Optimization of information technology utilization based on geography information system as a marketing media for micro, small, and medium enterprises to improve competitiveness in Bantul Regency, Indonesia

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Abstract. Micro, small and medium enterprises (MSMEs) are the largest group of economic actors in the Indonesian economy. The growth of the micro industry grew by 8% every year, especially in Bantul Regency, Special Region of Yogyakarta. Various factors that led to the growth of the small micro industry in Bantul were caused by the increasing stretch of business in the creative economy sector, the majority of which were engaged in the craft sector. As support, the Government of Bantul provides policies that protect or secure raw materials for handicraft or industrial production properly and facilitate physical promotion by participating in various exhibition events through online media. In the era of information technology development, the support of online information system become one of the promotional media that can reach a large area. The research objectives are to build a website for MSME in Bantul Regency and to provide a media for MSME actors to advertise their goods and services. In this study, the MSME information system that was built was equipped with facilities for maps, images and videos of MSME products. This map facility makes it easy for users to go to business locations. The system was developed by utilizing the Application Programming Interface (API) of google map and database used to store all MSME data using MySQL with the PHP: Hypertext Pre-processor Programming language. The result is development of marketplace website (*https://wartacara.com/ukm*) that have many features to explore and advertise MSME actor in Bantul Regency.

1. Introduction
Today, the development of the digital era must be anticipated by MSME factors. One of the efforts that must be done is to utilize the information and communication technology to carry out promotions and conduct transactions by using social media. At present, the use of social media has become a necessity of the community. Dependency of information on social media is something that must be anticipated in

MSME factors. Social media has an important role in the business world especially in the field of marketing and it is one of the media that can rapidly spread information. Social media is not only a place to show or express oneslef to the outside world, but also as a place to get a lot of information. Various kinds of social media are useful for consumers to get information. [1]

When using internet or social media in the promotion process, MSME factors do not have to provide their own infrastructure. The facilities provided by social media include Facebook, Twitter and other media can be used as a promotion platform. Besides social media, the facilities offered by the government or the community can also be used to promote MSMEs. The use of promotional media, of course, will save costs in conducting promotions and does not require investment in managing promotional media on the internet. All promotional needs on the internet such as the availability of information systems, hardware, and other requirements, have been provided by the service providers. Some media on the internet that can be used include *Bukalapak, Tokopedia*, or other government websites that provide information about MSME factors. Online sales in Indonesia have experienced extraordinary growth reaching 20% consistently every year. In 2016, it was estimated that there were more than 180 million internet users and had reached approximately 40% of the 250 million total population. Based on the survey, there are four of the most popular online vendors in Indonesia, such as: *Lazada, Tokopedia, OnLine eXchange* and *Bukalapak*, with a strong customer base [2].

The availability of service managers who provide MSMEs promotion facilities already exists in several cities, for example there is a website – *http://umkm.jogjakota.go.id* in the city of Yogyakarta. The information presented is certainly beneficial for MSMEs actors or people who are seeking information on an MSMEs. With the existence of this website, promotion of MSMEs can be done easily, all UMKM facilities can be displayed on the website, such as location, potential, images and other information related to MSMEs while the weakness of the website is that there is no facilitation of map location and route to the location.

Research conducted by Meilani [3] showed that micro, small and medium enterprises (MSMEs) have great potential in driving community economic activities and at the same time become a source of income for most people in improving their welfare. Therefore, to improve the efficiency and effectiveness of independent and developing MSMEs, Information Technology (IT) is needed to promote enterprises and their products. For this purpose, Mobile Geographic Information System (MGIS) application was developed for android based mapping of MSMEs. In data collection process, the authors employed observation and interview as methods. The purpose of developing this application is as an alternative promotion media and to make it easy to find the location of MSMEs in Surabaya. Black box test was conducted to test the appropriateness of the application. In addition, testing was also conducted using a questionnaire involving 50 respondents with 15 questions representing 5 stakeholder needs. From the questionnaire results, it was concluded that 4 needs, namely, the need to promote products, to spread information, community service, and information of MSMEs have been highly fulfilled by the application, while the need to increase gross domestic product was sufficiently fulfilled by the application.

Kusuma's research [4] is developing an application that combines GIS technology with the Google Maps API to present information about tourism in Sidoarjo Regency as an effort to realize community empowerment strategies through developing tourism based on populist or community-based tourism development so that people are expected to be able to participate in developing tourism activities in their area, especially the people of Sidoarjo Regency.

Taryadi et al [5] has conducted research about Geographic Information System (GIS) application in mapping the potency of batik. Spatial model presented by GIS may directly be applied to understand the mapping of the potency of batik industry centre in Pekalongan city. System Development Life Cycle development methodology used in creating this application adopted Use-Case Diagrams tool, whereas for the database design The Entity Relationship Diagram was used. The test result with the Alpha test and the beta test were used to test the suitability of the application developed with the needs of users. The Alpha test result using black-box method indicates that all the function in the application of GIS is

working well, suit to the design of the application. The result of the Beta testing can be summarized as follow which are the GIS application developed has a good interface and easy to use, the user can easily follow the provided instruction and the system is able to provide the information required by user, such as the mapping of the business field, the mapping of the amount of business in one district, the potency of the business type per village and displayed suit to the map location. The presentation of the results of this research with the use of GIS technology can facilitate Describe the results of the research in the form of data visualization. Use of GIS technology in more detail of information visualization so you need information about SMEs can be very complete.

In addition, Susanti et al [6] have conducted marketing research on batik based on GIS. This study has two purpose. First, this study aims to analyse the requirements of batik industry on effective and powerful software to select their supplier effectively. Second, this study aims to design, build, and test a web-based decision support system that using Geographic Information System (GIS) to select the best supplier for raw material. A prototype approach is used as a method for developing a web-based decision support system and several SMEs and supplier of batik industry in Central Java and Jogjakarta is used as a preliminary of object for proposed web-based decision support system. Thus, after the initial prototype of an information system was developed, this study uses acceptance sampling with alpha and beta testing and use system testing with positional accuracy testing as a tool for revising and enhancing the initial prototype. The result of all of those testing indicate that application of supplier selection based on GIS in the batik industry has been successfully used and did not experience an error, satisfied the user need and there was no differences between the coordinate of selected starting and ending point from GIS with the coordinate of selected starting and ending point from Global Position System (GPS). The other researches related to the use of GIS are as in reference [7].

2. Research Method

2.1. Research Location
The object of this research is MSMEs in Bantul regency. The website that has been built is able to display the map of Bantul regency with Google Map coordinates, with latitude -7.8866666666667 and longitude 110.3275. Besides the main coordinates of Bantul regency, the coordinate objects needed are sub-district, villages, and coordinates of MSME locations. Table 1, displays the coordinates of the sub-districts in Bantul regency and Table 2, showing the coordinates of village in the Kasihan sub-district.

Table 1. GPS and Google Map Coordinates of Sub-district in Bantul Regency

| Sub-district | GPS Coordinates | | | | | | Google Map Coordinates | |
| | BT | | | LS | | | | |
	DD	MM	SS	DD	MM	SS	Latitude	Longitude
Srandakan	110	14	46.7	7	56	20.21	-7.9388888888889	110.24611111111
Sanden	110	15	56.34	7	58	4.83	-7.9677777777778	110.26555555556
Kretek	110	19	6.69	7	58	20.21	-7.9722222222222	110.31833333333
Pundong	110	20	37.2	7	57	20.61	-7.9555555555556	110.34361111111
Bambang Lipuro	110	17	47.21	7	56	58.04	-7.9494444444444	110.29638888889

Pandak	110	17	50.46	7	54	35.63	-7.9097222222222	110.29722222222
Imogiri	110	22	52.6	7	55	14.92	-7.9205555555556	110.38111111111
Dlingo	110	27	54.69	7	56	6.9	-7.935	110.465
Banguntapan	110	24	39.72	7	49	42.8	-7.8283333333333	110.41083333333
Pleret	110	24	26.72	7	51	59.73	-7.8663888888889	110.40722222222
Piyungan	110	28	35.23	7	50	19.38	-7.8386111111111	110.47638888889
Sewon	110	21	33.81	7	50	58.21	-7.8494444444444	110.35916666667
Kasihan	110	20	41.26	7	49	42.96	-7.8283333333333	110.34472222222
Sedayu	110	15	30.24	7	48	49.25	-7.8136111111111	110.25833333333

Table 2. GPS and Google Map Coordinates of Villages in Kasihan Sub-district

| Village | GPS Coordinates | | | | | | Google Map Coordinates | |
| | BT | | | LS | | | | |
	DD	MM	SS	DD	MM	SS	Latitude	Longitude
Kasihan sub-district	110	20	41.26	7	49	42.96	-7.8283333333333	110.34472222222
Bangujiwo	110	18	47.82	7	50	23.16	-7.8397222222222	110.31305555556
Tirtonirmolo	110	20	41.31	7	49	42.96	-7.8283333333333	110.34472222222
Tamantirto	110	19	36.37	7	49	30.60	-7.825	110.32666666667
Ngestiharjo	110	20	46.86	7	48	1.65	-7.8002777777778	110.34611111111

2.2. Research Diagram
Information system development begins with designing a database. The purpose of database design is to fulfil information that contains specific user need. Figure 1 shows flow diagram of the research implementation.
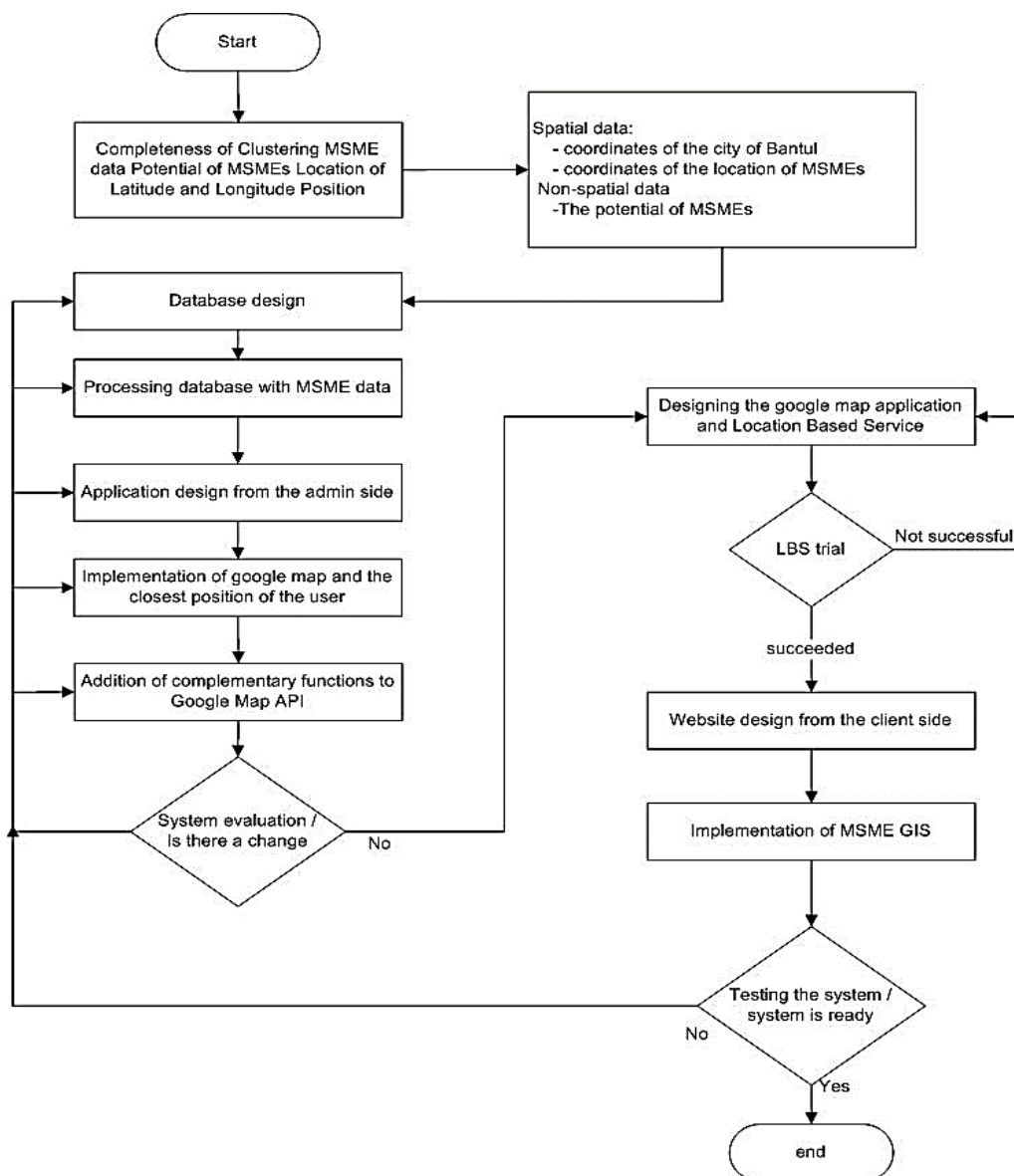
Figure 1. Flow diagram of the research

In summary, the flow diagram of the system development stages are as follows:

a) Identifying the problems by analysing system requirements to be developed
b) Collecting completeness of MSME data, including coordinates location data and potential MSME data
c) Designing the database and carrying out the normalization process to produce a database that is avoided from data duplication
d) Develop applications from the admin side. Application developed to complete all data stored in the database
e) Register on the Google Maps site to get an API Key that contains the code to access Google Maps.

f) Integrating information originating from the database that has been created along with the Google Maps API application into the web that has been designed.

g) In developing applications, the server side is equipped with Google map-based applications, especially in the process of determining coordinates

h) System evaluation from the server application side

i) Developing applications from the client side, the process of creating a web interface is done to design the desired website appearance.

j) After all the scripts have been created and the web interface has been designed, website can be displayed and published with the domain name www.wartacara.com/ukm.

3. Result and Discussion

3.1. Google Map API utilization

This Bantul Regency geographic information system is designed by using Google Map. Google Maps is a Google product that can display a map-based location point. In developing the application (website) that was built, the google map API is used to display the location points of the sub-district, villages and the MSME actors also display routes that can be used to get to a location for MSME actors. The process of displaying location points on Google Map is illustrated in Figure 2. The process of displaying location points is taken from stored tables in the form of latitude and longitude points using the Google map API. This application able to display these data.
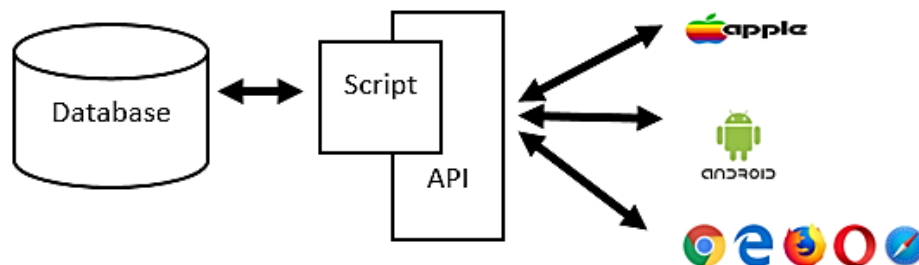

Figure 2. Application developed

In developing this website, the Google Map API functions that are used included in the reference [7]:

- Google Maps API
  This function is used to display maps on the website and set the map mode to be displayed. The implementation of this function is used to display a map of the area on the front page and the location of each MSME.

  Script:

  ```
  <script>
  function initMap()
  {
  var map = new google.maps.Map(document.getElementById('map'), {
  zoom: <?=$zoom?>,
  center: {lat: -7.801371, lng: 110.364762 }
  });
  ```

```
var secretMessages = [<?php foreach ($sig as $key) {echo "'<div id=content> <div
id=siteNotice></div> <div id=bodyContent> <p><a
href=".base_url('home/detKel/')?><?=$key['kecamatan_id']."#peta-ukm><b>Lihat beberapa
kelurahan di kecamatan</b> <h5 id=firstHeading
class=firstHeading>".$key['kecamatan_nama']."</h5> </a></p> </div> </div> ',";}?>];

<?php $j=0; foreach ($sig as $dt) { ?>
var marker = new google.maps.Marker({
animation: google.maps.Animation.DROP,
title: "<?php echo $dt['kecamatan_nama'];?>",
position: {
lat: <?php echo $dt['kecamatan_latitude'];?>, lng: <?php echo $dt['kecamatan_longitude'];?>
},
map: map
```

- Google Place Auto Complete
  Google Place Auto Complete is used for the process of entering data on address of MSME actors such as street names, city names, regional names and other place names. In the process of entering data, the choice of data is almost the same as the data entered. The process of displaying data is done in the form of auto complete in real-time.

  Script:

```
autocomplete.addListener('place_changed', function() {
 infowindow.close();
 marker.setVisible(false);
 var place = autocomplete.getPlace();
 if (!place.geometry) {
   window.alert("No details available for input: '" + place.name + "'");
   return;
 }
 if (place.geometry.viewport) {
   map.fitBounds(place.geometry.viewport);
 } else {
   map.setCenter(place.geometry.location);
   map.setZoom(17);
 }
 marker.setPosition(place.geometry.location);
 marker.setVisible(true);

 $('#txtLat').val(place.geometry.location.lat());
 $('#txtLng').val(place.geometry.location.lng());
 var address = '';
 if (place.address_components) {
   address = [
   (place.address_components[0] && place.address_components[0].short_name || ''),
   (place.address_components[1] && place.address_components[1].short_name || ''),
   (place.address_components[2] && place.address_components[2].short_name || '')
   ].join(' ');
 }
 infowindowContent.children['place-icon'].src = place.icon;
 infowindowContent.children['place-name'].textContent = place.name;
 infowindowContent.children['place-address'].textContent = address;
 infowindow.open(map, marker);
 });
```

- Google Direction API

By using Google Direction API, this website can display routes that connect between two locations, information in the form of distance, estimated time of arrival to the route that must be passed to get to a location.

Script:

```
<script type="text/javascript">
  var map;
  var options = {
    enableHighAccuracy: true,
    timeout: 5000,
    maximumAge: 0
  };
  function success(pos) {
    var crd = pos.coords;
    dsa(crd.latitude,crd.longitude);
  }
  function error(err) {
    console.warn(`ERROR(${err.code}): ${err.message}`);
    alert ('Terjadi kesalahan saat menghubungkan ke server');
    dsa(-7.875138676242137,110.32486636965064);
  }
  function dsa(mylat,mylon){
    map = new GMaps({
      el: '#map_canvas',
      lat: mylat,
      lng: mylon
    });
    map.renderRoute({
      origin: [mylat,mylon],
      destination: [<?=$ukm->alamat_latitude?>,<?=$ukm->alamat_longitude?>],
      travelMode: 'driving',
      strokeColor: '#131540',
      strokeOpacity: 0.6,
      strokeWeight: 6
    }, {
      panel: '#directions',
      draggable: true
    });
  }
  $(document). ready(function(){
    navigator.geolocation.getCurrentPosition(success, error, options);
  });
</script>
```

3.2. Implementation and How the application work from the user side
The main page of website is the first page seen when a user writes an address in *wartacara.com/ukm* on an internet browser. The initial process of this application displays a map of the city of Bantul with marker points in the form of sub-district locations. Figure 3 is the initial appearance of the website that was built.
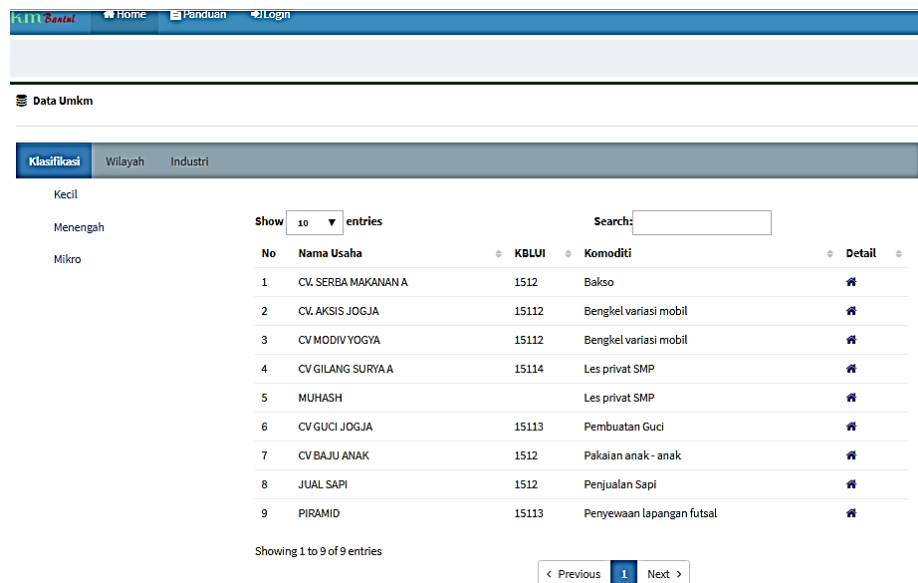
Figure 3. The main page of website

3.3. Potential of MSME

Important information that must be presented on this website is the potential of MSMEs. The main menu that visitors can use to find out the potential of MSMEs is through the regional and industrial classification menu. The main menu of website page display at Figure 4. The display shows a menu that can be selected by website visitors to see the potential of an MSME.
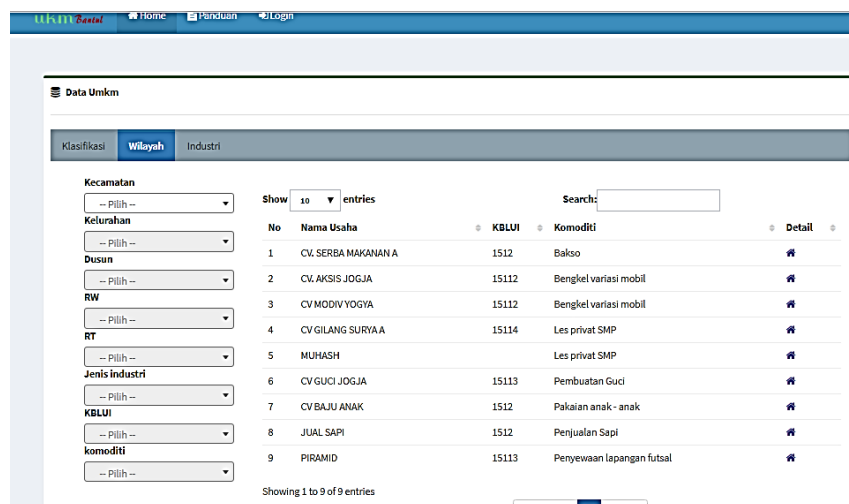

Figure 4. The main menu of website

The website will display detailed information from MSMEs, namely address location information, MSME information in the form of text, images and videos as well as products from MSME players. Figure 5 shows an example of the results of a MSME search.

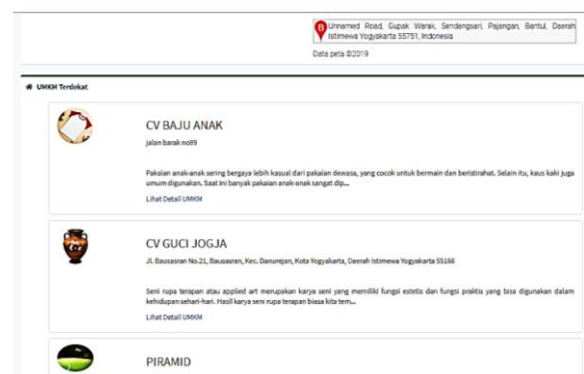**Figure 5.** Detail information of MSME in website

Figure 6. The nearest MSME location

3.4. The nearest MSME Location

Besides informing the location of MSMEs, this application also displays other locations related to MSMEs around the location of the location being searched. Figure 6 displays the other locations closest to the search point.

In addition to informing the nearest location, this application can provide facilities to users to choose and view other locations. With this information, the user obtains other MSME locations adjacent to the first location.

3.5. Display of route pages

This page contains a map display and the route to an MSME location. The results of the page display are found in Figure 8. The route search process begins by entering the starting point and location point searched. This process will display a map to the location as in Figure 7 and the route to the location.
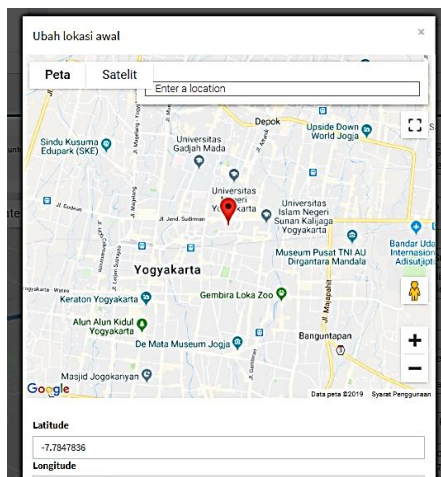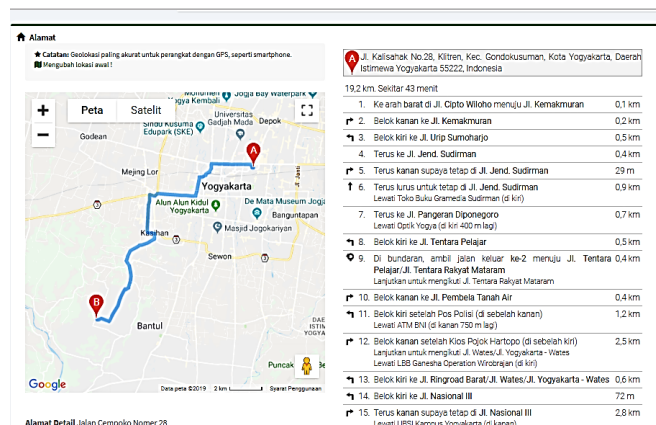

Figure 7. Location point of MSME

Figure 8. Route to MSME location

This route search program uses an application provided by Google Map. Programs for displaying the results of travel routes use two Google API (Application Programming Interface), namely API service directions and API display directions. Both APIs are useful for knowing the direction or route between two coordinate points or more. By utilizing this API, we can draw these route lines or often known as

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polyline. Besides the route, we also get information in the form of distance, the estimated time arrives until the step-step path that we must pass.

4. Conclusion
The conclusions of this research are:

a) The design results of this website based on the MSME geographic information system make it easy for users to find information about MSME objects.
b) Information displayed in the form of text information, images of potential areas, and displaying the route to an MSME location.
c) This route application was developed by utilizing the API (Application Programming Interface) from Google Map.
d) By using this website (*https://wartacara.com/ukm*), many MSME actors and government can explore every potential in Bantul Regency

Acknowledgments

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