

The Implementation of Engineering Sciences using Matrix Method for Cultural Heritage Assets



I Nengah Tela, Amran Hamzah

Abstract: *One of several forms of implementation of engineering knowledge is the matrix method, one of them Market Appeal-Robusticity Matrix method. With this matrix the research conducted is (1) evaluating Minangkabau cultural heritage assets in Tanah Datar District in terms of their uniqueness and importance as tourist attraction assets, and (2) Evaluating Minangkabau cultural heritage assets in terms of the quality and current state of Cultural Heritage Tourism in Tanah Datar District. Furthermore, the Market Appeal-Robusticity Matrix method has been used to assess cultural heritage assets in Tanah Datar. Then for further information, in addition to direct observation, obtained from the tourism sector, travel agents, government, asset owners, and conservation specialists for questionnaires and interviews. The results of this research indicate Batu Angkek-Angkek and Istana Basa Pagaruyung, Sari Tabek Hall, Rao-Rao Mosque, Tuo Kampai Nan Panjang House, and Batu Basurek achieved the highest scores. Therefore, one of the implications of this research is the proposition of specific steps to improve the image of tourism products including the formulation of policies and management for the government, asset owners, and the community of Tanah Datar District with the aim of preserving these cultural heritage assets, so that this potential remains and able to become an economic resource, and also to position assets as a unique tourist product location for both this area and Indonesia.*

Keywords : *Engineering Sciences, Cultural Heritage Assets, Market Appeal, Robusticity, Tanah Datar District..*

I. INTRODUCTION

One of several forms of implementation of engineering sciences is the matrix method, one of them Market Appeal-Robusticity Matrix method. Cultural heritage assets is commonly known in West Sumatra and Indonesia and is considered important for assets development. This type of cultural assets is defined as a form of assets with special interest, which serves the desire of tourists to learn about

history and lifestyle goals [1], [2]. Cultural tourists learn a lot from foreign cultures and ways of life. This includes the desire to become a temporary part of the local community. Activities to see and learn cultural assets, festival events or visit a historical monument, and appreciate folklore or art.

[3] introduces a new type: tourists who visit cultural sites for social prestige for visiting them. Therefore he refers to three broad groups: (1) i.e. motivated tourists (who choose their destination according to cultural opportunities); (2) groups of tourists who are inspired (who choose destinations based on international recognition) and (3) groups of tourists who are interested (those who at some time feel attracted by culture, even though that is not their main motivation). The classification according to interest, according to [4] based on research conducted in Hong Kong, which distinguishes between five types: (1) highly motivated cultural assets; (2) sightseeing (whose interests are visiting the main famous tourist attractions: the most iconic of the destinations on offer); (3) ordinary cultural assets (culture is a less important element); (4) incidental cultural assets (culture is not an interesting element and cursory contact) and (5) accidental inventor (culture is not an interest but, conversely, when there is contact he becomes very involved and has great experience).

Efforts to find a model for assessing assets potential and asset management in destinations have generally been done by many people. [5],[6], for example, proposed a resource-based theory to evaluate the competitive potential of certain types of assets in a destination. Generally they find that the competitive advantage of inherited assets assets is always at the target of (1) ownership of assets, (2) problems of scarcity, (3) something valuable, and or difficult to imitate or replace. While assessments and asset management concentrate on assessing the assets potential of a geographical area, there are other assessments such as empirical research that has expanded to the problem of assets partnerships and stakeholder involvement in the assets planning process. [7] research shows that it is necessary for heritage managers to appreciate meaningful elements of local culture, meaning that the place of inheritance must have a group of assets that are culturally meaningful. Namely the existence of relevant criteria for assessing the value of inherited assets, according to [4], the assessment includes its scarcity, potential, representation, visual appeal, evidence of technical processes or innovations, and associations with special people, with cultural practices or certain spiritual beliefs.

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* Correspondence Author

I Nengah Tela*, Doctoral Student at Universiti Technology Malaysia Architecture Department, Universitas Bung Hatta, Padang, Indonesia. Email: nengagtela@gmail.com

Amran Hamzah, Centre for Innovative Planning and Development (CIPD), Faculty of Built Environment, Universiti Technology Malaysia, Johor Bahru, Malaysia. Email: merang@utm.my

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Other than that the evaluation of aesthetic, historical, scientific, and social values is also important to understand the significance of cultural assets.

According to [8], assessing cultural significance must involve two main steps: (1) examining the potential of the asset market (Market Appeal) and evaluating Robusticity (asset resilience), namely the ability of assets to cope with increased traffic [4]. In this process, assessment of market attractiveness determines whether inherited assets have attractive features for tourists and must therefore be correlated with Robusticity assessments that determine the extent to which visits do not interfere with the cultural value of assets. Research objectives, several research objectives have been developed as follows. (1) Evaluating Minangkabau cultural heritage assets in Tanah Datar District in terms of their uniqueness and importance as assets object assets (2) Evaluating Minangkabau cultural heritage assets in terms of the quality and current state of Cultural Heritage Assets in Tanah Datar District.

II. METHODOLOGY

Research methods through (1) documentary research (2) site observation; (3) questionnaire surveys are the three main research techniques used. All stages of this method are integrated in the matrix method using the Market Appeal-Robusticity Matrix method.

In this research ten assets in the Tanah Datar District, West Sumatra, Indonesia will be examined, namely: (1) Istano Basa Pagaruyung; (2) Batu Basurek; (3) Limo Kaum Mosque; (4) Medan Bapaneh Batu Batikam; (5) Rumah Tuo Kampai Nan Panjang; (6) Balairung Sari Tabek (7) Makam Panjang Tantejo Gurhano; (8) Rumah Gadang Bandar Kuning; (9) Batu Angkek-Angkek; (10) Rao-Rao Mosque. These ten assets have been developed more than 50 years ago and are well-known by the local and widespread community in Indonesia. Then, all of these assets will be analyzed based on aspects of inheritance value.

First, document research aims to gather background information to assess the cultural significance of the assets and investigate the factors that hinder the development of heritage assets. Second, sources include government research and planning documents, printed assets reports and promotional materials, as well as academic literature on assets planning. Third, site observations in the study area are very important in completing the assessment process, where researchers record information such as architectural style and integrity of historic buildings, availability of information on the location of the streets, provision of signage and tourist facilities, and tourist behavior. Questionnaire surveys are (see table 1) to collect traveler opinions about the accessibility and attractiveness of assets, availability of tourist information, and provision of facilities.

Table 1: Group of Respondents

The Institution	Distribution Amount	Amount Received	Amount not Returned
Tourist Agency	125	115	20
Traveler	80	75	5
The Government in the field of assets	50	45	5

The owner / person in charge of the asset	25	22	3
Conservation Specialist	20	18	2
Amount	300	265	35
Percent (%)	100%	90%	10%

The study method involves several problems such as the following: First is the criteria in knowing the Minangkabau cultural heritage assets in the Tanah Datar District area in terms of their uniqueness and importance as assets of the assets attraction. Initial studies were carried out on Minangkabau cultural heritage assets involving aspects such as having historical values, commonly known and having existed for more than fifty years. Second, is to know the Minangkabau cultural heritage assets in terms of quality and conditions during the area of the cultural heritage assets in Tanah Datar District. The approach used to determine assets that have good value and quality value for assets that are in accordance with the conditions during the period examined in this investigation. Third, is to suggest a strategy or steps for the development of cultural heritage assets in Tanah Datar District, with analysis using the market appeal-robusticity matrix method. Using this method, the value of Minangkabau cultural heritage assets in Tanah Datar District can be determined based on the value of the uniqueness and quality of assets in terms of asset strength.

A. Data analysis

Raw data obtained through interviews are reinterpreted and questionnaire data are recorded and entered into a computer evaluation system and analyzed through the use of excel software. Data analysis is performed to process the data obtained through the process of data collection, and the data collected is analyzed until the research objectives are answered. The analytical procedures discussed are focused on the relationship of each element or indicator that needs to be evaluated. There are four indicators, namely market attractiveness, product design needs, cultural significance and resilience.

Each asset is assigned or chosen by its variables, with separate scores, divided into assets and a subset of cultural heritage management. Depending on the intended setting, this score can be shown by two options (yes / no) or by using a scalepoint system.

B. Point Scale System

A point scale system that is carried out for high ratings will be given a score of 5 (five). Evaluation criteria will be given a value of 5, if the asset is categorized as good for all criteria on the indicators, following the assessment that matches the highest criteria

On the second level. At this level the assessment of asset criteria is valued at 3 (three), with a standard rating. Assets have a common feature for each indicator criteria assessment.

Ranking If the valuation of indicator assets is bad, such as negative or irrelevant effects on cultural heritage assets, a value of one will be given. This shows the asset has the lowest value for each indicator criteria.

Evaluation criteria are defined for the valuation of assets analyzed for each indicator and sub-indicator with different criteria, as follows:

- Value 5 for high ranking.
- Value 3 for medium / regular assessment.
- Value 1 for low rank.

After valuation is determined based on a given score, this criterion will be used to provide an asset valuation standard. According to [8], the assessment of cultural heritage assets is based on variables in the cultural heritage assets sub-index, as listed in Table 2.

Table 2: Variables in the Cultural Heritage Assets Sub-Index

Assets	Cultural Heritage Management
<p>A. Market appeal:</p> <ol style="list-style-type: none"> 1. Beauty and the environment. 2. Identification of assets outside the location. 3. National symbols or icons. 4. Evocative assets. 5. Support the attractiveness aspects around research. 6. Attractions for special needs (funeral rites, festivals and sports). 7. Assets product equipment is being studied. 8. Assets activities in the study area. 9. Institutional goals in heritage and culture. 10. Internal (government) political support. <p>B. Product design needs:</p> <ol style="list-style-type: none"> 1. Accessibility to Asset Supporters. 2. Accessibility to the location of assets of the population area. 3. Ease of supporting assets. 4. Attractions between each surrounding asset. 5. Facilities (toilets, parking, parks, information, etc.). 	<p>A. Cultural significance:</p> <ol style="list-style-type: none"> 1. Value of beauty (architect). 2. Historical value. 3. Educational value. 4. Social value. 5. Scientific value. 6. Rarely or Ordinary (local, regional, nose). 7. Representativeness (local, regional, national) <p>B. Robusticity:</p> <ol style="list-style-type: none"> 1. Strength of assets. 2. Repair the parts. 3. Management plans or policies in the study area. 4. Regular monitoring and feeding. 5. Potential to involve and consult with building owners. 6. Potential negative impacts for visitors are high on: Surface assets, local lifestyles, and cultural traditions. 7. Potential changes (some development products) to negative impacts on: Appearance of assets, lifestyles and local cultural traditions. 8. Frequency of tourists or visitors.

Before the point scale, the assets were first classified according to the assets function, then plotted against the level of cultural heritage assets in the Flat Land District, using the Market Appeal Method - the Robusticity Matrix method. The requirements for asset valuation are based on the variables of each indicator that has been classified and will also determine the asset plot in the form of a matrix.

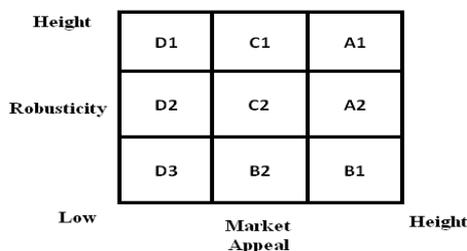


Figure 1. Market Appeal-Robusticity Matrix on Assets Potential, Source: [4], This matrix shows the relationship between the Robusticity continuum and Market Appeal.

Level A assets are places that have the highest value (A2) for Market Appeal and from the highest rank (A1) to (A2) for Robusticity. This asset is ideal for coordinating assets activities because it has continuity with tourist attractions and can be used at a significant level. However,

conservation assessments are categorized as second rank and are proposed to protect cultural values from high tourist or visitor impacts. Grade B assets have a high category (B1) to moderate (B2) for Market Appeal but are low to strong. Low Robusticity means that the physical surface of fragile assets or cultural values is very sensitive to important impacts on the arrival of visitors or tourists. Tourists have a high interest in assets but because of physical fragility, their reception capacity is limited to frequent use. 'C' Grade Assets have a simple Market Comparison and have a high resilience (C1) to moderate / moderate (C2). From a assets perspective, there are two types of management options available for assets. This is because these assets have good physical strength, therefore, these assets can accommodate a high number of tourists compared to the proposed application market. Implementing a management approach for optimal asset development or enhancing the tourist experience of market attraction is possible. Another alternative is that management policies can be implemented by maintaining the status quo, due to the limited number of tourists coming.

Grade D assets have a low market appeal (D1) and do not (D2) attractiveness to tourist arrivals, lack of asset attractiveness, and intrinsic value of assets that do not satisfy tourists. These types of assets need to be managed for other types of assets with challenges, assets managed by others, and promotion of limited assets.

The determination of the criteria and characteristics of indicators is done as a direct approach to cultural assets related to urban assets. Each criterion is used to obtain a score, based on this character will be known asset categories in assets development. Assets are scored to distinguish between situations and levels of tourist satisfaction. All of these efforts have been carried out by conducting on-site research and interviews based on the types of tourists or visitors visiting the site. To determine each indication, an explanation of the sub-indicators will be explained below.

C. Attraction of Cultural Assets

The main purpose of the analysis is to find out the assets of Minangkabau cultural heritage in Tanah Datar District in terms of their uniqueness and importance as an attractive assets asset. This study was conducted on Minangkabau cultural heritage assets, from sub-pointers (1) market appeal namely beauty and environment, introduction of assets outside the location, symbols or icons of the country, aspects of destination attractiveness, aspects of attractiveness to tourists, attractiveness for functions and completeness Assets products in the study area, Assets activities in the study area, Institutional Goals / Objectives, and internal political support (government). (2) is the product design needs, namely the location of tourist attraction, ease of transportation, youth for tourists, tourist attraction in each area of assets, ease of infrastructure (toilets, location of vehicles, parks, surau and others).

Then the criteria in assessing Minangkabau cultural heritage assets in terms of quality and current state of cultural heritage in Tanah Datar District. The study was conducted on Minangkabau cultural heritage assets, through the Cultural Significance sub-indicator and Robusticity sub-indicator.

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The sub-indicators of Cultural Significance are beauty values (architecture), historical values, educational values, social values, scientific values, Rare or Comon (extraordinary or ordinary), Representativeness (representation / appearance).

From the Robusticity sub-indicator namely asset strength, improved parts, governance or supervision design in the study area, regular supervision and maintenance, the potential to

involve and negotiate with the asset owner, the potential for negative impressions from visitors is high on; (surface assets, lifestyle and local cultural traditions), the potential for change (a part of the development product) of negative impressions on; (lifestyle and local cultural traditions), the frequency of tourists or visitors.

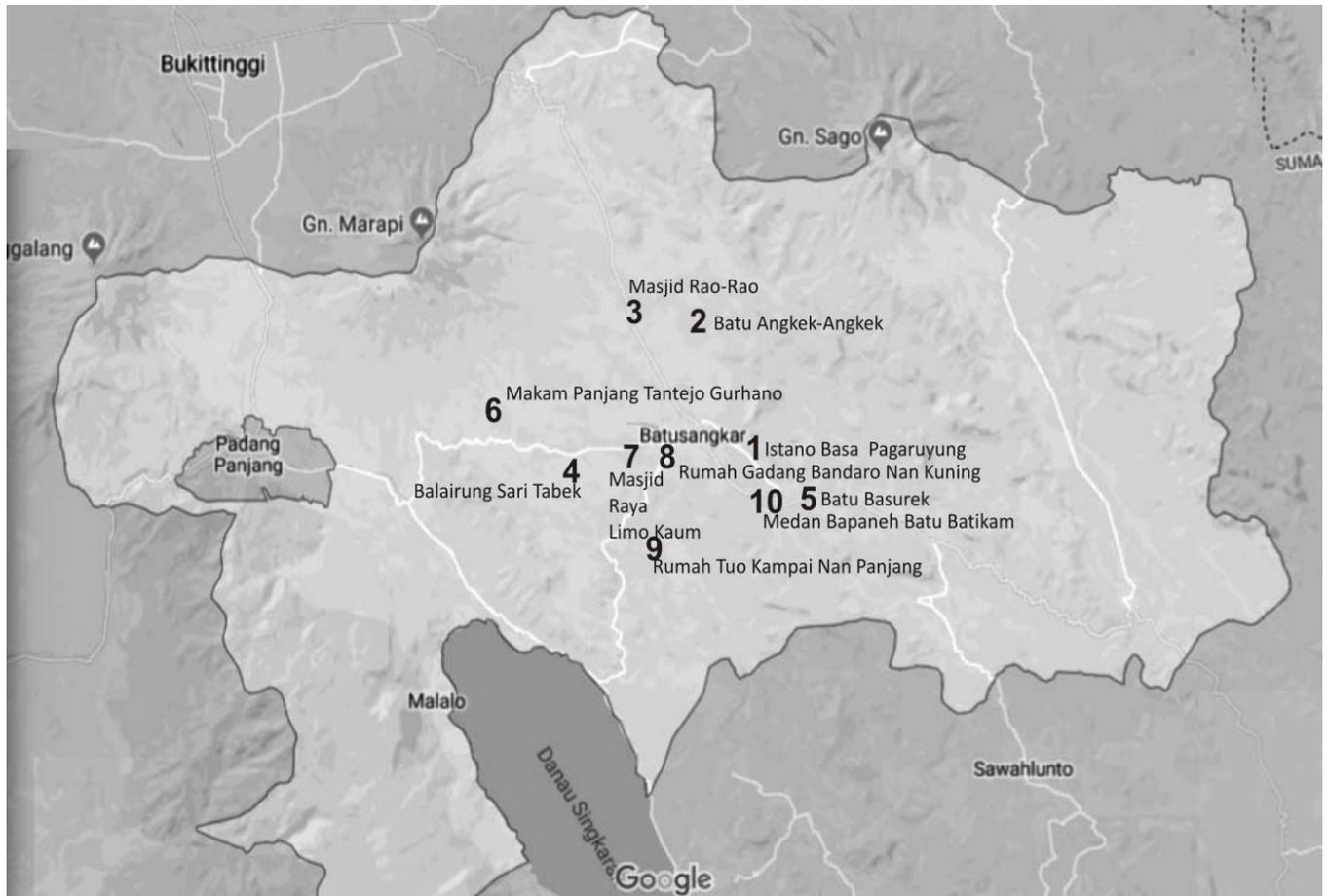


Figure 2. Location Map of Cultural Heritage Asset Distribution, in Tanah Datar District, West Sumatra, Sumber. Google Map, modified by the author.

The results of this study are to strengthen the assets of Minangkabau smell in the Tanah Datar District, so as not to lose its authenticity. These assets can be promoted better, to serve as one of the attractions of the cultural heritage tour. The importance of this study will be addressed to parties such as: The government is expected to consider all suggestions in the development of the cultural heritage assets sector in Tanah Datar District. In addition, this document can be used to guide development and monitor the preservation of cultural heritage assets. Furthermore, assets is also useful as a guide in determining the basis relating to the management of the attraction of cultural heritage assets.

In terms of education, that cultural heritage assets in Tanah Datar District of West Sumatra, Indonesia is very important to be made an inventory and historical documentation, so that it becomes a guide in understanding the history of Minangkabau cultural heritage. This is something that is very important in the field of education, where history and study of it are specific to the academic field as exposure to the appreciation of Minangkabau cultural heritage.

For the assets sector, this study is expected to spread all

kinds of Minangkabau cultural heritage assets in the form of; Cultural heritage assets themes, various forms of routes and models for building assets for cultural heritage assets, and as a guide to future development. For assets practitioners, this study is also useful as a reference to the basis in assets efforts related to the governance of cultural heritage assets attractions.

While for local communities, this study is useful as a guide in developing and utilizing the potential of high-value cultural heritage assets as one of the attractions of cultural assets.

(1) Market appeal. Market appeal is a sub-indicator to state the attractiveness and supporting factors in increasing the promotion of assets assets. This sub-pointer is divided into ten sections that have differences in terms of criteria in assessing suitability to certain situations and circumstances.

All of these criteria have different characteristics such as beauty and the environment, introduction of assets outside the location, symbols or icons of the country,

attractive destinations, aspects of the attractiveness of supporters around the study, attractiveness for needs, completeness of products. Assets in the study area, activities Tourists in the study area, Objectives / Objectives of institutions in heritage and culture, and internal political support (government).

(2) **Product design needs** are some of the sub-indicators for market appeal. This sub-pointer consists of several assets that are suitable for attracting tourists to the destination, ease of transportation to allow tourists to the destination. Assets from the place of lodging, facilities for tourists, tourist attraction in each area of assets, and ease of infrastructure such as toilets, parking, parks, information and etc. The analysis carried out on each selected market appeal indicator is based on the valuation of assets in the study location that has a link between each attraction. Each asset is analyzed and valued based on criteria from highest to lowest. The assets that have the highest value are the assets of Istano Baso Pagaruyung, while the assets which are the lowest assets are the Medan Bapaneh Batu Batikam assets which are caused by the lack of traction and simple convenience stages that are there. However, changes that may be made to the lowest judgment are by holding activities that can be an attraction and produce a legendary story that has been passed down from generation to generation.

To get the quality stage of the destination Cultural Heritage Assets in Tanah Datar District, which involves ten cultural heritage destinations that have been selected and analyzed based on the cultural significance indicator, and robusticity indicator, which are analyzed and described as follows.

(3) **Cultural significance.** Cultural significance is a sub-indicator for robusticity that makes an element of cultural heritage governance. Cultural significance explains the suitability of the background assets. This sub-indicator is divided into seven parts, namely beauty, history, education, social, scientific, rare or ordinary (rare or common) and representative.

(4) **Robusticity analysis.** Robusticity is a major factor in determining asset characteristics. Robusticity is one of the management of cultural heritage that has eight sub-indicators. Robusticity is the management of assets against potential and supervisors in preservation and maintenance. This sub-indicator includes the fragility of assets to ensure the asset's ability to promote the balance of assets to the attractiveness of tourists or visitors who come to the asset.

III. RESULT AND DISCUSSION

The results of this research are the attraction of the Robusticity matrix market for cultural heritage assets in Tanah Datar District as follows.

Table 3: Scores of Cultural Heritage Assets Market Appeal Needs

Destination of Cultural Heritage Assets									
1	2	3	4	5	6	7	8	9	10

Scores of Cultural Heritage Assets Market Appeal Needs		Istano Baso Pagaruyung	Batu Basurek	Limo Kaum Mosque	Medan Bapaneh Batu Batikam	Rumah Tuo Kampai Nan Panjang	Balaurung Sari Tabek	Makam Tantejo Gurhano	Rumah gadang Bandaro Kuning	Batu Angkek-Angkek	Rao-Rao Mosque
Asset Sub-indicator	Beauty and the environment.	3	3	3	3	3	3	5	3	5	3
	Identificati on of assets outside the location.	3	3	3	3	3	3	3	3	3	3
	National symbols or icons.	3	1	1	1	1	1	1	1	1	1
	Evocative assets.	5	5	5	5	1	3	5	1	5	5
	Support the attractiveness aspects around research.	3	3	3	1	1	3	3	3	5	3
	Attractions for special needs (funeral rites, festivals and sports).	5	1	5	3	5	5	1	5	3	5
	Assets product equipment is being studied.	3	1	3	1	1	1	1	1	3	3
	Assets activities in the study area.	5	1	3	1	1	3	3	1	3	3
	Institutiona l goals in heritage and culture.	3	5	1	1	5	5	3	3	5	5
	Internal (goverme nt) political support.	5	3	3	1	1	3	5	1	5	5
Total score	38	26	24	20	22	30	30	23	38	36	

The results of this research indicate Batu Angkek-Angkek and Istano Baso Pagaruyung, Sari Tabek Hall, Rao-Rao Mosque, Tuo Kampai Nan Panjang House, and Batu Basurek achieved the highest scores.

The highest cultural heritage assets with a value of 38 based on indicators of market attractiveness are the assets of Angkek-Angkek and Istano Baso Pagaruyung.



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This was followed by Rao-Rao 36 Mosque assets, Balairung Sari Tabek 30, Batu Basurek and Tantejo Gurhano Tomb 26, Rayo Limo Mosque Kaum 24, Bandar Yellow Gadang House, 23, Tuo Kampai Nan Panjang score of 22 and Medan Bapaneh Batuam 20 stone score Sub-pointers for market appeal, such as beauty and the environment, the introduction of off-site assets, national symbols or icons and evocative assets. In addition, aspects of support such as attractiveness around assets, attractiveness for needs, completeness of products. Assets in the study area, Assets activities in the study area, Institutional goals / objectives in heritage and culture, and internal political support (government) are also indicators of market appeal Assets assets. This shows that the assets of Batu Angkek-Angkek and Istano Basa Pagaruyung are widely known by tourists and are frequently visited.

Istano Pagaruyung and Rao-Rao Mosque also received the highest score of 23 points based on indicators of product design needs. This is because the Pagaruyung Palace has a unique architectural value and a traditional Minangkabau house known as a "gadang" house, which has its own role and values, as well as the historical values they contain. In addition, this Pagaruyung Palace is the traditional house of King Pagaruyung which is always guarded and preserved as a symbol of the greatness of the Minangkabau people. In addition, Istano Pagaruyung is also a symbol of the West Sumatra region, making this asset widely known by tourists both domestic and abroad.

Meanwhile, other assets include Balairung Sari Tabek and Batu Angkek-Angkek with a score of 21, Limo Kaum Mosque and Gadang Nan Kuninang House with a score of 19, Kampung Nan Panjang with 17, Batu Basurek with a score of 15, Batu Batikam with a score of 13 and Kuburan Panjang Tantejo Gurhano has a low score of 11. Cultural heritage assets in terms of product design needs are simple assets. However, all of these assets have the opportunity to increase their marketing value through concepts such as combining these known assets with assets that are less well known in assets promotion.

The results of the interview found that for the draft concept of maintaining Cultural Significance and Robusticity in Tanah Datar District is by the method of maintaining assets, promoting power as a tourist attraction for assets and also increasing the number of community participation or community-based assets. Continue to combine assets with cultural heritage and environmental assets. Increase the diversity of objects and interests through nagari and overseas bases, or by increasing the role of nagari and nomads children to promote cultural assets.

IV. CONCLUSION

Cultural heritage assets needs to fulfill criteria such as; in the form of objects, buildings, or structures, fifty years of age or older, can represent the style of the age (genre) for at least fifty years, and have special meanings for historical purposes, for science, education, religion, and culture, and has high cultural values. Assets assets can show certain directions, and

some sub-indicators such as beauty and the environment, introduction of assets outside the location, national symbols or icons, evocative assets, supporting aspects of attractiveness around the study, attractiveness for specific needs, completeness of assets products in study area, assets activities in the study area. Objectives of institutions in heritage and culture, government political support, access to assets, access to the location of assets of the population, ease of supporting assets, attractiveness between each surrounding assets, convenience. Cultural heritage management can be seen from several indicators such as beauty value, historical value, educational value, social value, scientific value, rare or common, representative, asset strength, parts being repaired, governance or supervisory design in the study area, assets monitoring and maintenance, the potential to involve and negotiate for building owners, the potential for negative impressions for visitors is high, the potential for changes to negative impressions, the frequency of tourists or visitors.

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AUTHORS PROFILE



levels.

I Nengah Tela is working as Dean of the Faculty of Civil Engineering and Planning, Bung Hatta University. His research fields include Urban and Regional Planning and there have been many publications related to Urban and Regional Planning at both the national and international



Association and member of the Board of Trustee, Islamic Assets Centre, Ministry of Assets and Culture Malaysia.

Amran Hamzah is a Professor in Assets Planning and Director of the Centre for Innovative Planning and Development (CIPD) at Universiti Teknologi Malaysia. His area of specialisation is the interface between community based assets and biocultural conservation. He is also the President of the Malaysian Ecoassets