

# USER INTERFACE AND USER EXPERIENCE DESIGN OF LINTAS BANDUNG APPLICATION BASED ON MOBILE ANDROID FOR MEASUREMENT OF PUBLIC TRANSPORTATION IN BANDUNG CITY USING USER CENTERED DESIGN METHOD

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## Abstract

Bandung City is one of the biggest cities in Indonesia. Bandung is a metropolitan city that is quite densely populated, and even the city of Bandung has been named the capital of West Java Province. In the city which is also dubbed as the Flower City, it has public transport modes that serve travel routes within the city or across the city around Bandung Raya.

Public transportation that is very often found in the city of Bandung is City Transportation or Angkot, and Damri Bus or Trans Bandung. Public Transport is a means of public transportation with predetermined routes. According to the West Java Transportation Agency in 2016, based on statistical data on the use of conventional public transportation in the last 10 years has decreased from the previous 40% to 20%. Meanwhile, according to the Central Statistics Agency of West Java Province in 2018, based on statistical data on the use of private vehicles in the past 5 years, there has been an increase in vehicles in the city of Bandung, amounting to 3.9% each year. Meanwhile traffic jams in several locations in the city of Bandung are increasing. The decline in public interest in using public transportation is due to every information terminal on public transport routes, especially in the city of Bandung, which is very minimal, even in some terminals there is no information at all, making it difficult for users of public transportation services.

Based on these problems, a solution is created, a platform that can provide that information and is expected to help users of public transportation services to find out various travel routes in Bandung. The design of the solution focuses on the design of the User Interface and User Experience (UI/UX) of the platform to be developed. The design of the User Interface design will use the User Centered Design method to approach prospective users to get the needs of the design to be designed. Design testing refers to the System Usability Scale (SUS) as a standard in Usability Testing that will be carried out by users. The results of this study are the User Interface design on an application called Lintas Bandung based on Android mobile that has a test score of 79 and 80% acceptable to the user.

**Keywords:** Bandung City, Public Transportation, UI / UX, User Centered Design.

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## 1. Preliminary

Public Transport is a means of transportation that is familiar to most people in Indonesia. Communities in small and large cities have used this public transportation function as a tool to move people and goods from one place to another to become a destination location. Many urban communities have so far relied on mobility with public transportation. This is causes to an increase in the number of urban transportation facilities such as public transportation and other supporting facilities [2].

According to the West Java Transportation Agency in 2016, based on statistical data on the use of conventional public transportation in the last 10 years has decreased from the previous 40% to 20%. Meanwhile according to the Central Statistics Agency of West Java Province in 2018, in the last 5 years or so, the increase in vehicles in the city of Bandung is 3.9% each year. Data on March 19, 2018, the number of vehicles in the city of Bandung reached 3,321,917 units. The proportion of the use of modes of transportation with motorized private vehicles is 55.78%, private cars are 30.96%, and the use of public transportation modes is 13.25%.

Modes of online-based transportation are now beginning to be favored by various walks of life. Besides being easy in terms of usage, this kind of transportation is also considered to be more cost-effective. Many companies provide online-based services that demonstrate great enthusiasm among the public. As more people begin to switch to using online-based modes of transportation, conventional modes of public transportation are increasingly less in demand by the public, especially among millennials people. Lintas Bandung application is an application that will provide information related to public transportation in the city of Bandung. This research focuses on how to develop the User Interface and User Experience in Information applications with the direct involvement of users in it. The method in its development involves the user is User-Centered Design (UCD).

## **2. Basic Theory**

### **2.1 User Centered Design (UCD)**

User Centered Design is a design process that focuses on user needs. Applications developed using the UCD approach are optimized for end-users and emphasize how the end-user needs or desires of using an application [4]. The design is designed with adaptation to user behavior in using the application so that it does not force the user to change their behavior when using the application. The goal is that the design of the developed application can be useful and easy to use for users. The user-centered design will ensure that the application will maintain its usefulness well [7].

### **2.2 User Persona**

User Persona is a method that can identify user characteristics. Authors must think about how to satisfy various users. Some have different educational backgrounds, different levels of knowledge, different ways of solving problems [9]. Personas from the data collected through the results of the questionnaire can be identified as data such as patterns of behavior, goals, skills, attitudes, and environment by displaying physical personal details to create a real persona character.

### **2.3 Mental Model**

The mental model consists of several parts, with tasks in which there are sub-tasks. Mental models are behavioral diagrams made from user behavior data collected from audience representatives. Basically, mental models represent user activities when interacting with the system or concept. In making mental models, the observer must understand the system clearly so that the results obtained are accurate [10]. During observation, usually the thing that is tested is something complicated and complex to describe how the response is from the user. From these observations will later be the key to developing a new system or concept that will be the solution to the problems of previous users.

### **2.4 Hierarchical Task Analysis (HTA)**

A structured and objective approach to describing user task performance, hierarchical task analysis derived from user factors. In its most basic form, hierarchical task analysis provides an understanding of the tasks that the user must perform to achieve certain goals. This process can break down tasks into several sub-task levels [1]. In user experience, hierarchical task analysis can be used to describe interactions between users and software systems. When designing a new system, hierarchical task analysis makes it possible to explore various approaches to completing tasks even if sub-tasks exist in the application. When analyzing an existing system, it can help to optimize certain interactions [8].

### **2.5 Usability Testing**

Usability Testing is an activity in the design process of an application. Usability Testing consists of users who use an application while thinking about how to complete tasks that for them is something new [5].

1. Instructions and tasks: Users interact with the application based on a series of instructions and a series of assignments prepared before the test.
2. Verbalization: Verbalizations reveal how users understand and feel the application. If the user is silent for a longer, they are asked to continue verbalizing or rethink how to complete the task.
3. Reading the user: The evaluator observes the user's interaction with the application and listens to their thoughts. On this basis, evaluators analyze how well the application supports users in completing tasks.
4. Relationship between user and evaluator: It is the responsibility of the evaluator to establish the conditions under which the user can use the application and make positive or negative comments [3].

### 3. Research Methodology

#### 3.1 Conceptual Model

Conceptual modeling is an activity aimed at capturing the essence of a particular reality domain for the purpose of understanding and communicating global ideas about the involvement of individuals, groups, situations or events in a science and its development which aims to provide a thought and focus on the problematic of conceptualizing strategies for the problem to be solved [6].

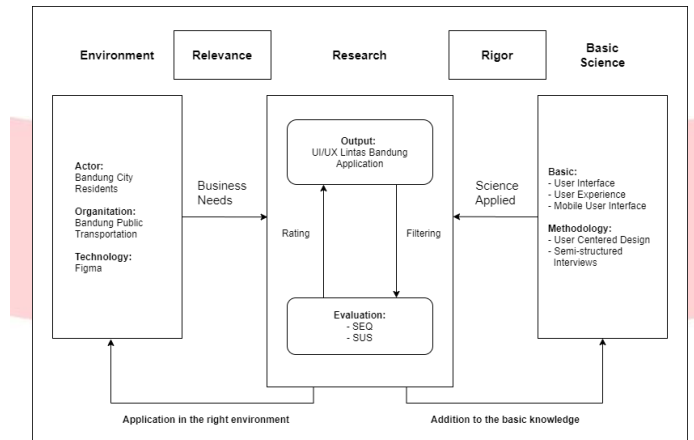


Figure 1. Conceptual Model

#### 3.2 Systematic Research

Systematic research is the stages or paths that are designed as a reference in making research. Research systemics can be interpreted as a rationale solution that is structured that is made that describes what aspects will be carried out in a study and adjusted to the research to be conducted. Systematic research is needed for the authorization framework of a research plan or paper which includes several important elements to explain what, why and how research will be conducted. This is a preliminary step or planning made in a structured manner before the research is finally carried out. The User Centered Design method is used as a reference for the Lintas Bandung Application design flow.

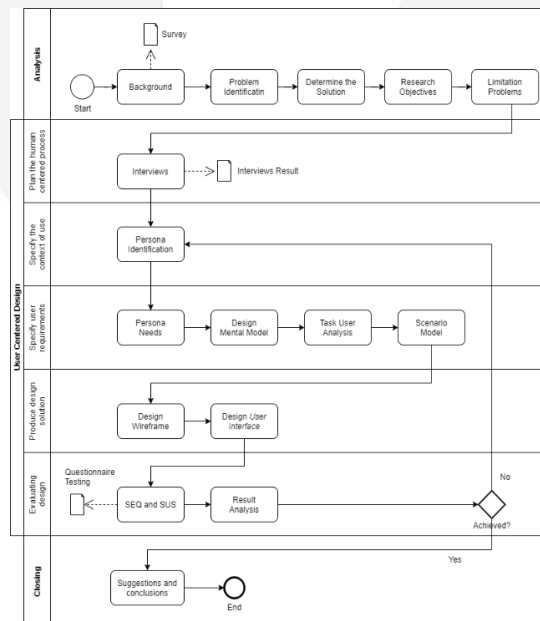


Figure 2. Systematic Research

## 4. Data Collection and Analysis

### 4.1 Mental Model

Mental Models represent the activities of users when interacting on a system or a concept. During mental observation of the model, usually the thing that is tested is something complicated and complex to describe how the response from the user. Mental Models in the Lintas Bandung application are described using affinity diagrams. The figure below explains the mental model in the User Interface design that has 4 main solutions namely Take Public Transportation, View Route Details, Order Ticket that have been booked, and Edit Profile.

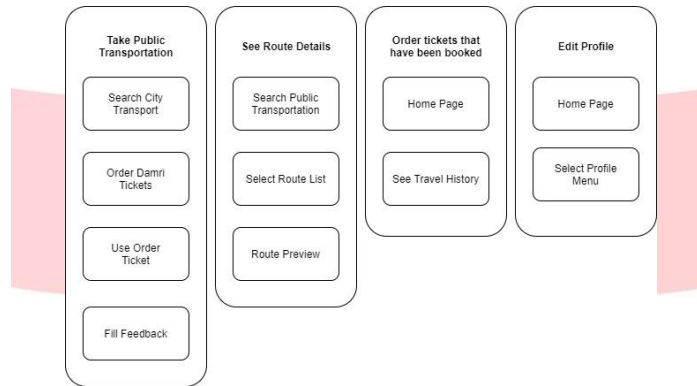


Figure 3. Affinity Diagram

### 4.2 User Task Analysis

User Task Analysis Process in this study will use the Hirarcial Task Analysis (HTA) method. In this process there are sub-tasks of the tasks that exist in the Mental Model. The purpose of this method is to identify in detail the steps that users must take to reach the main task.

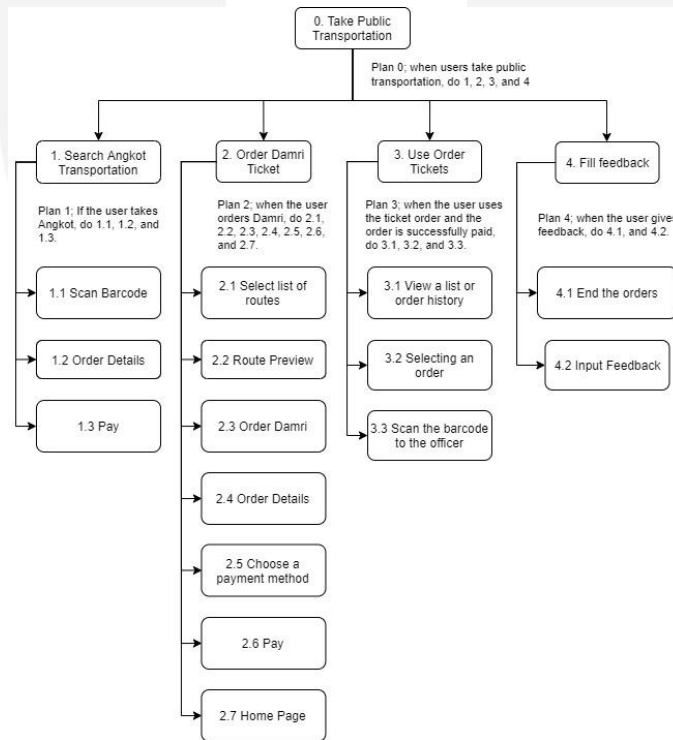


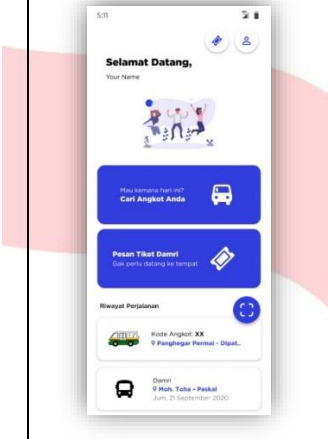
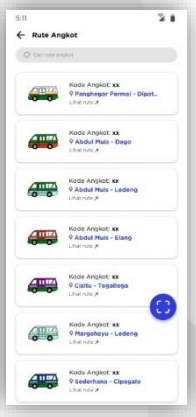

Figure 4. HTA Take Public Transportation

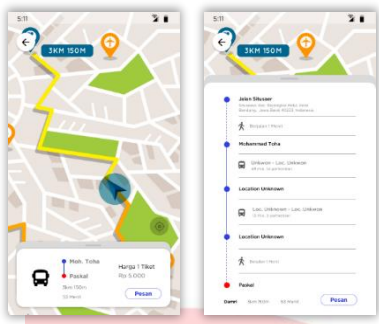
## 5. Implementation and Testing

### 5.1 User Interface Design

In this stage the wireframe that has been designed will be used as a reference for the User Interface design. The platform used in designing the User Interface is Figma. The following User Interface generated will be presented in Table 1.

Table 1. User Interface

No.	Name of Interface	User Interface	Description	Elements
1.	Home		Home page is the main display after logging in the application. This page is the center where all the features are linked. There is a Travel History feature that seems integrated with the Home page so that it can facilitate users to view it	Bars: <ul style="list-style-type: none"> <li>• Status bar</li> </ul> Content views: <ul style="list-style-type: none"> <li>• Text view</li> <li>• Image view</li> <li>• Collection view</li> <li>• Scroll view</li> </ul> Control: <ul style="list-style-type: none"> <li>• Button</li> </ul> Component: <ul style="list-style-type: none"> <li>• Picture</li> <li>• Icon</li> </ul>
2.	Search Angkot Routes		The Angkot route search page is a list of Angkot Kota routes in Bandung. On this page there is also a list of angkot colors according to the route, and users can search routes	Bars: <ul style="list-style-type: none"> <li>• Search bar</li> <li>• Status bar</li> </ul> Content views: <ul style="list-style-type: none"> <li>• Text view</li> <li>• Image view</li> <li>• Collection view</li> <li>• Scroll view</li> </ul> Control: <ul style="list-style-type: none"> <li>• Button</li> </ul> Komponen: <ul style="list-style-type: none"> <li>• Picture</li> <li>• Icon</li> </ul>
3.	Order Damri Ticket		The Damri Ticket Order page is a list of Damri or Trans Bandung bus routes. On this page the user can also search for a route.	Bars: <ul style="list-style-type: none"> <li>• Search bar</li> <li>• Status bar</li> </ul> Content views: <ul style="list-style-type: none"> <li>• Text view</li> <li>• Image view</li> <li>• Collection view</li> <li>• Scroll view</li> </ul> Control: <ul style="list-style-type: none"> <li>• Button</li> </ul> Component: <ul style="list-style-type: none"> <li>• Picture</li> <li>• Icon</li> </ul>

4.	Route Details		Route Details page is a map that will display the selected route for viewing. On this page will show the details of which locations will be taken on the route. This page can also display cost prices, distance traveled, and even travel time to the selected travel route.	Bars: <ul style="list-style-type: none"> <li>• Tool bar</li> <li>• Status bar</li> </ul> Content views: <ul style="list-style-type: none"> <li>• Text view</li> <li>• Image view</li> <li>• Collection view</li> <li>• Scroll view</li> </ul> Control: <ul style="list-style-type: none"> <li>• Button</li> </ul> Component: <ul style="list-style-type: none"> <li>• Picture</li> <li>• Icon</li> </ul>
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**5.2 SEQ (Single Ease Questions)**

In this study there are 9 functions in the application that will be tested. Respondents will be given several tasks and must complete them in accordance with the scenario that has been made. This research will use the Maze Design platform to conduct testing.

Table 2. Application Function Data

Function Number	Function Name	Task
F01	Explore On Boarding Screen	As a new user, you should explore in full a brief description of the application
F02	Account Register	As a new user, you must create an account before using the application by filling in personal data
F03	Application Login	Users who already have an account, must login to use the application
F04	Details of Public Transport Routes	See the details of Angkot / Damri routes, and see what are the unknown Angkot colors in Bandung
F05	Order Angkot	Order for City Transport Ticket
F06	Order Damri Ticket	Order for Damri Ticket (Trans Bandung)
F07	Use Ticket	Using Public Transportation tickets that have been booked and successfully paid
F08	Order Tickets by Trip History	Order more tickets that have been previously ordered
F09	Edit Profile	Change personal data in accordance with the wishes of the user

The execution of testing that will be given there are tasks on each function that must be done. After all the tasks have been completed, the user will fill in the SEQ stage questionnaire. Figure 5 as an example of the proposed scenario.

Function 1: Explore On Boarding Screen

Very Hard    ○   ○   ○   ○   ○   ○   ○   Very Easy

1   2   3   4   5   6   7

Figure 5. SEQ Questionnaire

**5.3 SUS (System Usability Scale)**

The second stage is post-test questioner testing by asking 10 questions to participants. In that question the user will choose a scale of agree or not according to what they feel after testing. Table 3 below will be submitted to respondents.

Table 3. Questions of System Usability Scale

Num.	Questions	Scale				
		1	2	3	4	5
		SD	D	N	A	SA
1.	I think I will often use this application					
2.	I feel this application is too complicated when it can be made simpler					
3.	I think this application is easy to use					
4.	I think I need someone's help to be able to use this application					
5.	I think the features contained in this application are well integrated					
6.	I think there are many inconsistencies in the application					
7.	In my opinion, other people can understand how to use this application quickly					
8.	In my opinion this application is very difficult to use					
9.	I feel confident using this application					
10.	I need to learn many things before I can use this application					

5.4 Result Test of SEQ

SEQ test results are the results of assessors of each task that has been given previously. Participants will provide evaluators according to a scale of 1 to 7 based on the experience felt at the time of testing. The following results of testing using the SEQ method will be presented in Figure 6.

No. Responden	No. Fungsional								
	F01	F02	F03	F04	F05	F06	F07	F08	F09
R01	7	7	7	7	7	6	6	7	5
R02	7	7	7	7	7	7	7	7	7
R03	6	7	7	6	6	4	4	6	7
R04	6	7	6	7	7	6	6	7	7
R05	6	7	7	6	6	6	6	7	7
R06	7	7	7	5	5	6	6	6	6
R07	7	7	7	6	6	6	6	6	7
R08	5	5	5	5	4	6	5	4	6
R09	7	7	7	4	6	6	4	7	6
R10	7	7	7	6	7	7	7	7	7
R11	7	6	7	6	6	6	7	7	7
R12	7	6	7	6	5	5	4	6	6
R13	7	7	7	6	7	7	6	6	6
R14	7	6	7	5	6	6	5	7	7
R15	6	6	6	6	6	6	6	6	6
R16	6	7	7	5	6	6	6	6	7
R17	6	7	7	6	6	6	6	6	6
R18	7	5	7	6	7	7	7	6	7
R19	7	7	6	6	7	7	6	5	7
R20	7	5	7	5	6	7	6	5	7
R21	7	7	7	6	6	6	7	7	7
R22	7	7	7	7	6	6	7	7	7
R23	7	7	7	6	5	6	6	6	6
R24	7	6	7	6	7	7	6	6	6
R25	7	7	7	7	6	7	7	6	7
R26	7	7	7	7	6	7	7	6	7
R27	7	7	7	7	7	6	6	5	7
R28	7	6	7	7	6	6	7	6	6
R29	7	6	7	7	7	6	7	7	7
R30	7	6	7	7	6	6	7	7	7

Figure 6. Result Test of SEQ

### 5.5 Result Test of SUS

SUS calculation process there are several steps that must be done so that the assessment is accurate in accordance with the questions given. Berikut beberapa Langkah yang harus diperhatikan.

1. Question of odd and positive order, then the score obtained from participants must be reduced by 1 (score - 1).
2. Even-order and negative-pitched questions, the score is calculated by 5 minus the score obtained from the participant (5 - score).
3. After making calculations on the results of the value of each question, then all the results are added up and the sum results are multiplied by 2.5.

Table 4. Result of SUS

Respondent	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Nilai
R01	5	1	5	1	5	5	4	2	5	5	75
R02	5	1	5	1	5	5	5	1	5	5	80
R03	5	2	5	2	4	3	4	2	5	5	72,5
R04	4	2	5	2	4	4	4	2	5	4	70
R05	5	3	4	2	5	4	4	1	5	5	70
R06	5	3	4	3	5	5	4	2	5	4	65
R07	5	3	5	4	4	5	4	1	5	4	65
R08	4	4	4	5	3	4	3	1	4	3	52,5
R09	5	3	4	1	5	5	3	1	4	3	70
R10	5	1	5	1	5	4	4	1	5	3	85
R11	4	2	2	2	4	4	4	2	4	4	60
R12	4	2	4	2	4	1	4	1	4	1	82,5
R13	5	2	4	1	5	1	5	1	4	1	92,5
R14	4	2	4	3	5	2	5	1	5	1	85
R15	4	2	4	2	4	2	4	2	4	3	72,5
R16	5	1	5	3	3	2	4	2	4	3	75
R17	3	2	4	2	4	2	3	2	3	2	67,5
R18	5	2	5	1	5	1	5	2	4	1	92,5
R19	4	1	3	1	5	2	5	2	5	1	87,5
R20	4	2	5	1	5	2	4	2	5	1	87,5
R21	4	2	4	3	4	2	4	2	4	4	67,5
R22	4	2	4	3	4	2	4	2	4	3	70
R23	4	1	5	2	4	1	4	1	4	2	85
R24	5	1	5	1	5	1	5	2	5	1	97,5
R25	5	1	5	2	4	1	4	2	5	1	90
R26	4	2	5	1	4	2	5	1	5	2	87,5
R27	4	2	5	1	5	1	5	2	5	2	90
R28	5	2	5	1	5	1	5	2	4	1	92,5
R29	5	2	5	2	4	1	5	2	5	1	90
R30	5	1	4	2	5	1	5	1	4	1	92,5
Score of SUS											79

Table 4 Percentage Acceptable

Num.	Acceptability Ranges	Score	Number of Responses	Percentage
1.	Not Acceptable	0-50	0	0%
2.	Marginal	50-70	6	20%
3.	Acceptable	70-100	24	80%

These results get Acceptable results (can be accepted) by users where with a percentage of 80%. This means that all users on the Usability Testing test can receive applications for immediate use in everyday life.



## 6. Conclusion and Suggestion

### 6.1 Conclusion

Based on the results of the discussion in the previous chapters and answering the problem formulation, research objectives, and referring to the analysis design of the Cross Bandung User Interface application design, the conclusions can be drawn as follows:

1. In designing the User Interface design, data related to user habits is very necessary for the needs of User Experience analysis so that the design is designed according to the user's needs, so the user wants to continue to use the application. The UCD method requires interviews with potential users to get these needs. Interviews conducted in this study using the Semi-structured Interview method.
2. User Interface Design is designed in accordance with the results of user experience analysis by processing the needs of the person, designing mental models, and designing scenario models.
3. Usability Testing is done to evaluate the design results, whether the interface is easy to use or not. The test uses SEQ and SUS methods that produce 4 SEQ values, namely 4 (moderate), 5 (easy enough), 6 (easy) and 7 (very easy). Testing ensures that the application is quite easy to use by users with the highest response value which is very easy. In the SUS test it gets a score of 79, where the score can be declared acceptable by the user.

### 6.2 Suggestion

By observing the results of research conducted on the design of the Cross Bandung Application User Interface design, it can be proposed some suggestions as follows:

1. After getting the evaluation results from the assessment given by the user, it is better to do the improvement process on low-value tasks so that the resulting tasks can facilitate the user and have a high final usability value.
2. When collecting user information, it should be done to a minimum of 10 sources in order to get more data related to what are the habits of the people of the city of Bandung in using public transportation and using application technology.
3. When conducting Usability Testing it should be done directly to prospective users so that users get sufficient understanding related to the tasks that exist in the application. In addition users will provide suggestions and in-depth input related to deficiencies in the application.

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