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Integration of Anthropological Surveying Tools, Walking Maps with the Geographic Information System to develop the Historical Map of Pak Phraek Community, Muang District, Kanchanaburi

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Abstract

The objectives of this research is to survey and collect the data for Pak Phraek Community historical sites and to create the historical maps of Pak Phraek Community, Kanchanaburi Province. The population and key informants included; villagers, philosopher of the Pak Phraek Community, 3 historical scholars, and the government agencies. There are four steps of data collection which are; Community Coordination, Observation and Survey, Interviews and Lesson Learned. This research used the geo-informatics concept, Participatory Geographic Information System concept (PGIS), and the walking map concept as the main concepts for this study. The research results are as follows:

(1) the surveyed data for the historical map making of Pak Phraek Community has concluded two issues as follows; the first issue, Pak Phraek community economy map, from the walking map to the completed map and importing into the geographic information system (GIS), found that there were 97 stores with 22 types of shops. The second issue, the map of Pak Phraek community historical houses/sites from the walking map surveying, to the complete map and imported into the geographic information system (GIS), found that there are 40 learning resources. (2) The historical map making of Pak Phraek Community implemented the geographic information system in the production and development of the Pak Phraek Community map which included; field work, data input, data edit, data management, data manipulation, data analysis and data display. In this way, the Participatory Geographic Information System (PGIS) concept has been adopted to be one of the work processes by free program software, for mapping. The results show that the information obtained from the PGIS process, the community and researchers were able to create a new map obtained from real/living information and to create community ownership of the data.

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Introduction

The policy of Thailand 4.0 encourages research that incorporates science, technology, and innovation. This research located a community that has the potential and readiness to conduct a science, technology and innovative research to help develop the community into a sustainable community by adopting to a Smart City concept. The Pak Phraek Community, is located in the urban area of Kanchanaburi. The Pak Phraek community is a commercial districtas well as a tourist attraction and learning center for Thai ancient history and architecture located on Pak Phraek Road, the area that intersects between Wat Nue (Devasangkharam Temple) and Wat Tai (Chaichumphon Chanasongkhram Temple). Pak Phraek Community is a multi-cultural community containing religious learning resources, ancient architecture and historical learning resources, as well as a tourism learning resources. The community is supported as a tourist community by Kanchanaburi Province. (Department of Tourism and Sports of Kanchanaburi, 2016). Based on researched data, Pak Phraek Community has sufficient potential to develop into a Smart Community. Pak Phraek community was founded since the reign of King Rama III and has a history related to the early Rattanakosin period; it was the location to build a new city to replace the old town of Kanchanaburi during the reign of King Rama III. During World War II the area was the operation center for Japanese soldiers and prisoners of war.

The Smart Community Concept is a presentation of digital economy and social drive by applying the digital technology to effectively develop the community. However, the important topic for community development should be to understand the problems and needs of people in the community and to ensure a participatory design that is most suitable for the properties of that community to provide people with a better quality of life and sustainable growth. (Ministry of Digital Economy and Society, 2016). The research was conducted to develop the community's tourism by creating an innovative map using Geographic Information Systems: GIS, which is an innovation that can be used to develop communities. The innovative maps can develop the community tourism through surveying and developing a historical map to offer information about the history of Pak Phraek Community and as a guide to the historical attractions of the community.

As an introduction, the researcher became interested in the research and development of the Integration of Anthropological Surveying tools, Walking Maps with the Geographic Information System to develop the Historical Map of Pak Phraek Community, Kanchanaburi in order to survey data for the historical map of Pak Phraek Community, Mueang Kanchanaburi District, Kanchanaburi to be a Smart Community Map (Smart Map) that can be used as a tool in the area of community development and tourism management. The two research questions proposed are: (1) What does it look like? and (2) how does it look as a tool to aid the development of the Pak Phraek community to be ready and develop as a Smart Community model in Kanchanaburi?

Objectives

1. To survey the data for Pak Phraek Community historical mapping.
2. To create historical maps of Pak Phraek Community, Kanchanaburi.

Conceptual framework

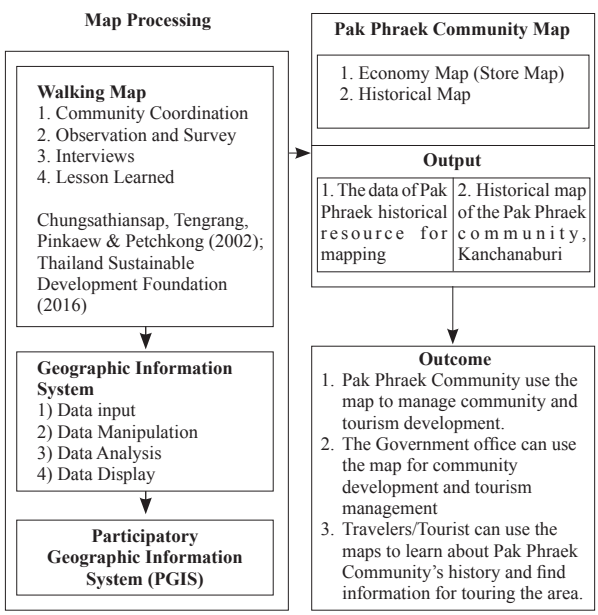

Figure 1 Conceptual framework

This research used anthropological tools to survey the community including walking maps. (Chungsathiansap, Tengrang, Pinkaew, & Petchkong, 2002; Thailand Sustainable Development Foundation, 2016) The process of surveying the Pak Phraek Community included the location, physical, economic

characteristics, architectural features and the settlement of the community by using a participatory action research process (PAR). The PAR process allowed villagers and groups of historic homeowners to jointly create the map, interview, joint surveying and lesson learned. Once the survey information was collected of the walking map it was then used to manage the geographic information system (GIS) preparing to the map processing by using the Participatory Geographic Information Systems (PGIS) conceptual process as the way to join the Historical Map processing according to Figure 1.

Research methodology

1. Population and key informants

Population and key informants included; 30 villagers of the Pak Phraek Community, 1 Philosopher of the Pak Phraek Community, 2 Local historical scholars and government agencies including 1 person from Muang Kanchanaburi Municipality and 1 person form the Department of Tourism and Sport, Kanchanaburi.

Figure 2 Key Informants: Supatra Tantivanich

Key informants are villagers in Pak Phraek community who were asked to provide information about the context of Pak Phraek Community, key informants include; Mrs.Supatra Tantivanich providing information about the history of Pak Phraek Community, information checking and providing the historical map data. Kanchanaburi history academics provided historical information on Pak Phraek Community and historical map data such as; Assistant Professor Monthon Kongtawthong and Kraingkrai Thongsri. The government agencies included Muang Kanchanaburi Municipality; Mrs.Kamolmas Premprayool (Chief of the Administrator of the Kanchanaburi Municipality) and 1 person from the Department of Tourism and Sport, Kanchanaburi.

2. Research instrument

This research used research instruments that included; research interview forms, walking map paper survey, community map (map scale 1:4,000), lesson learned instrument, the free source software; Geographic Information System (GIS) and Global Navigation Satellite System (GPS tool).

3. Collection of data

Survey of Pak Phraek Community map by the walking map concept. The walking map processes is discussed below:

3.1 Community Coordinate was the first process of the community survey by coordinating with community leaders, community philosopher and government sector leaders including The Muang Kanchanaburi Municipality for surveying the Pak Phraek Community map through the walking mapping survey tool. This process led the cooperation between researchers and villagers including group leaders, abbot (Tevasunkharama Temple and Chaichumphon Chanasongkhram Temple), groups of historic homeowners and staff of the Muang Kanchanaburi Municipality.

3.2 Observation and Survey, to survey the occupational characteristics, social characteristics, culture and the environment of the community. The researcher used participatory observation techniques to obtain complete information. By observation along with analyzing the data and using other methods in field work; the survey tools were of value, such as community maps, the surveys paper, and Global Positioning System (GPS) to create the community map and historical map.

3.3 Interview, to query and interview information about community maps and historical maps of Pak Phraek Community with the key informants including Pak Phraek Community philosopher, Chairman of Walking Street, Leader of Ban Nue and Leader of Ban Tai

3.4 Lesson Learned, Researcher used the Participatory Geographic Information Systems (PGIS). (Orban-Ferauge, 2011) The PGIS process implements the ground map and paper map and the Participatory Mapping invokes the communication, understanding and the participatory representation of spatial knowledge easier for the community with 5 steps; Identification of the problems, Building of the partnership, Data gathering, Data processing and Scenarios towards alternative (Figure 2) by the Meeting of villagers in Pak Phraek

Community, Pak Phraek Community philosopher, Kanchanaburi history academics, The government agencies included Muang Kanchanaburi Municipalityand the department of Tourism and Sport, Kanchanaburi.

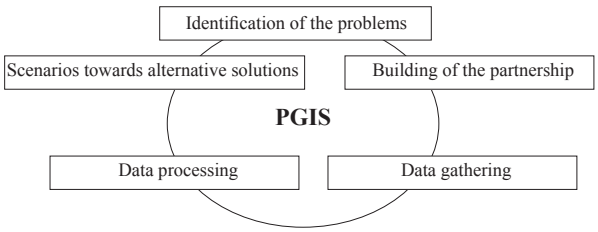

Figure 3 Process of participatory Geographic Information Systems (Orban-Ferauge, 2011)

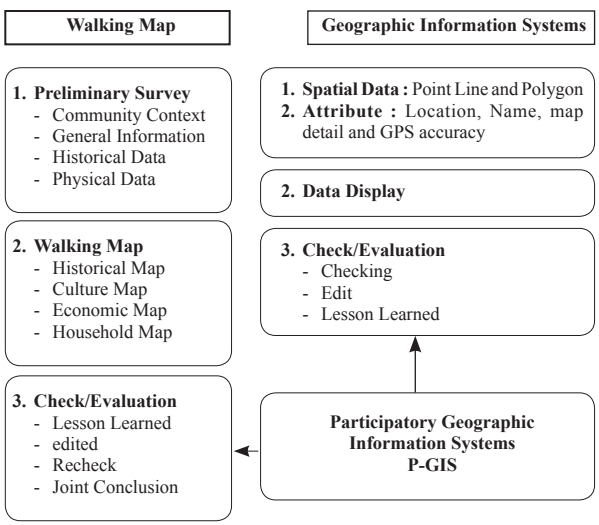

Figure 4 Research processing

4. Data analysis

In analyzing process, researcher analyzed two levels; Community level and household level (historic homeowners). The analysis in the community level had the analysis unit which is the household level and divide the method of data analysis as follows;

4.1 The qualitative analysis; the first process was textual analyzed and summary of results from inquiries, interviews, surveys and observations and synthesize it to the meaning of the text and the interpretation or the debate from what was observed in the study area. The second process was a data check to find credibility by the triangulation method and then analyzed with the theoretical concept. And the third process was to summarize the data, validation of the research results contained a summary of the results and participatory check from villagers and community.

4.2 The Historical Map of Pak Phraek Community was analyzed by the geographic information source with satellite data and aerial photographs, using geographic information systems programs such as; Quantum GIS programs and Google Earth programs. An example of the process is as follows:

1) Data input : Input field work data using the process of working map, the data in the form of points, lines and polygon.

2) Data Manipulation : Consist of information management by classifying the area line and point that shows the learning sources in the Pak Phraek Community.

3) Data Analysis : Geometric coordinate transformation of the historical houses/sites based on the coordinates that are collected from the Global Positioning System (GPS).

4) Data Display : Map display that was managed and analyzed via paper map and online map.

Results

1. The data for Pak Phraek community historical mapping.

1.1 The Economy of Pak Phraek community map

The Economy of Pak Phraek community map is a map that shows the location of 97 stores with 22 types of shops on Pak Phraek Road, Song Kwai Road and Sang Chu To Road. The economic map was developed by a survey that was conducted by researchers, research assistants, community philosophers and villagers involved with the participatory survey. When the information was completed, he researchers developed a map in geographic information system to be the image and map file with the following details; a sketch with the walking map process on the sheet work and by walking around Pak Phraek Community and interviewing the shop owners. In the second process the focus was on lessons learned and a check of the walking map data together with the community. The researchers then developed a map in the form of image files via geographic information system using a satellite image database that was developed from the walking map data survey along with the use of data from Global Positioning System (GPS) for the accuracy of map data.

1.2 Historical Map of Pak Phraek community

Historical Map of Pak Phraek community shows the location of historical resources in Pak Phraek Road,

Song Kwai Road and Sang Chu To Road developed by a survey of researchers, research assistants, community philosophers and villagers who were involved in the participatory survey. The researcher developed a map in geographic information system to be the image and map file with the following details;

The Historical Mapping was conducted by sketching using the walking map process on the sheet work and by walking around Pak Phraek Community and interviewing historic homeowners, The Pak Phraek Community philosophers and villagers (Participatory Mapping and GIS) along with capturing the coordinates on the Global Positioning System (GPS). To capture the coordinates of historical houses and sites in Pak Phraek Community was conducted by surveying 40 historical sites which include the following sites: Wat Thavornwararam (Vietnamese temple), The Supreme Patriarch Palace Tevasunkharama Temple (Wat Nue), History Hall of His Holiness the Supreme Patriarch "Somdet Phra Yana Sangworn", ChinPinKliao Home (The last Vietnamese home of Pak Preak Community), Japanese military Police Station during World War II, Chinese School, Kotchawat Home, Kulasuwan Home, Amnuai Home, Niwas SaenSuk Home, Merchant House of Japanese Spy, Suthee Home, RattanaKusum Home, Boonchai Panich Home, Kanchanamas Home (Hiding place for the Allied prisoners), Tamthong Home, Sri Jamnong Home, Siwapha Home, Hua Hong Home, Kanchanaburi Hotel, Prostitutes Section, Chuan Panich Store, Siri Choomsaeng Home, Boonyiam Jiaranai Home (Khoom Chantsiri), Boonpong and Brothers Home (Siri Osoth), Thai Seri Home, Sumitrakarn Hotel, Chao Mae Guan-im Shrine, Sitti-sung Home, Sahakul Panich Home, Somchit Setaphun Home, The City Gate, Na Muang Post Office, King Rama III Museum, City Pillar Shrine, Governor's Resident, Kanchanaburi Paper Factory, The JEATH war museum and Chaiya Chumpol Chana Songkram temple. In the second process the focus was on lessons learned and a check of the walking map data together with the community. The researchers then developed a map in the form of image files via geographic information system using a satellite image database that was developed from the walking map data survey along with the use of data from Global Positioning System (GPS) for the accuracy of map data.

2. Geometric coordinate transformation of the historical houses/sites

From the validation of the shape file location coordinates in the place of community and the data in the table data on the Street View function in the google earth program, it appears that there are multiple locations that don't match the actual location. Therefore, the researcher has corrected the information as well as adding the necessary information and creating a new shape file.

Figure 5 Mapping survey and capturing the coordinates on the Global Positioning System (GPS)

Figure 6 The walking map with history of Pak Phraek community

Geometric coordinate transformation of the historical houses/sites because the coordinates that are collected from the Global Positioning System (GPS) was wrong from the actual coordinates on the earth. The Researcher used the Ground Control Point (GCP) in the Image to Image concept (Dontree, 1999; Khunrattanasiri, 2019) is to adjust the coordinates from other satellite images (United States Geological Survey, 2019) that have the correct coordinates and are comparable with satellite images in Google Earth. (Figure 7 and 8)

	เรา	เรา	X	Y	เรา	เรา
59	60	60	556992	1550754	ร้านหมอเส็ง	ร้านค้า
60	61	61	556939	1550748	ร้าน ช.การช่าง	ร้านบริการ
61	62	62	556827	1550592	Like Club	ร้านอาหาร/เครื่...
62	62	62	556829	1550600	ครัวบ้านแหม่	ร้านอาหาร/เครื่...
63	63	63	556839	1550574	Dis	ร้านอาหาร/เครื่...
64	64	64	556853	1550483	ร้านเรพคารา โอ...	ร้านอาหาร/เครื่...
65	65	65	556855	1550466	ร้านบ้านตัวกลม	ร้านอาหาร/เครื่...
66	66	66	556873	1550407	ร้านจุ๊กกรู	ร้านอาหาร/เครื่...
67	67	67	556875	1550393	ร้านทับทิมกาญจน์	ร้านค้า
68	68	68	556887	1550380	ร้านรี แล็กซ์ เพล์	ร้านอาหาร/เครื่...
69	69	69	556889	1550347	แพปรีชา-พักลุง	ที่พัก
70	70	70	556900	1550338	บาเลนไทน์	ร้านอาหาร/เครื่...
71	71	71	556926	1550186	ร้านแก้วบริการ	ร้านค้า

id	Name_Th	Name_En	Type	Sub_Type	Sub_En	UTM_X	UTM_Y
59	ร้านหมอเส็ง		ร้านขายยา	ร้านขายยา	Drug Store	14.026801000...	99.527803000...
60	ร้าน ช.การช่าง		ร้านบริการ	ร้านซ่อมรถ	Garage	14.026683999...	99.527338000...
61	ร้าน Like Club		ร้านอาหาร/เครื่...	ร้านนวดแผนไทย	Massage Shop	14.025211000...	99.526402000...
62	ร้านครัวบ้านแห...		ร้านอาหาร/เครื่...	ร้านอาหาร	Restaurant	14.025471000...	99.526196000...
63	ร้าน Discovery		ร้านอาหาร/เครื่...	สถานบันเทิง	Bar	14.025093000...	99.526439999...
64	ร้านต้นเรพคาร...		ร้านอาหาร/เครื่...	สถานบันเทิง	Bar	14.024396000...	99.526587000...
65	ร้านบ้านตัวกลม		ร้านอาหาร/เครื่...	ร้านกาแฟ	Coffee Cafe	14.024224000...	99.526630999...
66	ร้านจุ๊กกรู		ร้านอาหาร/เครื่...	ร้านอาหาร	Restaurant	14.023[illegible]7000...	99.526792000...
67	ร้านทับทิมกาญจน์		ร้านอาหาร/เครื่...	ร้านอาหาร	Restaurant	14.023619000...	99.526821999...
68	ร้านรี แล็กซ์ เพล์		ร้านอาหาร/เครื่...	สถานบันเทิง	Bar	14.023436000...	99.526883999...
69	แพปรีชา-พักลุง		ที่พัก	ที่พัก	Motel	14.023189000...	99.526937000...
70	บาเลนไทน์		ร้านอาหาร/เครื่...	สถานบันเทิง	Bar	14.023026000...	99.526831000...
71	ร้านแก้วบริการ		ร้านค้า	ร้านค้า	Store	14.021502999...	99.527304999...

Figure 7 Example of coordinate correction data

Figure 8 Geometric coordinate transformation of historical houses/sites

3. The historical maps of Pak Phraek community, Kanchanaburi.

The researcher developed and designed the map. By using the process from the concept of geographic information system in producing and developing Pak Phraek Community map that included Field work, input data, manipulation, management data, query and analysis and visualization with Participation Geographic Information System concept. The creation of the historical map of the Pak Phraek RoadCommunity with the Open Source Software included; Quantum GIS and Google Earth with the following process;

3.1 To test import data with Open source software

Testing and editing data for the display of the map data in the QGIS program by dividing the data into 4 data layers included; the historical houses/sites, stores, temples and others places.

3.2 Map Displays

The researcher developed the data obtained from walking map into a map in the form of an image file from a computer via the Geographic Information System (QGIS program) using a database from satellite images and topographic maps from the Royal Thai Survey Department together with the surveying mapping data. As well as using data from the Geographic Information System (GPS).

3.3 The Infographic Map

The researcher made an online map on the website www.pakpraekmap.com and created an infographic map for tourism benefits of the community and government agencies in tourism management. (Figure 10)

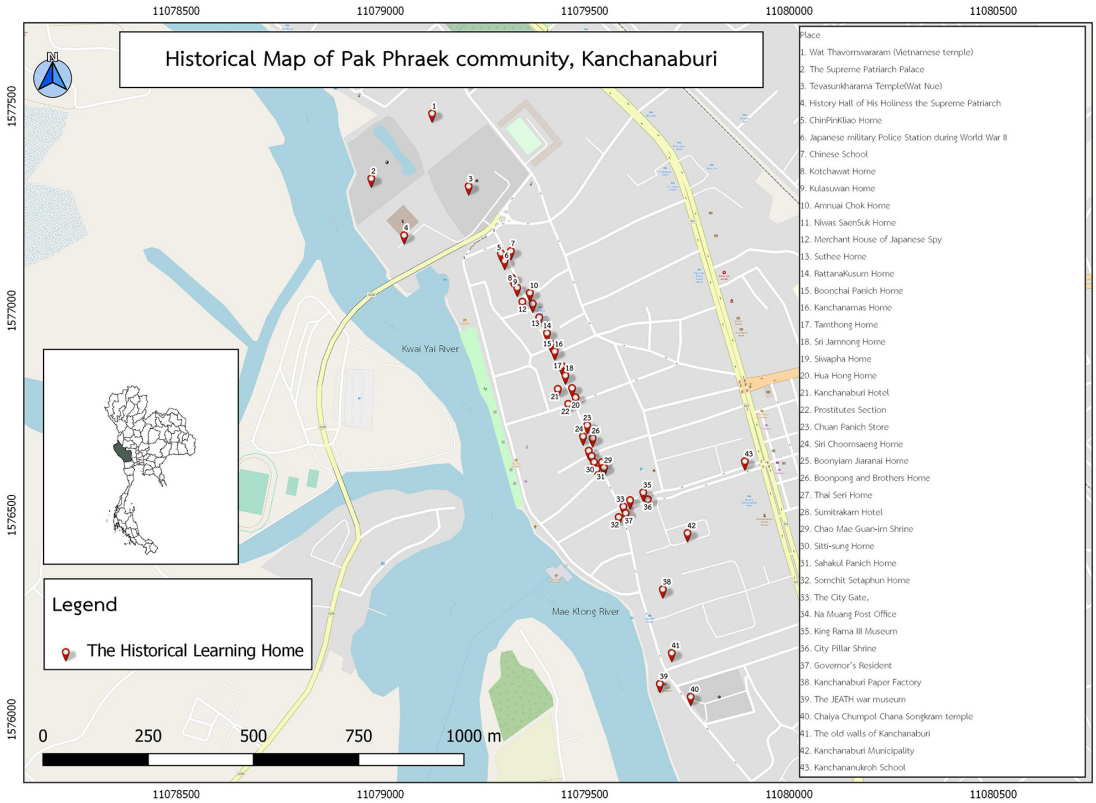

Figure 9 Historical map of Pak Phraek community

Figure 10 The infographic map

Discussion

In creating the historical mapping of Pak Phraek Community, key issues include the following ; first, the benefits of participatory GIS, the people in the community were able to participate to summarize the information of the historical map and the information received can be used for community development and tourism planning, consistent with the research of Fagerholm, Eilola, Kisanga, Arki, & Käyhkö (2019). who studied the place-based landscape services and potential of participatory spatial planning in multifunctional rural landscapes in Southern highlands in Tanzania and found that the data-scarce context common in the Global South, the participatory mapping of landscape services has the potential to advance understanding of the benefits that the landscape has for the local communities and how this information, when mapped spatially, can be integrated with local-level planning practices. The second issue, is the walking map process, which is the mapping process of historical houses/site process; (1) Community Coordinate (2) Observation and Survey (3) Interview and (4) Lesson Learned and using the Participatory Geographic Information Systems (PGIS) conceptual process for the field work which has different result from the research of Ratanopad (2015) who studied the web site mapping in archaeological site "KU" Tung Gula Ronghai area, Roi Et. Ratanopad (2015) does not have a working process for the walking map before exporting data as maps and online maps can be wrong because they may not be accurate with the participatory field work survey. This study has a different result from the research of Sriboonruang & Krumkrua (2017) in Community way of life Research Process for the Thung- Samo Relation re-Building in Walking Map and Community Calendar Concept, which did not have the process of the geometric coordinate transformation and GPS accuracy issue.

Suggestions

1. Should develop the map data in other historical communities in Kanchanaburi and linking information between historical communities to the route of tourism in Kanchanaburi.

2. The Participatory Geographic Information Systems (PGIS) conceptual process used the Ground Map data from the participatory lessons learned and the Paper Map that connects with the Geographic Information Systems (GIS). This concept can be used in the study of community resource management, water management mapping, community disaster management or a cultural map.

3. The Walking Map is a tool of anthropological study for location survey, the physical community can be successful with a collaborative process with community owners and Geographers who adopt this approach to develop into The Participatory Geographic Information Systems (PGIS) and The Participatory Mapping (Pmapping).

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