinayajgar Temple, Mela Devanga Street

Fig. 3a. Street 1 of Mela Devanga cluster

qualitative approach where a superficial documentation of the settlement to assess the heritage value and a questioner survey to assess theperception of the public was done. The study was done on site to avoid bias and was documented using photographs and rudimentary sketches. Further the heritage architectural elements were identified and a used as primary determining factors to assess the heritage value of the built environment. An empirical analysis was done on the identified elements which were used as variables. Parallel to this, from the collected data of 150 questionnaires a reliability test was conducted to verify validity of the survey. A method of random stratified sample was adopted in the questioner survey.A population sample of one hundred and fifty people was chosen at random to participate in the study depending on their availability and interest. This group represented the neighborhood of Mela-Devanga Street, the chosen study location.

Theoretical framework on the characters defining the heritage of Narasinganpettai

To understand the value of the built heritage, three important factors were considered namely the age of the building, the materials used in the construction and the predominant architectural elements that define the style of the building. In the study area of Mela-Devanga Street a survey of the houses was carried out and buildings with high, moderate and low visual value were recorded as seen below Fig 4. The Imageability is influenced by three key components, which are the age of the building, materials used and the planning style adopted. Fig. 5 shows the theoretical frame work of the study. Selected three key elements have a significant impact on the visual perception of the streets on Mela-Devanga. These elements and the quality of the streets affect the Imageability of the settlement. Unfortunately these elements have been undergoing rapid changes over the years losing its value. The conceptual framework of this study is to understand the quality of heritage value possessed by the Mela-Devanga settlement influenced by the above mentioned.

Experimental Analysis

To understand the degree of impact on the Imageability of the rural settlement a correlation study between the dependent variables and the independent variables affecting the dependent was done. The data analysis was done using the software SPSS.

Fig. 4. Imageability of the streets in the study area of Narasinganpettai

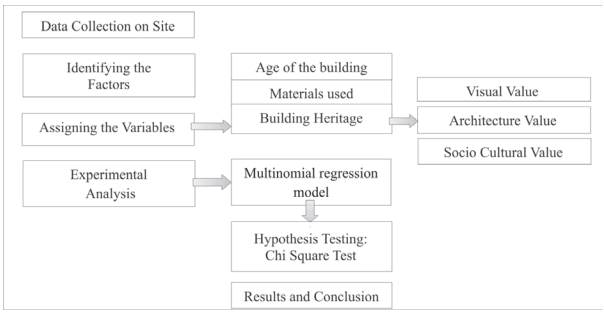

Fig. 5. Theoretical frame work of the study

Dependent variables

The level of Imageability is affected by the ratio of heritage buildings to the newer ones. Here this value is calculated for each of the four streets that make up the *Mela Devanga* cluster. The dependent variable affecting the Imageability is calculated as the percentage of heritage homes present in a given street.

$$B_{Img} = \frac{\text{No of } B_1 \times 100}{\text{Total No. of B}} \quad .. (1)$$

Here, B_{img} denotes the level of Imageability in each street affected by the percentage of heritage homes that are present, and B represents the total number of houses and B1 represents the heritage homes that are present which are at least a 100 years old. The selected buildings were classified as seen in Fig. 4.

- **B1** - Buildings highly affecting the Imageability

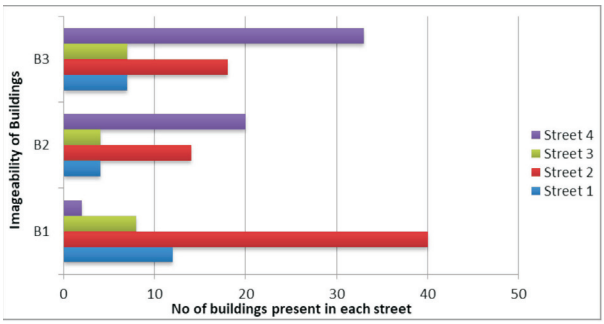

Fig. 6. Graph showing the varying level of Imageability in each street of the study area

- **B2** – Buildings moderately affecting the Imageability
- **B3** – Buildings least affecting the Imageability

The said above value was taking as the dependent variable for the ordinal regression to get the standard deviation and mean for all the observations as cited in (Kiruthigan and Thirumaran, 2016).

Independent variables

- **X1 Age of the Building:** Buildings classified into four groups of Age 0-30; 31-60; 61-100; >100.
- **X2 Materials used for construction:** The specific kind of materials used for the construction of the building in different parts like the roof, floor, wall and joinery.
- **X3 Planning style:** The planning style of the house was determined comparing the existing elements in the building to a 'Likert Scale' (Fig. 9) that classifies the building into a vernacular building, modern-day building and mixed type

Fig. 7. Showing building images with various architectural elements

of building. The qualities that impacted the assessment are the visual value, architectural value and the socio cultural value.

The value of the building was determined based on the score obtained by the building on a scale on 1 to 5 with 1 being the least and 5 being the best for its visual element, planning element and material element.The level of impact the above said element had on the Visual value, Architectural value and Socio-Cultural value was assessed**.** The Fig. 8 below represents the classification and elements that determine the value of the building.

$X3_1$ Visual Values: The aesthetic or artistic qualities of a building, space or a structure (James, 2021).

$X3_2$ Architectural Values: The inherent aesthetic and physical characteristics of created objects, spaces, buildings or streets (Architectural Value, n.d.).

$X3_3$ Socio Cultural Value: Socio-Cultural value in buildings is a concrete manifestation of society and its culture (Boubir, 2021).

The above mentioned three variables further depended on the smaller elements that make it which includes the Visual element, architectural element and the material elements.

It can be observed that the modern day building group falls under the measure of 2.5 to 3.5 in the Likert Scale as many buildings that have a higher degree of intricacy in details compared to the buildings that were built earlier (Likert, 1932). Where, it was observed that the vernacular buildings had highest level of intricacy. Fig 10 shows the difference of detailing present in the three groups of building.

Study of the Experimental Model

Test of reliability by *Cronbach alpha* analysis.

The reliability of the various independent variables and the element that affect the dependent variable was studied using the *Cronbach Alpha* method. It is considered to be a measure of scale reliability. The calculation of *Cronbach alpha* is equivalent to averaging all potential split-half reliabilities (L.M. Collins, 2007).

$$\alpha = (k/(k-1)) \times (1 - (\Sigma s^2_i / s^2_T)) \quad .. (2)$$

Here k represents the number of variants, Ss^2_i represent the sum of the variance and s^2T represents the variance of the sum.

Regression Analysis

Regression analysis is a reliable method of identifying whichvariables have impact on a topic of interest.A regression is used to predict the dependent variable based on the various independent variables.Similar methods have been used to establish the relationship between the built heritage to the architectural elements that influences the visual image. The effect of the change in an independent variable on a dependent variable can be assessed using the ordinal regression method (Norusis, 2004). The ordinal regression model can be defined as

$$\frac{log(P(Y \leq i))}{p(Y>i)} = log\ it\ (P(Y \leq i)) \quad .. (3)$$

$$\text{logit}\ (P(Y \leq i)) = \beta i0 + \beta i1X1 + \beta i2X2 + \ldots .. \beta inXn \quad .. (4)$$

In equation (3) 'i' denotes the effect on Imageability. Here (4) represent the slope equation for the *Parallel line assumptions,* where βj_0 represents the intercept and β_{j1}, $\beta_{j2.....}\beta_{jn}$ represents the coefficient for the respected variables X_1, X_2,….. X_n. The parallel line assumption indicates that the intercepts are different for each variable but the slope remains the same. If the relationship between the dependent and independent variable indicated by the slope is different across all the independent variable, the parallel line assumption is violated. In this case multinomial regression analysis should be used to find the impact.

Multinomial Regression analysis

A multinomial regression is primarily used when there is more than two dependent variables. The probability of each category of the dependent variable is predicted from the values of the independent variable.

$$p = \frac{\exp(a+b1X1+b2X2+b3X3+ \ldots)}{1+\exp(a+b1X1+b2X2+b3X3+ \ldots)} \quad .. (5)$$

In equation (5) p is the probability of the dependent variable which is equal to the exponential value of slope divided by one plus exponential value of slope. The software SPSS was used to run the test.

Hypothesis testing

From the above analysis the assumed hypothesis is tested and the Null hypothesis is rejected to prove the alternative hypothesis H_1

H_0-The Imageability of a settlement is not influenced by the built heritage

H_1-The Imageability of a settlement is influenced by the built heritage

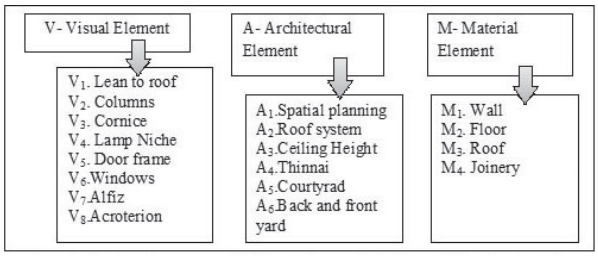

Fig. 8. Chart showing the groups of different elements that impact the planning style

Results and Discussion

The study of the Imageability of the rural settlement of Narasinganpettai was done in the chosen area of Mela Devanga cluster. The settlement pocket consists of a total of 169 houses, which were observed and documented Fig. (4) and a population sample of 150 people were chosen at random to participate in the study. The houses based on the observation were classified into B1 - Buildings highly affecting the Imageability, B2 – Buildings moderately affecting the Imageability and B3 – Buildings least affecting the Imageability. Reliability tests for the variables were conducted using the Cronbach Alpha method. The test results are mentioned below in Table 1. The alpha test indicates that the values are above 0.7 are reliable, acceptable and can be considered as strong independent variables for the study.

Further using these independent variables and taking B1, B2, B3 as dependent variables a simple linear regression test is done to understand the impact of the independent variables on the dependent variable. It was observed from the test that the multiple R is 0.93 (93%), indicating a strong positive relationship between the dependent variable and the independent variables. Additionally the R Square is 0.87, indicating that about 87% of the variation in the dependent variable is explained by the independent variables and the Adjusted R Square is 0.873, indicating that the addition of the predictor variables explains a significant amount of the variation in the outcome variable as seen in Table 2.

Table 1. Showing the Cronbach alpha values obtained for each individual variable

Variable	C. Alpha value
X1. Age of the building	0.779599271
X2. Materials used	0.789379588
X3. Planning style	0.949052378
1.Visual Value	0. 86589008
2.Architecture Value	0.82339142
3.Socio-Cultural Value	0. 74476399

The significant prediction of the model is tested using the values of the *Anova* test which indicates that in regression the degrees of freedom (*df*) is 3,

Absent	No Detail	Partial Detail	Intricate	Very Intricate
1	2	3	4	5
Mixed type building		Modern-day Building		Vernacular Building

Fig. 8. Chart showing the groups of different elements that impact the planning style

(a) (b) (c)

Fig. 10. Image showing the foot of the door frame found in a house which is (a) more than 100 years old, (b) less than 50 years old, (c) less than 20 years old

Table 2. Showing the values obtained from linear regression and anova test

Linear Regression Statistics							
Multiple R	0.93			Anova			
R Square	0.87		*df*	*SS*	*MS*	*F*	*Significance F*
Adjusted R Square	0.87	Regression	3.00	51.95	17.32	48.48	0.001
Standard Error	0.33	Residual	144.00	7.73	0.11		
Observations	150.00	Total	150.00	59.68			

indicating the number of predictor variables. The sum of squares (SS) is 51.95, indicating the amount of variation in the outcome variable explained by the predictor variables. The mean square (MS) is 17.32, which is the SS divided by the *df*. The F statistic is 48.48, which is the ratio of the MS for the regression to the MS for the residual. The significance F is 0.001, indicating that the regression model significantly predicts the outcome variable as seen in Table 2.

The regression equation for this model is:

$Y = 3.38 + 0.29(X_1) + 0.15(X_2) + 0.31\ (X_3)$…… (6)

Where: Y is the predicted value of the dependent variable, X_1 is the age of the building (categorized into four groups: 0-30, 31-60, 61-100, and >100), X_2 is the material used for construction (categorized into six groups based on a combination of four variables), X_3 is the planning factor (rated on a scale from 1 to 5) as explained above in *equation 6*. The coefficients of the equation indicate how much the predicted value of Y changes for each unit increase in the corresponding independent variable, holding all other independent variables constant. X_1, X_2 and X_3 are all statistically significant predictors of the dependent variable, while X_3 is the highest which means that the effect of Planning on the predicted value of Y is statistically significant on a slightly higher level, after controlling for the effects of Age and Materials as seen in *Table 3*

The parallel line model can be written as:

$$Y = \beta_0 + \beta_1(X_1) + \beta_2(X_2) + \beta_3(X_3) + \beta_4(X_1{*}X_4) + \text{å} \ldots (7)$$

Where X_4 is a categorical variable (Equation 7). To test for parallelism, we can perform a likelihood ratio test. If the p-value of the likelihood ratio test is not significant, then we can conclude that the parallel line assumption is met. It can be observed that the p value is less than 0.001 as represented in *Table 4* and hence the parallel line assumption is not met. When this is the case multinomial regression is adopted. The test is conducted under the multinomial regression in SPSS software. The likelihood ratio test also indicates that the final model is statistically significant, with a chi-square value of 140.71 and 6 degrees of freedom (df). The p-value (<.001) suggests that the final model provides a significantly better fit than the intercept-only model. Overall, these results suggest that the final model is a good fit for the data rejecting the null hypothesis and proving the alternative hypothesis H_1 (Table 4). The results of the model fitting criteria also from Table 4 shows that the final model has an AIC (Akaike Information Criterion) of 17.823, a BIC (Bayesian Information Criterion) of 36.363, a -2 log-likelihood of 1.823. This model includes at least one predictor and fits the data much better than the intercept-only model. Based on these results, it can be concluded that the final model is a much better fit for the data compared to the intercept-only model also proved by the significant likelihood ratio test as discussed above. The Cox and Snell measure of .847 indicates that the final model explains 84.7% of the variability in the dependent variable. The Nagelkerke measure of .988 suggests that the final model is a very good fit for the data, as it explains 98.8% of the total variation in the dependent variable. The McFadden measure of .963 indicates that the final model accounts for 96% of the variation in the dependent variable, which is a high level of explained variation. Overall, these results suggest that the final model provides a very good fit for the data, with a high level of variation explained by the predictors as seen in Table 4. Similarly from Table 4 the goodness to fit data shows that the for the Pearson statistic, a value of 0.000 indicates that the observed and expected values are in perfect agreement, with no evidence of lack of fit. Similarly, for the Deviance statistic, a value of 0.000 indicates that the model fits the data perfectly.

Further results from the likelihood ratio tests suggest that by including an additional predictor X_4 (as seen in Equation 7), to the predictor variables planning, materials and age of the building significantly improves the fit of the model as indicated by the

Chi-Square values and associated p-values (Sig.) From the above discussion it can be observed that the Null hypothesis can be rejected under the factors that the value of F > Significant F (F crit) Table 2, (Andrew, 2016) and the value of P is < 0.005, Table 3 & Table 5 (Di Leo and Sardanelli, 2020).

Conclusion

The present study on the fading Imageability of a rural settlement was based on a research survey. The research selects Narasinganpettai, Thanjavur in Tamil Nadu India as the research area for suitability evaluation of study on the built heritage and visual perception towards the fading Imageability of the rural settlement.This study identifies the strong association of built heritage to the imageability of a space. The built heritage is predominantly associated by the age of the building and materials used, although the visual perception is the most important factor that influences the Imageability of a space. The architectural elements that define the imageability are fading away or replaced by simpler alternatives that only give a considerable appearance and impression to the original elements. Several such elements are present in several rural pockets of Tamil Nadu, even India which defines the vernacular architectural style. Preserving these ele-

Table 3. Shows the values of coefficient, SE, t Stat and p value for the corresponding Independent variable

	Coefficients	Standard Error	t Stat	P-value
Intercept	3.38	0.18	18.33	0.0001
X1 Age of the Building	0.29	0.04	10.50	0.0001
X2 Materials used	0.16	0.03	5.15	0.0001
X3 Planning style adopted	0.31	0.03	7.75	0.0001

Table 4. Model fitting information, Pseudo R square test and Goodness to fit data.

Model Fitting Information						
Model	Model Fitting Criteria			Likelihood Ratio Tests		
	AIC	BIC	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	146.540	151.175	142.540			
Final	17.823	36.363	1.823	140.717	6	<.001
Pseudo R-Square			Goodness-of-Fit			
Cox and Snell	.847		Chi-Square	df		Sig.
Nagelkerke	.988	Pearson	0.000	26		1.000
McFadden	.963	Deviance	0.000	26		1.000

Table 5. Likeliehood ratio test for reduced model (including an additional predictor X_4)

Likelihood Ratio Tests						
Effect	Model Fitting Criteria			Likelihood Ratio Tests		
	AIC of Reduced Model	BIC of Reduced Model	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	35.154	49.059	23.154	21.331	2	<.001
Planning	14.158	28.063	2.158	.0035	2	.01
material	13.823	27.728	1.823	.000	2	1.000
Age of building	81.904	95.809	69.904	0.068	2	.001

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

ments is very important as it is the identity of a culture. This can be done through documentation and creating awareness amongst the people about the importance of these small but significant elements and the impact it has on the culture and heritage of a community. This research hopes to throw light on the architectural elements of various similar heritage settlements to preserve and conserve the built heritage of a culture.

References

Adda, 247. Tamil Nadu's Narasingapettai Nagaswaram Got Geographical Identification Tag," March 23, 2022. https://currentaffairs.adda247.com/nadaswaram-music/.

Andrew F.Siegel, A. F. 2016, August 16). Practical Business Statistics.Academic Press.

Architectural value. (n.d.). Architectural Value. https://www.bcpcouncil.gov.uk/News/News-Features/Dorset-Local-Heritage-List/Nomination-Criteria/Architectural-value.aspx

Boubir, N. 2021. Examples of Socio-Cultural Architecture. *International Journal of Humanities and Educational Research.* 3(05): 234–239. https://doi.org/10.47832/2757-5403.5-3.21

Di Leo, G., Sardanelli, F. 2020. Statistical significance: p value, 0.05 threshold, and applications to radiomics—reasons for a conservative approach. *Eur Radiol Exp.* 4: 18 https://doi.org/10.1186/s41747-020-0145-y

Ernawati, J. 2020. Imageability of a Historic Street and Its Influence on People Preference. *Proceedings of the International Conference of Heritage & Culture in Integrated Rural-Urban Context (HUNIAN 2019).* https://doi.org/10.2991/aer.k.200729.028.

Himani Bhasin, 2016. Change in Family Structure in the Modern Times. *International Journal of Indian Psychology.* 3(4). https://doi.org/10.25215/0304.169

James, B. 2021. Graphic Design and Electronic Literature: Building Bridges between New Neighbors. *The International Journal of Visual Design*. 15(2): 41–55. https://doi.org/10.18848/2325-1581/cgp/v15i02/41-55

Jiaxing, Z., Lin, L., Hang, L. and Dongmei, P. 2021. Evaluation and analysis on suitability of human settlement environment in Qingdao. *PLOS ONE.* 16(9): e0256502. https://doi.org/10.1371/journal.pone.0256502

Kiruthiga, K. and Thirumaran, K. 2017. Visual perception on the architectural elements of the built heritage of a historic temple town: A case study of Kumbakonam, India. *Frontiers of Architectural Research.* 6(1): 96–107. https://doi.org/10.1016/j.foar.2016.10.002.

Collins, L.M. 2007. *Science Direct.* "Research Design and Methods https://doi.org/10.1016/B0-12-370870-2/00162-1.

Likert, R. 1932. A technique for the measurement of attitudes. *Archives of Psychology.* 140: 1–55.

Local post office, Narasinganpettai Narasingampettai Village in Thiruvidaimarudur, District- Thanjavur Tamil Nadu - India, n.d

Lynch, Kevin, 1918-1984. (1960). The image of the city. Cambridge, Mass.: MIT Press. ISBN 0-262-12004-6.OCLC 230082.

Map of Narasingampettai Village in Thiruvidaimarudur, District- Thanjavur Tamil Nadu - India.(n.d.). CI Bootstrap 3. https://etrace.in/census/village/narasingampettai-thiruvidaimarudur-district-thanjavur-tamil-nadu-638449/

Narasingampettai Village in Thiruvidaimarudur (Thanjavur) Tamil Nadu | villageinfo.in. (n.d.).Narasingampettai Village in Thiruvidaimarudur (Thanjavur) Tamil Nadu | villageinfo.in. https://villageinfo.in/tamil-nadu/thanjavur/thiruvidaimarudur/narasingampettai.html

Narasingampettai Village Population - Thiruvidaimarudur - Thanjavur, Tamil Nadu. (n.d.). Narasingampettai Village Population - Thiruvidaimarudur - Thanjavur, Tamil Nadu. https://www.census2011.co.in/data/village/638449-narasingampettai-tamil-nadu.html

Norusis, M. 2004. SPSS 13.0 *Advanced Statistical Procedure Companion*. Prentice Hall, New Jersey.

Riegel, A. 1996. The modern cult of monuments: its essence and its development. Historical and Philosophical Issues in the Conservation of Cultural Heritage (Los Angeles: Getty Conservation Institute). 69–83.

Ruskin, J. 1885. The seven lamps of architecture 521, John B. Alden. Ruskin, J. 2013. The Lamp of Memory, 1849. Historical Perspectives on Preventive Conservation. 6: 2.

Singh, J. and Suksheetha Adulla, 2022. Spatial Expansion of Cities, Urban Design Lab. Urban Design Lab. https://urbandesignlab.in/spatial-expansion-of-cities/https://doi.org/10.25215/0304.169.

Wicklow County Development Plan, 2010. Wicklow County Development Plan 2010-2016. In wicklow.ie.Wicklow County.Retrieved April 9, 2023, from https://www.wicklow.ie/Living/Services/Planning/Development-Plans-Strategies/National-Regional-County-Plans/Wicklow-County-Development-Plan/Wicklow-County-Development-Plan-2010-2016.

Youn-Jeng Choi and Qingzhou Shi, C.H. 2021, April 29. Companion to BER 642: Advanced Regression Methods. Companion to BER 642: Advanced Regression Methods. https://bookdown.org/chua/ber642_advanced_regression/