Intellectual Property Right Dissemination Service Based On Mobile User Location in Indonesia

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***Abstract*—Intellectual Property Rights (IPR) system is an important economic element which supports economic development through the creation of innovative environments and the enhancement of competitiveness of a nation. As a member of the World Trade Organization (WTO), Indonesia conducted major amendments to its patent laws, trademark laws and copyright laws in 1997 in accordance with the TRIPS Agreement. Later on, an industrial design law, a trade secret law, and a semiconductor-integrated circuit law were established in 2000. The patent laws and the trademark laws were amended in 2001, while the copyright laws were amended in 2002. The *Directorate General of Intellectual Property Rights* (DGIPR) is a government office under the Ministry of Law and Human Rights of the Republic of Indonesia which is responsible for the registration and protection of intellectual property, including patents, trademarks, copyright, industrial designs, layout designs of integrated circuits and trade secrets. The DGIPR is also responsible for disseminating information on intellectual property (IP). Indonesia is one of the largest archipelago countries in the world and which has 33 provinces. Currently many people residing in these provinces find it difficult to obtain IP related information, such as: flagship trademarks, patent research or geographical indication of product from a province. At the same time there is currently no application or system in Indonesia that provides IP-based mobile information services. The aim of this study is to develop a system that disseminates the IPR information based on location of the IPR for mobile users. This system is also being integrated with social networks such as Facebook and twitter.**

***Index Terms*—Intellectual Property, Mobile User, Location Awareness**

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I. INTRODUCTION

INTELLECTUAL Property Rights are generic terms of exclusive rights given to the results gained by a person's original intellectual activities and to the intellectual property signs used for business activities. They signify the intangible rights that own economic value. In the convention establishing the World Intellectual Property Organization (WIPO) – which acts as the central organization for international protection of IP and the expert organization of the United Nations – IP rights are defined as follows: "Intellectual property shall include the rights relating to literary, artistic and scientific works, inventions in all fields of human endeavor, scientific discoveries, industrial designs, trademarks, service marks, and commercial names and designations, protection against unfair competition, and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields" [1].

Realizing the important role of the DGIPR in Indonesia, we furthermore understand that its service performance may have significant impact on Indonesia's economy. With the utilization of an IPR system, the economic development stemming from and relating to intellectual property can be improved in a sustainable manner. The IPR system certainly requires administration/management which is effective, efficient, transparent, accountable, and supported by adequate information technology tools, such as an IPR automation system. The existence of a proper automated system is intended to ensure an optimal management of IPR as a national asset. Such a system is also deemed very urgently needed in order to support economic development and R&D (research and development) activities in this era of knowledge and creativity-based economies (knowledge and creativity economic base) [2].

Today mobile devices are changing the way people work and communicate. Most of the innovative devices today offer the opportunity to access the users' location information using a programmable API. Another interesting aspect is the rapid development of mobile operating systems such as the Android, BlackBerry OS, IOS and the Windows Phone which combined

has a rising market share from year to year. Currently, the Android operating system can be considered as one of the fastest growing of mobile operating systems in the market. For this reason, the current study will use Android as its development platform.

In addition to mobile device, today social networks like Facebook and Twitter have become a significant medium for the dissemination of information. The information submitted by a user will be read by possibly thousands of other users. Other users can then further share the information they receive. Thus, sending information through social networks is one of the most effective ways for rapid dissemination. As of this writing Facebook and Twitter are the best known social networks, each growing rapidly with millions of users respectively.

Location-awareness is a very important aspect of context-awareness in mobile computing systems [3]. The off-the-shelf availability and everyday use of a number of moderate-cost mobile devices such as tablets, PDAs, smart phones, handheld and laptop computers (all with pre-installed wireless and wired networking) with their associated location information leads us to focus our attention on context-aware computing that rests lightly on our everyday environment. Location awareness began as a matter of static user location. The notion has recently been extended to reflect movement.

Location-aware systems addresses the acquisition of coordinates in a grid, for example the use of distance metrics and range-based (*lateration*) algorithms, or at least distances to a reference point as, for example, discriminating presence at a certain choke point on a corridor or in a room of a building [4].

Having reviewed various aspects mentioned above, we believe it would be very useful and even necessary to develop a system that could provide IPR information with location awareness based on mobile devices. The system could use the Google maps API to determine the position of the user, so that the user can obtain the IPR information based on his/her position.

The remainder of this paper is organized as follows; section 2 discusses the related work; section 3 discusses the description of the IPR based location, and section 4 discusses pathway and position analysis. Section 5 provides the discussion and finally section 6 is the conclusion of the work.

II. Related Work

A. Kingsbury Location Awareness System

The Kingsbury Location Awareness System or KLAS, is a prototype location based digital assistant for academic buildings at the University of New Hampshire campus, specifically the second floor of Kingsbury Hall [5]. The KLAS contains two main components, namely the location-awareness system and the user-interactive software. The location awareness system is comprised of a sensor network of IEEE 802.11 (Wi-Fi) access points. The software determines the user's location through signal strengths of these access points. This will run in the background without any user-interaction. The user will interact with two main parts: a dynamic tour guide and an indoor mapping application. The user can access it by using a personal data assistant (PDA). The prevalence in today's society of the IEEE 802.11 protocol is the reason it has been used for the basis of KLAS's location determination. The IEEE 802.11 protocol defines a medium access control mechanism and physical access method to facilitate communication between two devices.

B. Travel Information Assistance

Services for mobile devices are gradually growing with more orientation towards user-location oriented services [6]. Mobile users nowadays are no longer satisfied with the old frameworks that render static and inappropriate services regardless of the user's location. Users require a service that provides intelligent suggestions and results that pertain to their locations, which are also of maximum usefulness and can be immediately utilized.

The study reported in [6] focuses on applying artificial intelligence principles, such as ontology, knowledge base and natural language processing, in building an intelligent mobile and Web service on Twitter, which is one of the biggest mobile-oriented network communities on Internet. The scope of the service is restricted to providing intelligent and personalized query results about restaurants and food for mobile users in Bangkok metropolis, Thailand. The system architecture has also been emphasized with the use of the emerging ontology in constituting the knowledge base in which the building of the ontology model would be instanced with real-value knowledge that would be continuously fed and queried by Twitter's tweet messages.

C. Foursquare - Location Based Service

The service was created in 2009 by Dennis Crowley and Naveen Selvadurai [6]. Crowley had previously founded a similar project called *Dodgeball* as his graduate thesis project in the Interactive Telecommunications Program (ITP) at New York University. Google bought Dodgeball in 2005 and shut it down in 2009, replacing it with Google Latitude. Dodgeball user interactions were based on SMS technology, rather than an application.

Foursquare, stylized as foursquare, is a location-based social networking website for mobile devices, such as smart phones [11]. Users "check in" at venues using a mobile website, text messaging or a device-specific application by selecting from a list of venues from the application locates nearby. In many ways, Foursquare already reinvents what happens both before and after the check-in. Just look at how Jimmy Choo employed a pair of trainers to inspire a three-week frantic offline shoe hunt in London - with shoe sales jumping 30% around the time of the campaign - as proof of the concept. It's the one campaign that Tristan Walker, Foursquare's director of business development, speaks most highly of, even though the start-up didn't directly participate

in the sale. In this case, the LBS is implemented in e-commerce and/or e-marketing as discussed in [12, 13, 14].

D. Sharing Location within Social Groups

This study explores a distinct approach that draws from works on location-awareness and GSM positioning. '*Connecto'* is an application that is always on [8]. It has location tagging and sharing applications that allows groups of friends to 'tag' locations using a standard Windows Mobile phone. Using GSM cell towers to position each phone, Connecto reports each user's status and location to the group, supplementing the standard contacts view. In this way, Connecto supports the sharing of status and location in an unobtrusive manner, automatically communicating location and status without user involvement. Through sharing status and location, the system supported each groups' ongoing repartee a site for social exchange, enjoyment and friendship.

III. IPR Based Location Framework

A. Intellectual Property Right

As mentioned earlier, an intellectual property right is an exclusive right. The justification of this proposition involves more than one theory. In the case of a patent right, typical theories involved might well include the theory of incentives for creation and the theory of compensation for public opening [9]. The former theory contends that denying an exclusive right to the creator of an invention that is physically unseizable and intangible would give rise to the possibility of a third party getting a "free ride" and would thereby diminish the incentive to create. Therefore, an exclusive right is granted to the creator so that she can preclude any third party's unauthorized use of her invention and thus, personally make exclusive use of it. The latter theory asserts that an exclusive right is granted to the inventor as compensation for opening her invention to the public.

In both cases, it is expected that a patent right plays a major part in enabling exclusive use of an invention by virtue of its exclusivity. In the case of copyright, some people rely on the so-called theory of ownership based on mental labor, which says that ownership of a sort should be recognized for a product of mental labor, just as ownership over a tangible entity that is the product of physical labor is recognized. Naturally, this theory is premised on the exclusivity of such ownership.

In recent years, concurrent with the changes in economic circumstances – such as the advancement of globalization of economies – trade of articles other than products such as service trade has increased significantly. While an economy is proceeding with shifting an emphasis on service areas, the differences in the intellectual property system between countries is being questioned as one of the possible non-tariff barriers against the promotion of free trade. As a result, the need for the international harmonization of intellectual property systems has increasingly attracted attention.

Intellectual property systems are different in each country, where intellectual property rights take effect independently. The prevalence of counterfeit brand products and pirated CDs has recently brought about tremendous damages in trade, which has increased the number of international disputes related to intellectual property rights. The result of these problems has been an increase in the significance of the international protection of intellectual property rights and international harmonization of intellectual property systems.

Among the treaties administered by the WIPO are the following: the Paris Convention for the Protection of Industrial Property, the Berne Convention for the Protection of Literary and Artistic Works, the Rome Convention concerning protection of neighboring rights to literary works, Patent Cooperation Treaty (PCT), the Budapest Treaty on the International Recognition of the Deposit of Microorganisms, the Madrid Agreement concerning the protection of indication of source, Trademark Law Treaty, and the Treaty on Intellectual Property in Respect of Integrated Circuits (IPIC), and the Patent Law Treaty (PLT).

The work of [10] examines the enforcement of IP rights within a dynamic general equilibrium of framework, one in which the North invents new products and the South imitates them. A welfare evaluation of a policy of proper IPR is provided, by decomposing the welfare change into four items: (a) terms of trade; (b) production composition; (c) available products; and (d) inter-temporal allocation of consumption. The analysis proceeds in stages. It begins with an exogenous rate of innovation in order to focus on the first two elements. The following two components are added by endogenizing the rate of innovation [10].

In the absence of foreign intervention, proper investment of IPRs move the terms of trade against the South and bring about a reallocation of manufacturing towards higher priced Northern products, which harms the South. If the rate of innovation is responsive to this policy, the rate of innovation rises initially but declines subsequently. The initial acceleration of innovation is, however, insufficient to compensate Southern residents for its eventual decline. Consequently, the shift in the time pattern of available products also hurts the South. The last result may not be robust enough to model specifications, but it shows that endogenous innovation does not guarantee benefits to the South from tighter IPRs on account of the R&D investment response [10].

In the software industry, one of the factors behind the recognition of software-related patents was the transformation of a nation's machine industry into an "information and knowledge" industry [15]. The practice of patenting began with the advent of the Industrial Revolution. While patents were initially issued for mechanical inventions, the scope was expanded to protect inventions in the chemical and electrical fields as well. In response to the information and knowledge industry boom of the 1990s, the scope was again expanded to cover software-related inventions.

Currently, information and telecommunications systems

produced by the information and knowledge industry serves a fundamental role in many other industries, and this role is expected to become increasingly important in coming years. Consequently, it is extremely important from a social perspective to adequately protect software-related inventions—the core components of these information and telecommunications systems—in an effort to promote the development of software and, ultimately, the development of the aforementioned systems. At the same time, however, there are those who point out that the exercise of software-related patent rights, which can potentially affect a wide range of information and telecommunications systems that are prevalent in society and industry, may actually hinder technological innovation.

The emergence of open source software and the heightened awareness of the importance of software interoperability drove discussions on how to strike a balance between the protection and utilization of software-related intellectual property rights. In June 2005 the METI organization formed a "Study Group on the Legal Protection of Software and Promotion of Innovation" to more closely examine the treatment of software-related intellectual property rights from the perspective of promoting innovation. In October of the same year, the Study Group released an interim report that summarized the issues at hand. Based on an analysis and organization of software characteristics, the Study Group proposed the elimination of any hindering effects that software patent protection might have on innovation.

The transition to free trade in the post-socialist economies offers promises & rewards. For example, the privatization of biomedical research offers both promises and risks [16]. Although it promises an increase in private investment, it also has the risk of creating an anti-commons through the proliferation of fragmented and overlapping IPR. An anti-common in biomedical research may be more likely to endure than in other areas of IP because of the high transaction costs of bargaining, due to heterogeneous interests among owners and due to cognitive biases of researchers. Privatization must be more carefully implemented if it is to serve the public goals of biomedical research. Decision makers should create regulation to ensure coherent boundaries of upstream patents and to minimize restrictive licensing practices that interfere with downstream product development. Otherwise, more upstream rights may lead paradoxically to fewer useful products for improving human health.

B. Distribution of IPR in Indonesia

In Indonesia, the distribution of IPR is managed by the DGIPR, which has 33 regional offices in the country. Since year 2003, IP applications can be filed not only at the DGIPR but also at regional offices. The DGIPR has an e-filing system that can be accessed from regional offices. The following table presents the number of applications through regional offices.

From Table I, it is evident that the Island of Java is the dominant source or origin of copyright and industrial design applications submitted to DGIPR. However, for trademark applications, a more even distribution can be seen from among Java and others provinces, such as Sumatera, Kalimantan, Sulawesi, and Bali. Patent applications mostly come from the DGIPR offices because most of the applicants need in-person representatives/consultants. There are also many applicants from outside of Jakarta or Tangerang that come directly to the DGIPR to apply for their IP. These applications can be classified based on applicants' residence address to determine the region of origin.

Table 1. Number of IPR Applications through Regional Offices in 2012

Code	Regional Office	Copy Rights	Industrial Design	Trade Mark	Patent
01	D.I. Aceh	2	0	35	0
02	North Sumatera	1	0	16	0
03	West Sumatera	1	0	9	0
04	Riau	0	0	3	0
05	South Sumatera	2	0	4	0
06	Lampung	1	1	1	0
07	DKI Jakarta	3	0	14	0
08	West Java	49	3	256	0
09	Central Java	51	3	275	0
10	East Java	96	14	634	0
11	West Kalimantan	1	0	18	0
12	South Kalimantan	1	0	7	0
13	East Kalimantan	5	0	10	0
14	North Sulawesi	0	0	14	0
15	South Sulawesi	4	0	55	0
16	Bali	5	3	46	0
17	NTT	0	3	6	0
18	Maluku	0	0	0	0
19	Papua	1	0	0	0
20	Jambi	3	0	1	0
21	Bengkulu	0	0	1	0
22	D.I. Yogyakarta	91	10	279	0
23	Central Kalimantan	2	0	3	0
24	NTB	3	2	12	0
25	Southeast Sulawesi	3	0	1	0
26	Central Sulawesi	1	0	1	0
27	Banten	0	0	0	0
28	Gorontalo	0	0	1	0
29	North Maluku	0	0	0	0
30	Bangka Belitung	0	0	7	0
31	Kep. Riau	0	0	0	0
32	West Sulawesi	0	0	0	0
33	West Papua	0	0	0	0

C. IPR Data Source

Currently the DGIPR has data concerning IPR applications for registration from both domestic and abroad. The following Table 2 presents the number of IPR applications that have been registered in the DGIPR.

The DGIPR classifies IP applications based on the original document from the 33 provinces. Each province has cities or regencies. For instance, the province of Bali is divided into 8 regencies (*kabupaten*) and 1 city (*kota*), which are: Jembrana Regency, Tabanan Regency, Badung Regency, Gianyar Regency, Klungkung Regency, Bangli Regency, Karangasem Regency, Buleleng Regency, and Denpasar City.

Table 2. Number of IPR Registered in the DGIPR

Type of IPR	Number of Application	Number of Registered Application
Patent	87.000	73.000
Trademark	744.300	434.000
Industrial Design	44.700	24.000
Copyright	46.000	40.000
Geographical Indication	22	22
Trade Secret	0	0

The current study gives the experimental query to the IPR database system on how to select the top 5 IPR types based on user location or user preferences. For instance, when a user is located in Denpasar, the query will give result as presented in Figure 1.

```
//query for trademark based on user location
select limit 5  trademark_title, owner, application_date
from dw_table
where  cities like '%get_location%'
order by application_date

//query for trademark based on user query
select limit 5  trademark_title, owner, application_date
from dw_table
where  trademark_title like '%get_title%' or
        owner like '%get_owner%'
order by application_date

//query for trademark based on user query
select limit 5  trademark_title, owner, application_date
from dw_table
where  cities like '%get_cities%' or
        owner like '%get_owner%'
order by application_date
```

Fig. 1. Query based on location

From the query in Figure 1, the *cities* variable represents the location of the IP application originated. Creating an auxiliary table that contains the name of the city and the longitude and latitude location will assist in determining the user's location more effectively. In the DGIPR, each type of IPR has its own database with a mechanism to extract the data from data warehouses into a single database.

Figure 2 presents the ETL (Extraction, Transformation and Loading) process which will be done automatically using the *Kettle Pentaho*, which is an open-source software to handle the data warehouse. Pentaho has a scheduler that runs as it is configured. The Pentaho Data Integration delivers powerful ETL capabilities using an innovative, metadata-driven approach. The Pentaho Data Integration provides an intuitive, graphical, drag and drop design environment and became an alternative approach for this study for extraction, transformation and restore and loading process or as a data integration tools.

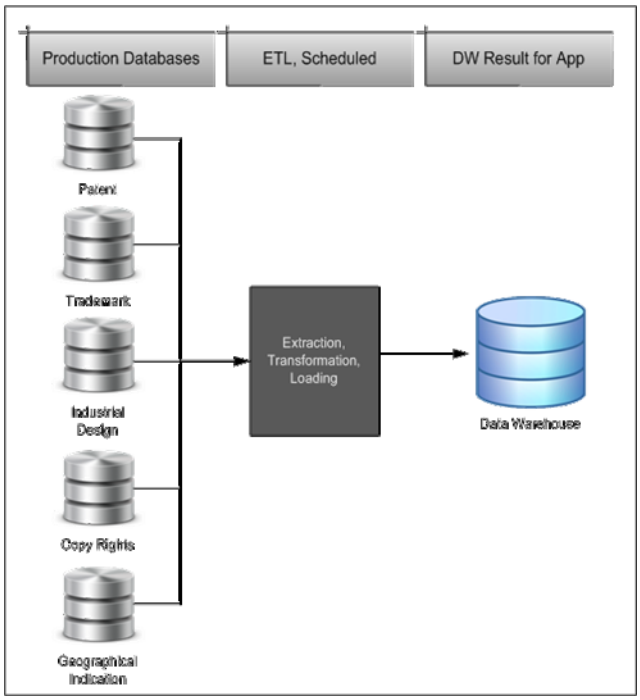

Fig. 2. An illustration of data warehouse processing in the DGIPR

Another approach that can be used is one based on a scheduler such as the *cron* job process. Cron enables schedule jobs (commands or shell scripts) to run periodically at certain times or dates so that availability of data for the system will be more adequate.

D. Location Sensing Technologies

A central problem in location aware computing is how to determine the physical location of a person or object [17]. Researchers in academia and industry have created numerous location sensing systems that differ with respect to accuracy, coverage, frequency of location updates, and cost of installation and maintenance.

There are many technologies for this purpose such as: Global Positioning System (GPS), Radio Frequency Identification (RFID), Infrared, Bluetooth, Wi-Fi, Mobile

Phones, etc. Figure 3 shows the available location sensing technology based on location accuracy.

In Figure 3, horizontal span of each box shows the range of accuracy which the technology covers; the bottom boundary represents current deployment, while the top boundary shows predicted deployment over the next several years. To provide support for a variety of location-aware applications, researchers are working on techniques for fusing data from multiple sensors, on methods for representing location data, and on drawing high-level contextual information from location data.

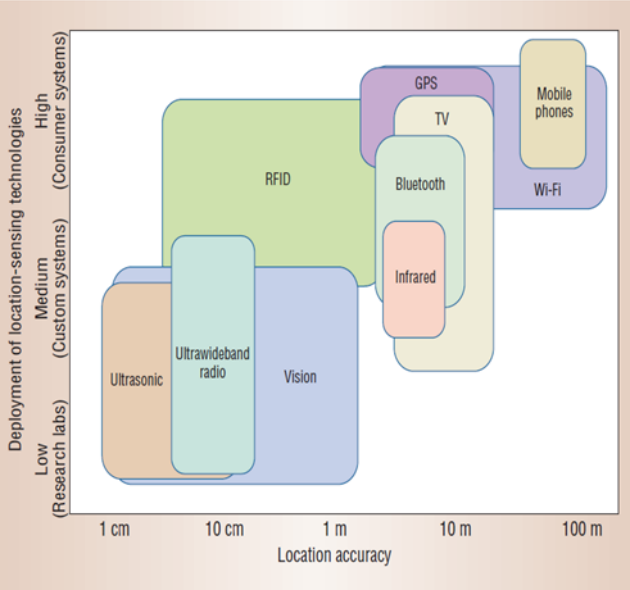

Fig. 3. Location sensing technologies based on location accuracy

E. Model/Framework

In facilitating the development of the system prototype, in this study some open-source tools are used. The tools are as follows:

- Google API as engine to handle maps;
- Facebook and Twitter API for integrating application;
- Android SDK + Google API Add-On Plugin as backend application;
- MySQL/PostgreSQL as backend database;
- JAVA as programming language;
- Grails as application framework;
- Sun Glashfish as web server;
- Eclipse + Android plugin (ADT) as IDE;
- Kettle Pentaho for ETL tools in handling the data warehouse process.
- Handheld device (especially using Andoid OS).

The model/framework of the proposed Intellectual Property Rights (IPR) Information Systems is presented in Figure 4. The details of the framework are as follows:

- The IPR database is generated from the ETL (data warehouse) from each of the applications in the DGIPR. This process is done automatically using a batch script that is run in a schedule. Kettle Pentaho acts as the engine in processing the ETL process to extract data from the old sources into the new data warehouse.
- The application server will communicate (do some queries) with the IPR database based on the user's location and will display a Google Map on the mobile device with the use of the Google API.
- The web application interface is intended to take over management of IPR information behind the scenes. So there are administrators to ensure the system's service is running correctly.
- The system uses Google APIs Add-On for Android as an extension to the Android SDK development environment that helps develop applications for devices that include Google's set of custom applications, libraries, and services. A central feature of the add-on is the Maps external library, which helps to add powerful mapping capabilities to the Android application.
- The Android OS can automatically retrieve the longitude and latitude, and it can interpret results obtained in the form of maps with the help of the Google map API.
- The GSM Provider provides location-based services (LBS) services to obtain the location of the IPR. LBS represents a general class of computer program-level services used to include specific controls for location and time as one of features for IP location tracking.
- After the longitude and latitude location is captured, the system will display a map on the mobile device that consists of IPR information based on the user's location.
- Realizing the importance of social networks today, the information obtained from this system can be disseminated through social networking such as Facebook or twitter through their API.

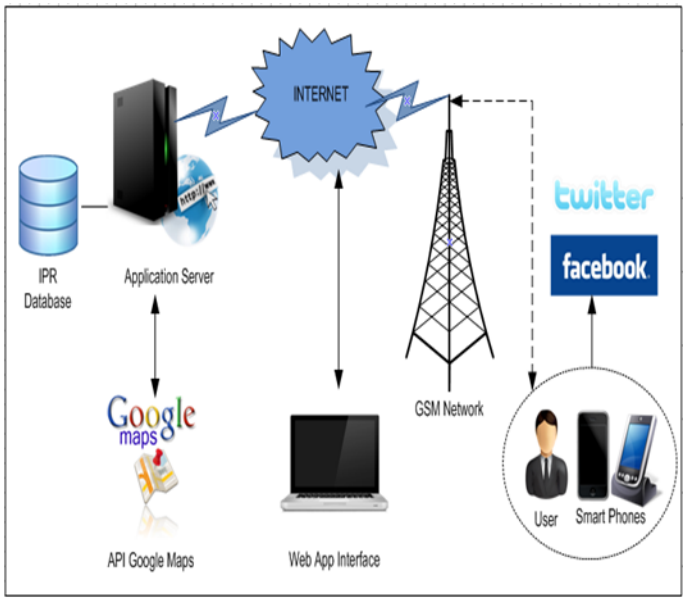

Fig. 4. IPR Based Location Framework

The following is the flowchart that describes how the system works (see Figure 5). Figure 5 shows that there are four areas in the flowchart. The areas are as follows:

- *Server*: it will handle the data warehouse process and it will communicate with external sources using API and will provide proper information to clients and administrators based on queries given.
- *External Sources*: it will work based on requests from web server. The information will be disseminated to other users that are connected through friend lists in Facebook or followers in Twitter.
- *Client*: it will communicate with Google Maps API in accessing maps and web server to obtain the IPR information. QoS depends on the quality of network services and the condition of server traffic.
- *Administrator*: it will monitor the whole system by communicating with the web server.

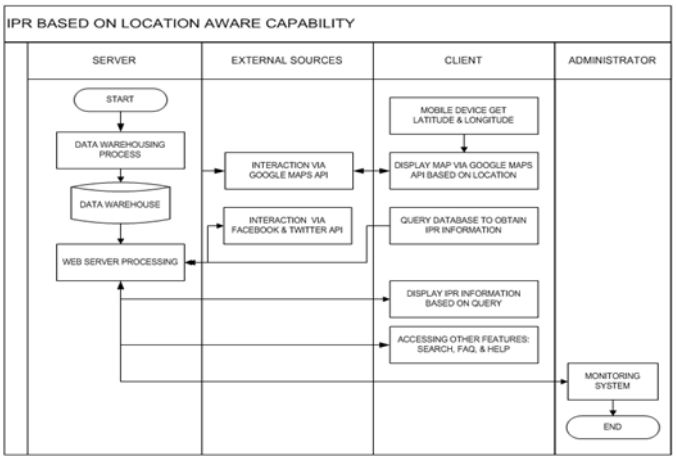

Fig. 5. Location-based IPR System Flowchart

IV. Results and Discussion

The prototype for user's location information based on IPR in the mobile device can be seen in Figure 6. The application will show the Google Map based on the user's location based on GPS data, which include the IPR information. The map will also change when the user moves to a different location. If the user is in a building, then the detection of the user location will be based on LBS system of the GSM which has less precision from GPS.

This application needs support from a GSM provider through data access services. Data access speeds will affect the quality of application services. Faster access to data means better service is provided. Furthermore, the information gained can be disseminated through social networking.

The other consideration is the use of LBS services that is provided by telecommunication (GSM) providers. This approach has less accuracy than GPS in detecting user locations and there is a small charge for using this service according to the service provider.

Figure 7 presents the top ten IP application which is grouped by province and it was submitted without a consultant. It shows that location (province) is an important aspect in disseminating IP information. This figure presents a statistical test when the application is performed in three different cities in a province based on the success rate in obtaining IPR information. It also shows that there are a big potential of intellectual property from different provinces in Indonesia.

Fig. 6. IPR Information Application based on user location (GPS or LBS)

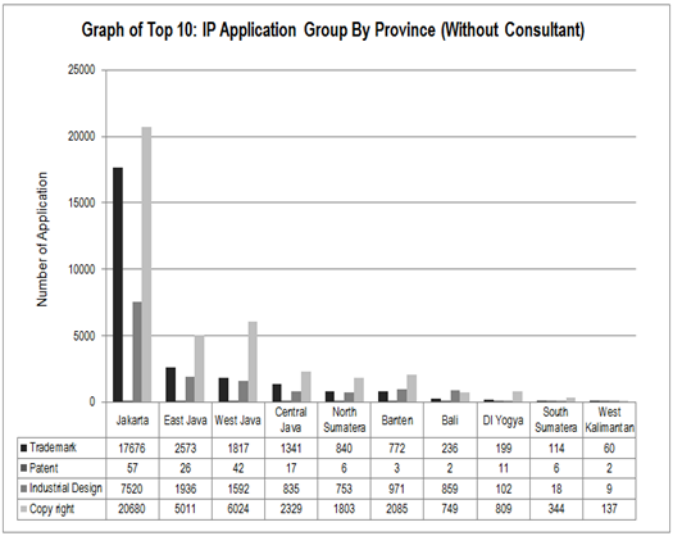

Fig. 7. A graph of the top ten IP application – grouped by province

In a small city, the accuracy of the location detection may bring to less accuracy. This is because the determination of the user location will first be converted from the longitude and latitude location of their city's name. The results of these conversions may degrade the accuracy of detection of the

user's location, as it assumes the city size is in closed curve form. However, in our future work we plan to create a geo-fence for each city to get more accuracy for the user location determination.

The following are the statistics of user polling based on user expectations to the common application features.

Figure 8 indicates that users expect the system to have more application features. For instance, the capability to search the IPR information based on keywords that they enter. Social media is also an important feature for disseminating the IPR information as such the current system may be extended to use keywords for searching purposes.

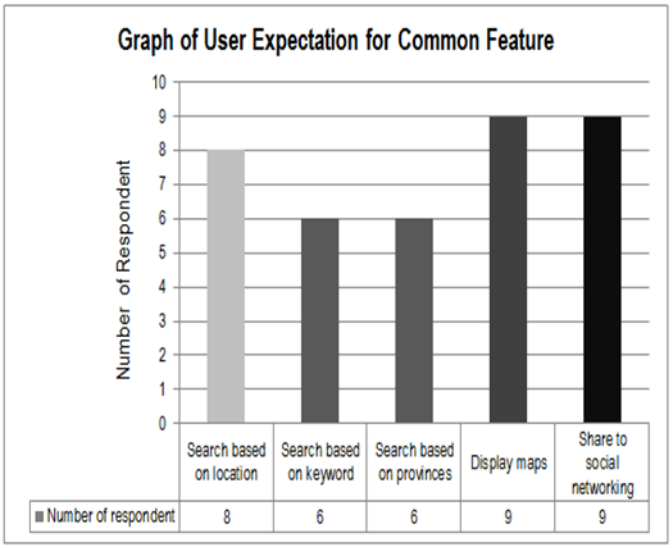

Fig. 8. Graphs of user expectation for the common application features

V. CONCLUSIONS

The objective of this paper is to provide an intellectual property information dissemination service based on the mobile user's location. The design is as follow: the public can find what trademarks are registered in a city they visited and what kind of product that available in that location based on those IPRs. The geographic location will indicate on what IPR is available in that location.

The detection of the user's location based on the GPS's longitude and latitude often have constraints for indoor environment. Therefore, the method of location based service is considered to be used in indoor as this IPR system does not need high accuracy of prediction in determining user location. For further study, the combination of geolocation and geo-fencing approach can enrich the features provided to the users. In addition, the application is expected to perform searches based on keywords entered by the user. The user can explore more information in regard to the IPR information and it may relevant to the user profile. Another consideration is to extend the client side of the system to other platforms such as Blackberry, Apple iOS, and Windows Phone.

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