Product Development of Suspended Bicycle as Aerial Lift in Surabaya Zoo Park

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Abstract—Tourism sector is the prospective field that could add up foreign exchange. However, it is still lack in management above all if it is compared to the Asian countries such as Thailand, Singapore and Malaysia. On the other hand Indonesia especially Surabaya has several tourism facilities that could be improved. One of the tourism assets in Surabaya city is Surabaya Zoo Park (SZP). There are some obstructions which are faced in SZP development so it cannot capable to give the best service to the visitor. Principally, SZP should have interesting facility that is it could give the unusual situation and give the new experience for the guest. Besides it relies on the existing potency it is needed the improvement of new facility for the visitor. As the problem solution above, it is needed the first study to classify what kind of potential tourism necessitated to be improved. Location assessment is implemented to determine the specification of new facility. The new facility in SZP which is in line to the Indonesia tourism concept is the innovation of this research. The design concepts are environment friendly, economist and capable to convey the visitor take pleasure in the surrounding within the different manner. The suspended bicycle is selected as one kind of Aerial Passenger Tramway (APT) with some modification. Especially in the driver this is used human power vehicle.

Keywords—suspended bicycle; nature tourism; new experience; aerial lift

I. INTRODUCTION

Tourism is one sector which is managed seriously by Indonesia centre as well as by the province and city government. They implemented Indonesia Visit Year 2009 and 2008 as the policy to increase the number of foreign tourists comes to Indonesia. With in the increasing of the number of tourist comes to Indonesia directly it will enhance the foreign exchange as it can be seen on the table 1 [1]. The public around the tourism object will also obtain some benefits from the arriving of them.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of foreign tourist</th>
<th>Average expense each person (US$)</th>
<th>Average stay (days)</th>
<th>Foreign exchange acceptance (million US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Each visit</td>
<td>Each day</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>5.153.620</td>
<td>1.053,36</td>
<td>110,42</td>
<td>10,49</td>
</tr>
<tr>
<td>2002</td>
<td>5.033.400</td>
<td>893,26</td>
<td>91,29</td>
<td>9,79</td>
</tr>
<tr>
<td>2003</td>
<td>4.467.021</td>
<td>903,74</td>
<td>93,27</td>
<td>9,69</td>
</tr>
<tr>
<td>2004</td>
<td>5.321.165</td>
<td>901,66</td>
<td>95,17</td>
<td>9,47</td>
</tr>
<tr>
<td>2005</td>
<td>5.002.101</td>
<td>904,00</td>
<td>99,66</td>
<td>9,05</td>
</tr>
<tr>
<td>2006</td>
<td>4.871.351</td>
<td>913,09</td>
<td>100,48</td>
<td>9,09</td>
</tr>
<tr>
<td>2007</td>
<td>5.505.759</td>
<td>970,98</td>
<td>107,70</td>
<td>9,02</td>
</tr>
<tr>
<td>2008</td>
<td>6.429.027</td>
<td>1.178,54</td>
<td>137,38</td>
<td>8,58</td>
</tr>
</tbody>
</table>

In order to the amusement place could attract the tourist visit the object, it should capable to offer the interesting object which is different to the others place. One existing and interesting concept is bring the visitor enjoy the nature tourism by means of aerial lift. Within aerial lift, the visitor could obtain the new panorama which is different without change the existing landscape that is within to benefit the height to watch the landscape.

Technical problem:

1. Suspended bicycle is operated at the elevated location therefore the safety factor is to be concerned. How the passenger could not down from the bike that is within it guards the passenger keep in the save area.
2. Suspended bicycle is the combination between the aerial and monorail train system.

3. The velocity of every unit is the problem when the driver at the front would like to be slower on the other hand the back driver wants to be faster.

4. The distance between terminals should be proper because if too long it will make the people exhausted whereas if too short the landscape will be very limited.

5. Suspended bicycle will be interesting if it could be played by two people or more.

6. How the bottom structure of it could not prevent the watching of passenger to the view nevertheless the bike still strong enough.

**Design constraint:**

1. Suspended bicycle is driven by the human power to implement environment friendly as the answer of the green design agenda.

2. The distance of pathway is about 500-1000m since if too far the driver will be tired on the way and could not continue the crossing. While the control of distance also for the limitation of time to avoid the long wait in line. Within the above distance the passenger will enjoy the view around 10-20 minutes.

3. The system uses the terminals as the location of start and stop. The pathway is something like circled and finally back to the terminal.

4. The pathway uses monorail system.

5. The bike especially for the pleasure facility within the market main target is the family or a couple.

6. The using by the children under 15 years old is obligatory to adjacent by the older people.

**Purpose:**

1. Designing the tour amusement which is brought the visitor could feel the new experience that is different as usual.

2. Designing the playground includes the system as tour facility to enjoy the landscape from the different point of view that is the suspended bicycle.

3. Enhancing the interest of visitor in order to come at tour place which is offer the novel and different thing.

**Benefit:**

The result of this research could become as one of the alternatives for the party who active in the tourism industry in the effort to improve the business. The design of suspended bicycle could be implemented to be used for adding the existing tour object appeal that is within to serve the different tour object. It is hoped could invite the visitor come to the tourism object, finally could increase the cash in of tourism facility management.

**II. PREFACE STUDY**

Aerial Passenger Tramway (APT) is the unit of structural and mechanic component that is used for carrying the passenger in suspended transport and it is moved using wire. Based on The American National Standard Institute (ANSI), there is some classification of APT. The categorization based on the function, kind of driver, support method and the number of cable. Based on the cabin form the APT could be differentiated in gondola, chair and sky mobile. Figure 1 illustrates some kind of existing aerial lift.

![Figure 1. Some types of existing aerial lift: tramway, chairlift and funitel.](image)

There are 3 (three) important aspects from pattern of habit in the choosing playing park and the facility involved that are the variation which is looked for by visitor, seasonal and the different factor [2]. The different factor in playground could be definititional by 5 (five) issue: the number of visitor activities in one day, the time needed in every activity, the time for activities, the sequence of selective activity and the composition of activities preferring. Basically, the activities in the fairground is limited by the time, therefore the activities in it could make easy the visitor to enjoy the whole existing facilities based on the available time. The suspended bicycle could answer the above requirement. It responds the visitor necessity in trying the new thing, enjoy the challenge game all at once enjoy the view around the fairground.

Some ergonomics theory especially concerning to the bike design are to be implemented in the design process of suspended bicycle in order to the product could be guaranteed in the aspect of effective, comfort, safe, health and efficient [3, 4 and 5] as we can see at Figure 2.

![Figure 2. The dimension and reach out of human leg [2].](image)
Base on the observation in the Surabaya Zoo Park (SZP, Figure 3), not all the area of SZP could be passed by the monorail bike lines. There are a lot of leafy tree and the type enclosed animal corral in the area of 1 and 2. On the other hand, the area 3 and 4 are correct and proper because there are some interesting view surround of them and the caged of animal are opened type.

Figure 3. Map of Surabaya Zoo Park (SZP).

III. DISCUSSION

This amusement has the main purpose as the play amusement in the tourism area. How the design could bring the visitor enjoy the panorama in tourism area from the certain height and feel the amazing impression in the altitude. There are some analyses to be discussed: marketing, customer behavior [6], environment, activities (include extreme activities), ergonomic, mechanic [7] and material [8]. Based on the analyses it could be arranged the design requirement and objectivity (Table 2).

Table 2. Design Requirement and Objectivity.

<table>
<thead>
<tr>
<th>Component</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>Strong, light and excellent join.</td>
</tr>
<tr>
<td>Roof</td>
<td>As sun shading, easy to clean and repair.</td>
</tr>
<tr>
<td>Pathway</td>
<td>Strong, stable and tremendous connection to the pole.</td>
</tr>
<tr>
<td>Paddle</td>
<td>Easy to repair, easy to row, short enough so the children could reach out fit to the sole of foot.</td>
</tr>
<tr>
<td>Seat</td>
<td>Easy to repair, firm to support passenger body, seat is made of the material which is easy to clean.</td>
</tr>
<tr>
<td>Safety utensils</td>
<td>Easy to repair/ adjust, easy to fasten and release, strong enough to stand the passenger body so he/she is not drop, not border the passenger so he/she still free to move or put something.</td>
</tr>
<tr>
<td>Transmission system</td>
<td>Easy to repair or maintenance and easy to paddle.</td>
</tr>
</tbody>
</table>

Design concept

Based on the main purpose of the design, how the visitor could enjoy the new situation that is to watch the landscape from the certain altitude using the car is driven by the human power therefore the concept is *slow but fun*. This amusement is not emphasizing the velocity since this car is driven by human. Within using human power, the car operational become environment friendly and energy save. Although this amusement moves slowly, fun element which is offer should be existed. Within the slow velocity, the passenger could take pleasure in the landscape more relax not in a hurry.

To avoid obstacle for the passenger to watch the view in their traveling therefore it is preferred the frame structure to reduce the surface. Aesthetics element could be created from the car frame structure. There are 3 (three) alternatives design of suspended bicycle as we can see on Figure 4, 5 and 6.
From the 3 (three) alternatives above it follows that preferred one of them with the same consideration as we can see on the table 3. Alternative 3 is choosing as the guidance to create design final within think about aesthetic aspect to be executed.

Table 3. The comparison among the design alternatives.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Durability</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Weight</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Operation</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Comfort</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Safety</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

Shape morphology

Aesthetics aspect of this suspended bicycle is taken from the shape of fruit (pear). Besides the fruit shape is organic it also gives the fresh impression. Within take fruit shape morphology it is expected the passenger obtain the fresh after using the car (Figure 7).

Final design

From the selection of design is implemented then evaluation within add some aesthetic element in order to the amusement more interesting. Adding element exactly like stripping and the title of Surabaya Zoo Park on the chain cover (Figures 8, 9, 10, 11 and 12).

Figure 6. Suspended bicycle design, alternative 3.

Figure 7. 'Suspended' fruit as the character morphology of the suspended bicycle design (front view).

Figure 8. The development of selected suspended bicycle design.

Figure 9. Final design (side view).

Figure 10. Final design (front view).
IV. CONCLUSION

As the tourism amusement, the suspended bicycle design is hoped to fulfill the need of user in the amusement place. That is, for enjoyment of the landscape and feel the challenge when in the altitude. That will give the new experience to the passenger. The placement of car in the suspend position could give the sensation which is more exciting compare to the other amusement. The using of human power besides could save the energy, this amusement also environment friendly since there is no pollution, either air as well sound pollution like the amusement with the engine. The most important thing in the design of the suspended bicycle to be considered is the driven mechanism and the safety factor of the passenger.

ACKNOWLEDGMENT

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REFERENCES

[1] Ministry of Culture and Tourism, Republic of Indonesia (website)