The Implication of Smart Environment on Old Palembang Cultural Heritage Places

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Abstract. Palembang as old city has many historical places in various conditions. Some of these places are still easy to be found, well maintained, abandoned as well as leaved as named without any physical evidences. The cultural heritage deals with modern live and the threat of extinction. In the internet era, the term smart environment for cultural heritage becomes another approach to conserve the historical artefacts. However, the conservation should also consider the non-physical aspect such as the relationship between people and the environment in the heritage place. This paper elaborate the use of people place relationship in determining the smart implication at the at Palembang cultural heritage area. To achieve this aim, study have two objectives; (1) examining how people of historical places attached to their living environment as well as their city, (2) determining the level of potency of historical places to find the appropriate smart strategy for conservation. Place attachment was measured through questionnaires filled by the 136 residents from seven old urban kampons in Palembang. Then, results from this were confirmed by respondents understanding on the history of place and their visiting experience to determine the potency of historical places. Those statistical analyses used PASW v.19. The result shows three groups of heritage places at Palembang cultural heritage area; the ones with high, medium and low attachment in urban scale. The smart strategy can be applied at medium and low attachment to rebirth and strengthen the attachment to the places. The use of virtual reality on these places is the appropriate strategy for smart heritage conservation. The combination between Virtual Reality and multimedia technologies will support the development at historical places of Palembang

1. Introduction

Palembang is one of old cities in Indonesia with long history. It was an international hub, a capital of Palembang Darussalam Sultanate. In the past time, the center of city was located at riverside area. Therefore, the historical places can be found along the Musi River. Musi river divide the city into two riverside area; Ulu at southern and Ilir at northern. The historical places are the old riverside settlements’, historical buildings and old public facilities. In present, these places are still a part of city center and influenced by modern development. Generally, their conditions are varying. Some of them are well maintained and easy to find. The others are abandoned or no longer found.

Conservation of historical place is important for a society. The globalization is spread all over the world brings some disadvantages to the issue of identity. The international architecture style is easily to be found in any modern city. The general style brings similar expression of modern thought in
architecture. However, the loss of identity becomes threat in modern society. In fact, the identity is important intangible assets for any society. The identity differentiates one society to another and become competitive advantage. Further, the society can learn their locality from the historical places. The local wisdom expressed at the historical places is the important thought for dealing with future life. Now, the historical places are threatened by the modern development. Therefore, to conservation of historical places is a must for city like Palembang.

Historical places reflect identity. Relph (1976) coins the place represents the identity of physical and social environment [1]. The place has physical elements. The elements reflect the uniqueness of the place. In other words, the specific element and its setting differentiate place from other places. Therefore, the place can be a specific character that generates identity for its surrounding as well as urban reminder in bigger scale [2,3]. The historical places (along with its architecture) were the expression of identity. In order to sustain the identity, the distinctiveness should be well maintained and recognized by the residents of places and citizen.

Effort to sustain the identity must take people into account. Conserving the historical place means not only protect and maintain the place but also brings the people to get in the effort. In the internet era, the term smart environment for cultural heritage becomes another approach to conserve the historical artifacts. However, the conservation should also consider the non-physical aspect such as the relationship between people and the environment in the heritage place. This paper elaborate the use of people place relationship in determining the smart implication at the at Palembang cultural heritage area.

2. Literature review

2.1. Place Attachment in Conservation

Place attachment is one of concept that relates people and their physical environment. It defines as emotional bonding between an individual and his living environment. The scale of this relationship can be in living environment, neighborhood, urban, region and country [4,5]. The bonding brings the memory and perception toward the living environment. When the experience towards the place is continuing, the attachment will become stronger and lead to identity [6,7].

Place attachment has four dimensions; place identity, social bonding, place dependence and nature bonding [8–10]. Place identity is a person definition on his self, caused by the setting and the meaning of the place. One’s interaction with the society and the natural environment directs to the social and nature bonding. The ability of a place to accommodate one’s activities leads to place dependence. Further these four dimensions is complemented by the place attachment predictors caused by one’s preference towards the place. The predictors are place value, special place and response on development [9]. The predictors and dimension are used to measure the place attachment according to the scale of place [11].

The existence of historical place results the people perception. It is one of attachment toward the place. The perception of historical places in a city implies its history. How the history of the city appreciated by the people is influenced by the perception towards the historical places. If the perception is positively appreciated, then the identity of the place strengthens city identity. Moreover, the existence of historical places in the city reflects the culture of city society. It contributes to city distinctiveness [12,13]. Those places are tangible assets of the city and the distinctiveness is the intangible asset.

The place attachment and historical place are strongly tied. People and the environment have related since a long time ago. Therefore in conserving the historical places, the planner should consider the people who lived there. The cultural significance of certain historical place will be lasting if people were engaged in the conservation effort [12,14,15]. Place attachment is the antecedent to the people’s loyalty [16]. Level of attachment determines the support for conservation. The stronger quality of attachment is the stronger support for conservation. At the end, it creates more sustained identity of the place [17].

2.2. Smart Tools in Heritage Conservation

Historical place is also named as cultural heritage. Cultural heritage refers to a locality, natural landscape, settlement area, architectural complex, archaeological site or standing structure that is recognised and often legally protected as a place of historical and cultural significance (ICOMOS 2007
in [18]). Physical setting of historical place can promote identity in two contexts; the built heritage and innovative design [2]. The built heritage accommodates the tradition in a certain place. The innovation in places, elements and supporting social wisdom contribute to the identity. Conserving the built heritage along with offering new innovation design are the basic factor in conservation. Dealing with internet technology, the term smart environment for cultural heritage becomes another approach to conserve the historical places.

The trend of smart city leads to the application of smart technology in conservation. The application of smart technology can be in form of restoration techniques, data bases, user interactive technology and the cultural heritage [19]. Restoration techniques include the smart method of archiving and authentic digital surrogates. Smart in data base includes photogrammetric, reality-based 3D documentation and perpetual digital conservation [20,21]. The interactive use includes social media, 3d visualization and virtual reality technology [22–24]. The application of each form of smart application requires certain condition as mentioned in previous studies. The restoration techniques should apply latest friendly technologies, equipment, software, authenticity assurance and spatial data [22]. Database should be efficient in using the data, analysis and presentation opportunities [20]. When users apply the digital in cultural heritage, it brings the literature on digital engagement, interactive and participation of user in heritage place. The digital tool should enhance and not replace the artifacts or historical evidences [25].

Since the early of 2000s, the virtual heritage has become important term in preservation, conservation and interpretation of culture and history [26,27]. As many historical places are threaten to be destroyed or lost, then the emergence of long lasting documentation must be formed to sustain the culture and history. The advanced technology is needed to overcome the threat on cultural heritage assets [28] such as 3D reconstruction, hybrid 3D models, virtual reality devices and software and web-based virtual tour system [24,29,30]. In virtual heritage, the historical places were examined and preselected as the potential digital conserved built heritage. The virtual heritage is applied for the historical places that no more exist, unreachable, geographically remote or has limited access caused by some constraints such time, distance, scale, safety even cost [27]. The best scenario of virtual heritage is the places or collections are chosen by the public [21], presented in interesting presentation, assisted young generation to learning and have strong motivational impact [27].

The use of virtual reality in conservation has been studied in many cases. For some international cases, the VR has also been applied in form of interactive simulation museum for Hagia Sophia and Pompeii, visualization of environment for Ancient Malacca and PC webbased application for Campeche old Mexican City, Pompei. Further, the presentation of VR use some tools such as PC engine for Notre Dame, virtual overlay seen in certain kiosk at Ename, Belgium, or projection in certain wall surface like Salzburg, Austria and Sala Della Volta Dorata, Roma [26]. Studies on implication of VR in Indonesian virtual heritage have also been developed for documentation. The documentation by using VR GIS allows the 3D model georeferencing to put the coordinate to the model with in the of Sewu Temple area. Further, VR is also used for promotion the cultural tourism destination such as 3D walk through of Lawang Sewu in Semarang virtual museum at Istana Siak Sri Indra Pura (Supardi, Danuri and Prayitno, 2016) and at Istana Basa Pagaruyung Batusangkar. The aforementioned case of VR implementation in heritage places are conducted both within the object of heritage, area of conservation and heritage site. Hagia Sophia, Salzburg, Sala Della Volta Dorata, Lawang Sewu, and at Istana Basa Pagaruyung Batusangkar are the case that use VR for visualization within the deteriorated built heritage. The built heritages are still existed. Campeche old Mexican City, Pompei, Notre Dame and museum of Istana Siak Sri Indra Pura are cases that use PC for VR presentation of the built heritage in museum. Sewu temple is the case that uses VR for visualization in a wide area of conservation. Ename and Ancient Malacca are the practices that use VR for visualization of environment of heritage site where the built heritages are no longer found.

3. Methodology

This paper elaborate the use of people place relationship in determining the smart implication at the at Palembang cultural heritage area. To achieve this aim, study have two objectives; (1) examining how people of historical places attached to their living environment as well as their city, (2) determining the level of potency of historical places to find the appropriate smart strategy for conservation. In order to examine the place attachment, the survey questionnaire was done to 136 respondents. It measured the
attachment towards 23 historical places in seven urban kampons along Musi riverside area. The data was analyzed by using factor analysis and cross tabulation. Factor analysis measured the dimensions of attachment; place identity, place dependence and place value. To determine the level of potency of historical places, the result form place attachment measurement was crosstabulated with the respondents’ understanding on the history of places and visit. This statistical analysis used PASW v.19.

The urban kampons are the old settlements at Musi riverside area which have historical as well as cultural value. The kampons are named as Kapiten, Kletonge, Bahrak, Munawar, Suro, Sekanak and Kuto. The kampons are located at two side of riverside area (Figure. 1). Historically, those kampons had been established since pre-sultanate era. They were addressed for certain ethnics in Palembang. Kapiten and Kletonge were the Chinese settlements (kletonge means the temple). Bahrak, Munawar and Kuto were Arabian settlements. Except Kuto, these four old settlements are located at Ulu. Meanwhile, Suro and Sekanak were Malay Palembang settlements and located at Ilir. All of these kampons have old buildings that full of history.

A total of 136 questionnaires were distributed in seven kampons (Table 1). The respondents are the residents of those kampons. Generally, each kampong contributes more than 16 % to the total 136 valid questionnaire.

Table 1. Distribution of questionnaires

| Kampong | N  | %  |
|---------|----|----|
| Kapiten | 25 | 18.4|
| Kletonge| 16 | 11.8|
| Bahrak  | 18 | 13.2|
| Munawar | 16 | 11.8|
| Sekanak | 23 | 16.9|
| Suro    | 20 | 14.7|
| Kuto    | 18 | 13.2|
| Total   | 136| 100|

Figure 1. Location of 23 historical places in Palembang city map
The respondents are relatively equal between male and female. About 86% of respondents are more than 20 years old, with 10.3% senior residents. More than 80% of them have stayed for more than 20 years in the kampong. The demographic profile of respondents shows in Table 2. The questionnaire consists of 15 questions on place attachment dimensions, one question on respondents’ understanding on the history of the places and one question on respondent visiting experience.

### Table 2. Demographic profile N= 136

| Description       | F   | %  |
|-------------------|-----|----|
| **Gender**        |     |    |
| Male              | 67  | 49.3 |
| Female            | 69  | 50.7 |
| **Age**           |     |    |
| <20 years old     | 18  | 13.2 |
| 21-30 years old   | 60  | 44.1 |
| 31-50 years old   | 44  | 32.4 |
| > 50 years old    | 14  | 10.3 |
| **Length of stay**|     |    |
| <5y               | 5   | 3.7 |
| 6-20y             | 20  | 14.7 |
| 21-30y            | 62  | 45.6 |
| 31-50y            | 36  | 26.5 |
| >50y              | 13  | 9.6 |

4. Result and Discussion

4.1. Place Attachment and potency of historical place

Place attachment in seven kampongs was measured in forms of 15 questions. The questions were derived from three dimension of place attachment which are place identity, place dependence and place value. Respondents gave their response within 1 to 5 Likert scale, namely strongly agree, agree, neutral, disagree and strongly disagree. The questions were translated as component in factor analysis. The Kaiser-Meyer-Olkin (KMO) value is 0.91 showing the sample is adequate. From the factor analysis running, the 15 components were extracted into three components, as shown in Table 3 as the highest value for each component. They are love (0.847), satisfaction (0.753) and economic value (0.869). Respectively, place identity, place dependence and place value contribute the most influence factor of attachment. This result represents the historical value is not the main factor in forming the attachment. Factor analysis show historical value (0.67) is lower than recreational value (0.831).

To confirm the results on historical value, respondents also answered their understanding on history of 23 historical places at seven kampongs. The places had been existed since sultanate era. Places are shown in Table 4. At kampong kapiten and klenteng, the square, the kapiten houses and temple were part of Chinese settlements that have long history and unique architecture setting. The tangga rajo pier was used by the sultan when visit this territory. Similar to them, Kuto, Bahrak and Munawar also have unique architecture and history as Arabian settelement. Suro and Sekanak were the local malay settlements that are mixed with colonials buildings. At city center, there are many places with history of Palembang sultanate. The beringin janggut was an area of sultanate palace named kuto beringin or kuto cerancang before it was burnt by the Dutch colonial and moved to kuto kecik, the place near Kuto Besak Fortress and the Great Mosque. Tengkuruk Permai and Sayangan were the other places and settlement area that had been existed since sultanate era. Unlike the other places, the physical heritage at these three places is no longer existed anymore. The area becomes modern trading area and the names were given to name street to memorize their history (toponim).
Table 3. Factor analysis results on place attachment

| Place Attachment Dimension | Component 1 | Component 2 | Component 3 |
|----------------------------|-------------|-------------|-------------|
| Place Identity             |             |             |             |
| A part of me               | .771        | .399        | .211        |
| Love                       | .847        | .329        | .214        |
| Define who I am            | .765        | .412        | .191        |
| Meaningful                 | .609        | .599        | .233        |
| Being accepted             | .729        | .390        | .255        |
| Not a part of it           | -.686       | -.156       | .001        |
| Place dependence           |             |             |             |
| The best place             | .600        | .572        | .076        |
| Doing                      | .524        | .699        | .113        |
| Not going to move          | .252        | .734        | -.002       |
| The only one               | .366        | .727        | .241        |
| Satisfy                    | .448        | .753        | .234        |
| Place value                |             |             |             |
| Scenic value               | .002        | .581        | .579        |
| Economic value             | -.008       | .151        | .869        |
| Historical value           | .493        | -.027       | .671        |
| Recreational value         | .242        | .138        | .813        |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. |

In general, the statistic shows that the understanding on history of kampong is relatively lower than in city center. In average, less than 50% of residents understand the history of mentioned places. It reflects that the residents have limited understanding on history of other kampons. He could understand his kampong history, but not so well on other kampons. For respondents, their understanding on Munawar complex history is relatively mediocre (51.5%). Among 23 places, Munawar complex history is relatively well-known for residents of all kampons.

Statistic also shows that the highest value goes to Kuto Besak Fortress (82.4%), Ampera Bridge (81.6%) and Great Mosque (79.4%). All of these three places are not located at kampons. They are at city center, near the Musi River. However, some of historical places are not well known by the respondents which are Sayangan, Tengkuruk Permai, Kuto Market, old shop houses at Klen teng, Societieit at Sekanak. Extremely, the Beringin janggut history has lowest statistics (2.9%). Residents almost do not know the history of Beringin Janggut.

Table 4. Respondent’s understanding of history (N=136)

| Kampung       | Historical places | F  | %   |
|---------------|-------------------|----|-----|
| Kapiten       | Square            | 46 | 33.8|
|               | Kapiten house     | 62 | 45.6|
|               | Tanging rajo pier | 41 | 30.1|
| Klon teng     | Old shop houses   | 22 | 16.2|
|               | Chandra Nadi Temple | 53 | 39  |
| Bahrak        | Old houses        | 50 | 36.8|
To confirm the attachment on 23 historical places at seven kampongs, the factor analysis were cross tabulated with the respondent’s history understanding. To simplify paper presentation, only the results on history understanding and positive response on attachment (agree and strongly agree) were shown in Table 5. Statistic shows consistency on places that are well known with the love, satisfaction and economic value. Ampera Bridge has highest results, followed by Kuto Besak fortress and Great Mosque respectively. Societeit and Beringin Janggut have very low results which is in line with previous statistical analysis.

Table 5. Cross tabulation of attachment on historical understanding

| No. | District | Love | Satisfaction | Economic value |
|-----|----------|------|--------------|----------------|
| 1   | Ampara   | agree | 42.6% | 43.2% | 41.1% |
|     |          | strongly agree | 21.4% | 34.6% | 42.7% |
| 2   | Kuto     | agree | 32.4% | 41.2% | 39.9% |
|     |          | strongly agree | 41.2% | 34.6% | 42.7% |
| 3   | Kuto Besak Fortress | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 4   | Ampara   | agree | 24.7% | 39.6% | 43.2% |
|     |          | strongly agree | 43.2% | 24.7% | 39.6% |
| 5   | Kuto     | agree | 27.8% | 29.4% | 36.5% |
|     |          | strongly agree | 45.7% | 12.5% | 21.2% |
| 6   | Klenteng | agree | 20.9% | 21.6% | 23.7% |
|     |          | strongly agree | 37.7% | 42.6% | 29.4% |
| 7   | Rumah Kembar | agree | 35.7% | 43.2% | 41.1% |
|     |          | strongly agree | 41.1% | 34.6% | 42.7% |
| 8   | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 9   | Sayangan | agree | 15.2% | 36.5% | 43.2% |
|     |          | strongly agree | 24.3% | 42.6% | 29.4% |
| 10  | Tengkuruk Permai | agree | 20.9% | 21.6% | 23.7% |
|     |          | strongly agree | 37.7% | 42.6% | 29.4% |
| 11  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 12  | Beringin Janggut | agree | 35.7% | 43.2% | 41.1% |
|     |          | strongly agree | 41.1% | 34.6% | 42.7% |
| 13  | Munawar complex | agree | 42.6% | 43.2% | 41.1% |
|     |          | strongly agree | 21.4% | 34.6% | 42.7% |
| 14  | Old houses | agree | 24.7% | 39.6% | 43.2% |
|     |          | strongly agree | 43.2% | 24.7% | 39.6% |
| 15  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 16  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 17  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 18  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 19  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 20  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 21  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
| 22  | Great Mosque | agree | 40.7% | 42.5% | 41.4% |
|     |          | strongly agree | 35.7% | 33.3% | 42.5% |
Table 6. Response on place visit

| Places              | Visiting the place | %   |
|---------------------|--------------------|-----|
| Kapiten             | 93                 | 68.4|
| Klenteng            | 79                 | 58.1|
| Baharak             | 61                 | 44.9|
| Munawar             | 70                 | 51.5|
| Sekanak             | 83                 | 61.0|
| Kuto Besak Fortress | 115                | 84.6|
| Suro                | 75                 | 55.1|
| Kuto                | 19                 | 14.0|

Table 7. Cross tabulation of attachment on place visit

| Places             | Love | Satisfaction | Economic value |
|--------------------|------|--------------|----------------|
| Kapiten            | Agree | 26 | 25 | 40 | % within | 56.5% | 65.8% | 58.8% |
|                    | Strongly agree | 52 | 40 | 45 | % within | 78.8% | 78.4% | 80.4% |
| Klenteng           | Agree | 19 | 23 | 33 | % within | 41.0% | 60.5% | 48.5% |
|                    | Strongly agree | 46 | 36 | 40 | % within | 69.1% | 70.6% | 71.4% |
| Baharak            | Agree | 22 | 23 | 27 | % within | 47.8% | 60.5% | 39.7% |
|                    | Strongly agree | 32 | 22 | 28 | % within | 58.5% | 43.1% | 50.0% |
| Munawar            | Agree | 25 | 21 | 29 | % within | 54.3% | 55.3% | 42.6% |
|                    | Strongly agree | 36 | 27 | 32 | % within | 54.5% | 52.9% | 57.1% |
| Butterfly          | Agree | 21 | 22 | 35 | % within | 45.7% | 57.9% | 54.4% |
|                    | Strongly agree | 43 | 32 | 43 | % within | 65.2% | 62.7% | 76.8% |
| Suro               | Agree | 21 | 23 | 27 | % within | 46.8% | 60.0% | 37.8% |
|                    | Strongly agree | 32 | 22 | 28 | % within | 58.5% | 43.1% | 50.0% |
| Kuto Besak Fortress| Agree | 21 | 23 | 27 | % within | 45.7% | 60.0% | 37.8% |
|                    | Strongly agree | 43 | 32 | 43 | % within | 65.2% | 62.7% | 76.8% |
| Suro               | Agree | 48 | 31 | 29 | % within | 46.8% | 60.0% | 37.8% |
|                    | Strongly agree | 32 | 22 | 28 | % within | 58.5% | 43.1% | 50.0% |
| Kuto Besak Fortress| Agree | 48 | 31 | 29 | % within | 46.8% | 60.0% | 37.8% |
|                    | Strongly agree | 32 | 22 | 28 | % within | 58.5% | 43.1% | 50.0% |

8
4.2. Smart heritage conservation implication

The previous discussion shows how people relate towards historical places and the factor that drive the attachment. The different result on two cross tabulation shows that the historical value does not stimulate the attachment and willingness to visit the place. Economic value, satisfaction and love are more influencing to the attachment and visit. Regarding the conservation effort, study determined the smart implication that should be applied to 23 historical places (Table 8). The implication is applied to all places, in terms of restoration, database and sustained maintenance. For places with strong attachment and not physically threatened, the Virtual Reality is an optional. The VR can be used within the built heritage for visualization of history. For places with weak attachment, VR is still applied to increase the attachment. Virtual Reality become a must to be applied at places with weak attachment, physically threatened even no longer exist. VR can be implemented for visualization of environment of heritage site where the built heritages are no longer found. In this case, Sayangan, Tengkuruk Permai and Beringin Janggut are the sites that has no built heritage. The physical evidences of built heritage are no longer existed. Therefore, these sites can use virtual overlay seen in certain kiosk or projection in certain surface. By doing so, their existence will be not as toponim only, but also the virtual visualization. Therefore, the future generation will have more understanding on city history, strong attachment and support the conservation of historical places in their city.

Table 8. The smart heritage implication based on people place relationship

| Place | Jiangu | Kampung house | Tengkuruk Permai | Old shop houses | Chinatown | National Temple | Old houses at Balangk | Masjid Al Muktamar | Tanah Lot | Tengkuruk Permai | Kuran | Lebak Mas | Jati | Agung | Keruneng | Beringin Janggut |
|-------|--------|---------------|------------------|----------------|-----------|-----------------|---------------------|------------------|-----------|----------------|------|----------|-----|-------|----------|----------------|
| Time  |        |               |                  |                |           |                 |                     |                  |           |                |      |          |     |       |          |                  |
| Scale | Weak   |               |                  |                |           |                 |                     |                  |           |                |      |          |     |       |          |                  |
|       | Medium |               |                  |                |           |                 |                     |                  |           |                |      |          |     |       |          |                  |
|       | Strong |               |                  |                |           |                 |                     |                  |           |                |      |          |     |       |          |                  |
| RES: |        |               |                  |                |           |                 |                     |                  |           |                |      |          |     |       |          |                  |
| RES: |        |               |                  |                |           |                 |                     |                  |           |                |      |          |     |       |          |                  |

RES: restoration; Db: Data Base; VR: Virtual Reality; SM: Sustained Maintenance Roussou, 2002).

5. Conclusion

This paper elaborate the use of people place relationship in determining the smart implication at the Palembang cultural heritage area. The study shows that the measurement of place attachment can support the effort to conserve the historical places. Attachment toward the place can be used to determine what smart tools to be applied as a part of conservation. By combining the attachment and smart technology, the smart environment at cultural heritage places can be implemented. Further, the conservation become people based effort, and it will be sustained by the support from the people.

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7. References

[1] Relph E 1976 1976: Place and placelessness. London: Pion.

[2] Gospodini A 2004 Urban morphology and place identity in European cities: built heritage and innovative design J. Urban Des. 9 225–48

[3] Lewicka M 2008 Place attachment, place identity, and place memory: Restoring the forgotten city past J. Environ. Psychol. 28 209–31

[4] Lewicka M 2010 What makes neighborhood different from home and city? Effects of place scale on place attachment J. Environ. Psychol. 30 35–51

[5] Lewicka M 2011 Place attachment: How far have we come in the last 40 years? J. Environ. Psychol. 31 207–30

[6] Low S M and Altman I 1992 Place Attachment Place Attachment (Springer {US}) pp 1–12

[7] Smaldone D 2007 The role of time in place attachment In: Burns, R.; Robinson, K., comps. Proceedings of the 2006 Northeastern Recreation Research Symposium; 2006 April 9-11; Bolton Landing, NY. Gen. Tech. Rep. NRS-P-14. Newtown Square, PA: US Department of Agriculture, Forest Service, Northern Research Station: 47-56. vol 14

[8] Williams D R and Vaske J J 2003 The measurement of place attachment: Validity and generalizability of a psychometric approach For. Sci. 49 830–40

[9] Brown G and Raymond C 2007 The relationship between place attachment and landscape values: Toward mapping place attachment Appl. Geogr. 27 89–111

[10] Raymond C M, Brown G and Weber D 2010 The measurement of place attachment: Personal, community, and environmental connections J. Environ. Psychol. 30 422–34

[11] Hernández B, Hidalgo M C, Salazar-Laplace M E and Hess S 2007 Place attachment and place identity in natives and non-natives J. Environ. Psychol. 27 310–9

[12] Tweed C and Sutherland M 2007 Built cultural heritage and sustainable urban development Landsc. Urban Plan. 83 62–9

[13] Handal J 2006 Rebuilding city identity through history: the case of Bethlehem-Palestine Des. Sustain. Cities Dev. World 51–68

[14] Samant S 2004 Manifestation of the urban public realm at the water edges in India’s cities a case study of the ghats in Ujjain Cities 21 233–53

[15] Hanh V T H 2006 Canal-side highway in Ho Chi Minh City (HCMC), Vietnam Cities 21 310–9

[16] Prayag G and Ryan C 2011 Antecedents of Tourists’ Loyalty to Mauritius J. Travel Res. 51 342–56

[17] Walker A J and Ryan R L 2008 Place attachment and landscape preservation in rural New England: A Maine case study Landsc. Urban Plan. 86 141–52

[18] Wessels S, Ruther H, Bhrutha R and Schroeder R 2014 Design and creation of a 3D virtual tour of the world heritage site of Petra, Jordan Proc. AfricaGeo 1–3

[19] Graziano T 2014 Boosting innovation and development: the italian smart tourism, a critical perspective Eur. J. Geogr. 5 6–18

[20] Toz G and Duran Z 2004 Documentation and analysis of cultural heritage by photogrammetric methods and GIS: A case study XXth ISPRS Congress. Istanbul, Turkey pp 438–41

[21] Taylor J and Gibson L K 2016 Digitisation, digital interaction and social media: embedded barriers to democratic heritage Int. J. Herit. Stud. 23 408–20

[22] Mudge M, Ashley M and Schroer C 2007 A digital future for cultural heritage AntiCIPAting the Future of the Cultural Past, Proceedings of the XXI International CIPA Symposium pp 1–6

[23] Zabulis X, Grammalidis N, Bastanlar Y, Yilmaz E and Cetin Y Y 2008 3D Scene Reconstruction Based on Robust Camera Motion Estimation and Space Sweeping for a Cultural Heritage Virtual Tour System 2008 3DTV Conference: The True Vision - Capture, Transmission and Display of 3D Video (IEEE)

[24] Remondino F and Rizzi A 2010 Reality-based 3D documentation of natural and cultural heritage sites techniques, problems, and applications Appl. Geomatics 2 85–100

[25] King L, Stark J F and Cooke P 2016 Experiencing the Digital World: The Cultural Value of Digital Engagement with Heritage Herit. Soc. 9 76–101

[26] Addison A C 2000 Emerging trends in virtual heritage (IEEE) Multimed. 7 22–5
[27]  Roussou M 2002 Virtual heritage: from the research lab to the broad public *Bar Int. Ser.* **1075** 93–100

[28]  Refslund S T, Ojika T, Addison A C and Stone R 2000 Virtual Heritage: Breathing new life into our ancient past *IEEE MultiMedia* **7** 20–1

[29]  Bastanlar Y, Grammalidis N, Zabulis X, Yilmaz E, Yardimci Y and Triantafyllidis G 2008 3D reconstruction for a cultural heritage virtual tour system *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci. Beijing* **37** 1023–8

[30]  Barsanti S G, Caruso G, Micoli L L, Rodriguez M C and Guidi G 2015 3D Visualization of Cultural Heritage Artefacts with Virtual Reality devices *ISPRS - Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci.* **{XL}-5/W7** 165–72