Application of APP Technology to Promote Urban Low-Carbon Transportation

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Abstract. According to the Economist Intelligence Unit's annual ranking of cities in the liveability index, bicycle penetration is one of the top indicators of liveability in the world. As one of the transportation tools of low-carbon life, bicycle can provide convenient travel tools and leisure activities, effectively reduce the burden of man-made development on the environment, meet the spirit of relaxation, is both pollution-free, economic, convenient and other advantages of transportation. The 21st century is an era of smart technology, and the rise of APP has changed people's life pattern and the way of obtaining information. However, it has become a current trend to take people and environment as design considerations [1]. The successful bike APP can meet the needs of cyclists of different ethnic groups when riding, improve the convenience of cyclists, so as to attract more people to use bicycles and promote low-carbon and energy-saving lifestyle. Based on a literature review and a survey of 50 existing bicycle apps, this study concluded that the “seven major functional categories, two navigation modes and two interface aesthetic” of the apps were the most important factors affecting users' preferences and download intention.

1. Introduction
With the prevalence of sustainable development, countries gradually adopt environmental protection and sustainable environment management, develop low-carbon cities and green transportation, and put forward relevant policies and urban vision planning. Bicycles, which are both environmentally friendly and convenient means of transportation, have gradually become a new choice for modern people to choose transportation tools. At the same time, they are the embodiment of urban people's re-mastering the pace of life, connecting the new generation's pursuit of independence, slow living and environmental protection [2]. Taiwan bicycle is booming, with 22 million users in 2014, and the annual Taiwan bicycle festival held since 2010 is a good indicator of the number of participants reaching 45,810, which proves the high popularity of bicycles in Taiwan.

In order to continue to develop humanistic bike lanes, make bicycle city and improve the overall service level, Taichung city in 107 bicycles in the overall planning of the republic of Taichung city, put forward idea of wisdom of the utilization of bicycles, establishing perfect bike APP system hope that people can be more convenient and the wisdom to enjoy low carbon life, cherish our energy and the environment. With advanced information technology and a high mobile Internet penetration rate, the concept of health has become increasingly important in people's mind as per capita income increases and leisure time increases. With this condition, the mobile APP can be used to promote the utilization rate of bicycles and promote the green lifestyle. However, there are many bike apps in the
mobile software platform. Search the key word "bike" in the APP Store and the search results of nearly 100 related apps will be displayed. However, in the past, APP design and promotion were mainly based on universal design, which had to meet the preferences of all ethnic groups, resulting in excessive APP functions and affecting users' efficiency and convenience. Therefore, design thinking was not carried out from the perspective of different ethnic groups. Therefore, in order to provide a new strategy of designing bicycle APP based on the preferences of different ethnic group, the purpose of this study is as follows:
1. To explore whether there are differences in the willingness of different ethnic groups to download the functions of the bicycle APP?
2. Understand the preferences of bike groups for the "function", "interface guide mode" and "interface aesthetics" of the bike APP design.

2. Literature Review

2.1 Usefulness of APP functions
It refers to the possibility that a user's in-app functions can help improve his/her work efficiency or meet his/her needs when using an APP, which is the usefulness of the function [3]. In the APP design manual, the designer is required to comprehensively analyze and observe the user's feelings and needs when using a certain system. Its purpose is to ensure that users have a correct prediction of product demand, understand the real expectation and purpose of users, and take human demand as the main direction of product function design [4]. Therefore, according to the cycling frequency and the purpose of cycling, the bike groups were divided into three groups to discuss the functional preferences of each group.

The following is the definition of ethnic groups: “cycling enthusiast” riders choose bicycles as the main means of transportation, and the sports value of cycling is mainly training or challenge."Leisure rider” refers to the rider's view of bicycle as one of the leisure sports, an activity to satisfy the mind and spirit outside daily life. “Commuter” refers to the rider's bicycle as the main means of transportation to and from work or school. After the integration of 50 bike APP, summing up to collect the bike APP first level "cycling record", "cycling diary", "route search", "training" challenge, "health records", "bike loan" and "other" seven big functions, and second level 19 detail function, as a reference for further establish APP functional architecture and strategy. Table 1

| Functional category | Function fine item | Function definitions |
|---------------------|-------------------|----------------------|
| B-1. Cycling record | B-1-1 Total mileage | Provide the number of miles the rider has logged in real time. |
|                     | B-1-2 The cumulative time | Record the cycling time of the rider. |
|                     | B-1-3 slope | Provide the slope of the section the rider is riding. |
| B-2. Cycling diary | B-2-1 Route record | The bike tracks can be stored on the app and uploaded to the cloud through the GPS location of Google maps. |
|                     | B-2-2 Photo clock | It allows users to upload photos taken during the ride to social media such as Facebook. |
|                     | B-2-3 Line review | The cyclists were evaluated in the cycling section. |
| B-3. Route search  | B-3-1 Recommended route | Show the recommended routes of bike paths in each district on the map. |
|                     | B-3-2 Bike path search | Display the route of the bike track on the map. |
|                     | B-3-3 Bike path search | Provides detailed information on attractions, food, snacks and accommodation in the vicinity, including name, address and telephone. |
number.

B-4. Training challenges

B-4-1 Exercise program
The APP offers irregular and different exercise plans to provide users with a suitable plan.

B-4-2 Moving target
Users can set their own riding goals.

B-4-3 Cycling association
Provide users to join the bike club formed by the APP, and provide users with a communication platform with fellow enthusiasts.

B-5. Health records

B-5-1 Calorie counting
Provides instant calories consumed by the rider during the ride.

B-5-2 Records the heart rate
When you need to measure, turn on this feature and place your finger on the camera on the back of the phone.

B-6. Bike rental

B-6-1 Visitor centre search
Display on the map the vicinity of the visitor centre and the visitor centre details, and plan the route to the visitor centre.

B-6-2 Lease point search
Show the bike rental points (private and public) on the map and plan the relevant routes, or further provide the number of bikes available and parking Spaces.

B-6-3 Bicycle search
Work with a bike rental agent to find your lost bike through the bike GPS system.

B-7. Others

B-7-1 Activities of letters
To provide information on cycling activities.

B-7-2 Event information
To provide information about cycling events.

2.2. Ease of use of APP
Refers to the ease of use of APP interface when users use it [3]. In the operation of APP interface, the interface navigation mode is the key factor that most directly affects the user's ease of use. The design focus is to simplify the operation process and make the user achieve the purpose in the shortest time. At present, APP navigation mode is divided into two types: persistence and temporary. “Persistent navigation mode” means that the list of display functions is displayed on the interface without any action, so there is no hierarchical relationship between the function options, but the number of functions can be displayed is relatively small [5]. “Temporary navigation mode” refers to the display function menu to click through or slide page, will from the side sliding interface function menu, the display function mostly as the top navigation and has many projects, but if not full open, cannot know the content of the project, so it can display the function of options is more, but the class structure, need to touch the number of operation will increase, if the user in a single hand operation at the same time, it may be difficult to touch because of is too far away from your fingers [4]. Table 2

| Category                  | Definitions                                                                 |
|---------------------------|-----------------------------------------------------------------------------|
| C-1 Persistent navigation mode | When a user opens an application and sees the navigation options at first glance, he selects the mode of the desired function by clicking on the screen. |
| C-2 Temporary navigation mode | When a user opens an application, he or she must click or slide the page to enable navigation. |

2.3. APP interface aesthetic
Interface aesthetics dominate the whole APP, virtually affect the degree of users for the be fond of APP, and interface aesthetics includes "interface layout" and the "interface colour ", mainly through the text, images and colour collocation between the three factor [6], improve the user's visual appeal, thereby increasing interface to the user when using the pleasure. APP "interface layout" is a part of graphic design, which is mainly composed of appropriate collocation of text and image [4]. It can be divided into text type and image type dominated by text type and image type in "interface layout".
"Interface colour" can affect the overall visual experience of the APP and create a brand. According to the theory of colour image in colour psychology, colours can give people different feelings and vary with different personal characteristics and life experience [7], so the colours displayed on the APP interface can also give users different feelings. Bicycles are pollution-free, healthy, recreational, close to the environment and other advantages of transportation. For bikes or bike apps, there should be different colours. Table 3.

3. Research methods

This study is based on the structure of the technology acceptance model, the above literature review and the investigation of 50 existing bicycle apps. Technology Acceptance Model provides a theoretical basis, research in the behaviour of the users to accept the new information system to design, mainly to explain and predict the user Acceptance of information system, and analyses the various factors influencing the users to accept the new information system, can be applied to a common explanation or predict the influence factors of using Information Technology. Its development is derived from the theories used in social psychology to predict individual attitudes and behavioural images. The use of information system is governed by user behavioural intention, while attitude toward using and perceived usefulness are dominated by perceived usefulness and ease of use [3].

Based on this model theory, this paper discusses the factors that affect users' use of APP. In terms of APP design, these three factors are the “usefulness of APP functions”, “the ease of use of APP” and “APP interface aesthetic”. Therefore, these three factors are the three most important factors that affect users' willingness to use-APP. It's concludes that the "function, navigation mode and aesthetic appearance” of apps are the most important factors affecting users' preference and download intention. Therefore, the questionnaire is divided into four parts. In the first part, the "bike APP function" is investigated, including the user preference degree of the main function and user willingness to download the detailed function. The second part is the user preference survey of the interface navigation mode. In the third part, the user preference is investigated according to the user's personal basic information and the basic condition of cycling. This study was conducted by means of electronic questionnaire, and the questionnaire was evaluated by Likert 5 scale. The higher the score from 0 to 5, the higher the user's liking degree or willingness to download. After the questionnaire was collected, SPSS software was adopted as the data analysis tool. The main statistical methods used in this study include descriptive statistics, univariate analysis and bivariate analysis.

4. Results and discussion

4.1. Basic information

This study through the form of electronic questionnaire, a total of 85 sample collection, in basic data in the main requirements of a different bike for APP development, so in view of the participants' gender, age, ethnic preference, ever using bicycle APP and willingness to use APP were involved five
specific item make a general description, through the distribution of degree analysis and present the sample of this study architecture. In terms of gender, males accounted for 44.7% and females 55.2%. In terms of age, the stratification was mainly concentrated in 19-25 years old (61.1%), followed by 26-45 years old (16.4%) and 45-60 years old (15.2%), respectively. The minimum age was under 18 years old and over 60 years old (3.4%). In terms of ethnic distribution, leisure cyclists were the main ethnic group, accounting for (69.4%), among which 18.5% were cycling enthusiasts, 15.2% were none of the three, and 7% were commuters. However, most of the participants had no experience of using the bicycle APP, accounting for 68.2%, while the willingness to use the APP was high, accounting for 83.5%. Table 4

| Category                      | Project          | Sample | Percentage |
|-------------------------------|------------------|--------|------------|
| Gender                        | Male             | 38     | 44.7%      |
|                               | Female           | 47     | 55.2%      |
| Age                           | Under the age of 18 | 3   | 3.4%       |
|                               | 19-25 years old  | 52     | 61.1%      |
|                               | 26-45 years old  | 14     | 16.4%      |
|                               | 45-60 years old  | 13     | 15.2%      |
|                               | More than 60 years old | 3  | 3.4%       |
| Ethnic group preference       | Professional cyclist | 0  | 0%         |
|                               | Biker            | 16     | 18.8%      |
|                               | Recreational cyclist | 59  | 69.4%      |
|                               | Commuters        | 6      | 7%         |
|                               | None of the above| 13     | 15.2%      |
| Have you ever used the bike APP | No               | 58     | 68.2%      |
|                               | Yes              | 27     | 31.7%      |
| Willingness to use bike related apps | No | 14     | 16.4%      |
|                               | Yes              | 71     | 83.5%      |

4.2. Usefulness of APP functions
On the basis of descriptive statistics, in the three kinds of bicycle group, ethnic sort are different for each function, explains the function of the different ethnic groups for bike APP be fond of different levels, the cyclist sort for "B-1 Cycling record", "B-2 Cycling diary", "B-4 Training challenges", "B-3 Route search", "B-5 Health records", "B-6 Bicycle rental" and "B-7 Other"; Leisure cyclists were ranked as "B-1 Cycling record", "B-4 Training challenge", "B-3 Route search", "B-2 Cycling diary", "B-6 Commuters ranked "B-3 Route search", "B-6 Bike rental", "B-1 Cycling record", "B-2 Cycling diary", "B-5 Health record", "B-4 Training challenges" and "B-7 Others". Table 5

| Functional category         | Ethnic group    | Ranking mean | SD  |
|-----------------------------|-----------------|--------------|-----|
| B-1 Cycling records         | Bikers          | 1.82         | 1.601|
|                             | Recreational cyclist | 3.45  | 1.826|
|                             | Commuters       | 2.50         | 0.707|
| B-2 Cycling diary           | Bikers          | 2.91         | 1.221|
|                             | Recreational cyclist | 3.67  | 1.807|
|                             | Commuters       | 3.00         | 0.000|
| B-3 Route search            | Bikers          | 3.91         | 0.944|
|                             | Recreational cyclist | 3.67  | 1.645|
|                             | Commuters       | 1.00         | 1.414|
| B-4 Training challenges     | Bikers          | 3.45         | 1.695|
Recreational cyclist  3.55  1.901
Commuters  5.50  0.707

B-5 Health records
Bikers  4.45  1.916
Recreational cyclist  3.84  1.736
Commuters  5.00  1.414

B-6 Bike rental
Bikers  5.27  1.737
Recreational cyclist  4.55  1.781
Commuters  2.00  1.414

B-7 Others
Recreational cyclist  6.06  1.702
Commuters  7.00  0.000

According to the univariate analysis method, F value is "3.951" and P value is "0.024" (<0.05). Therefore, different bike groups have significant differences in b-1 cycling record function, so it can be proved that there are significant differences between different groups in demand for bicycle APP function and download willingness. Table 6

| Cycling group B-1 cycling record | Sum of squares | Degrees of freedom | Mean sum of squares | F significance |
|---------------------------------|---------------|--------------------|-------------------|--------------|
| Between groups                  | 24.971        | 2                  | 12.485            | 3.951        | .024      |
| Within the group                | 192.764       | 61                 | 3.160             |              |           |
| Sum                             | 217.734       | 63                 |                   |              |           |

Using the bivariate analysis method, it was found that the P value of b-1 cycling record function for cyclists was 0.002 (<0.05), and the Pearson coefficient was .333**, so there was a significant correlation, and the correlation was low positive correlation. In b-6 bike rental function, its P value is "0.019" (<0.05), and Pearson coefficient is -.254*, so there is a significant correlation, and the correlation is low negative correlation. Among other functions of b-7, its P value is "0.019" (<0.05), and Pearson coefficient is -.222*, so there is a significant correlation, and the correlation is low positive correlation. For the b-6 bike rental function among recreational cyclists, the P value was "0.022" and the Pearson coefficient was .249* (<0.05). In terms of commuter function, all P values were >0.05, so there was no significant correlation. Table 7

| Project | Bikers | Recreational cyclist |
|---------|--------|-----------------------|
|         | Mean   | SD        | Person | P  | Mean   | SD       | Person | P  |
| B-1 Cycling records | 4.73   | .42       | .333** | .002 | 3.94   | .78       | -.096  | .384 |
| B-6 Bike rental     | 3.61   | .81       | -.254* | .019 | 4.13   | .76       | .249*  | .022 |
| B-7 Others          | 3.96   | .61       | .222*  | .041 | 3.28   | .86       | -.110  | .315 |

4.3. Ease of use of APP interface
According to descriptive statistics, the average value of the interface scale is 3.87, and the average value of each item is between 3.09 and 4.06. The test subjects have an obvious preference for the interface navigation mode, and the average value of the persistent navigation mode is relatively high.
Therefore, most of the test subjects prefer the persistent navigation mode when using the APP. Through using the method of double variable, in terms of gender for C - 2 temporary navigation mode in the T value is 2.655, the P value is. 010 (< 0.05), reason has significant correlation, and the correlation for the low positive correlation, and in the C - 2 temporary navigation model, the girl's average of 3.81 higher than boys average of 3.39, so the girls for C - 2 temporary navigation mode of high degree. Table 8

| Project             | Male Mean | Male SD | Female Mean | Female SD | F Value | T Value | significance |
|---------------------|-----------|---------|-------------|-----------|---------|---------|--------------|
| C-1 Persistent navigation mode | 4.18      | .766    | 4.06        | .734      | .181    | .737    | .463         |
| C-2 Temporary navigation mode | 3.39      | .755    | 3.81        | .680      | .994    | -2.655  | .010         |

4.4. APP interface aesthetic
By descriptive statistics, interface aesthetics interface layout and scale of the average of 3.75, each item average between 3.47 ~ 3.91, according to the questionnaire results showed that the participants for the interface layout liking difference is smaller, evaluation value at a higher score, including image - the symbol of the mean value of 3.91 is the highest of the three, the text type of mean value of 3.47, the lowest for three so participants prefer image while using the APP and give priority to with symbols of interface layout.
According to descriptive statistics, the average value of interface layout scale in the aesthetic sense of interface is 3.20, and the average value of each item is between 2.65 and 3.73. According to the questionnaire results showed that the participants for a greater difference between liking interface aesthetics, warm colour department of the mean value of 3.73 is the highest of the three, the quality is average of 2.65, the lowest in the three subjects that have no pollution, healthy, sports leisure, low carbon life of imagery, accord with the bike APP colour configured for warm colour department. Table 9

| Category                      | Factor              | Mean | SD   |
|-------------------------------|---------------------|------|------|
| Interface aesthetics - interface layout | The text type       | 3.47 | 0.810|
|                                | Image type-symbol   | 3.91 | 0.766|
|                                | Image type- simulation | 3.87 | 0.856|
| Interface aesthetic feeling - colour image | Warm colours       | 3.73 | 0.812|
|                                | Medium colours      | 2.65 | 0.752|
|                                | Cool colours        | 3.61 | 0.810|

5. Conclusion
According to the research results, among the bike APP functions of different bike groups, only the cycling record function is significantly different, while bicycle enthusiasts have significant correlation with "cycling record", "bike rental" and "other" functions. Leisure rider at the same time for "bicycle rental" function also has significant correlation, while for bike commuters APP functions are no significant, confirm function of different ethnic groups for bike APP download will or liking have differences, although the Numbers are low but according to the average download will significantly high for most download function will are different RACES. However, the "persistent navigation mode", the "picture type-illustration" interface layout and the overall bike APP's warm colour system
as the main colour configuration show that the bike has the image of green life, carbon reduction and energy saving, which are all the results of the subjects' preference. Therefore, the results of this study as the basic design principles of the bike APP build, change the original APP general design patterns, to use demand and different RACES like project as the new mode of design, improve the convenience of users using the APP and download the APP intention, thus improve bicycle use, promotion of green energy saving the life style of success.

6. References

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