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Mobile Application for Accessing Paper Citation with Social Network Feature

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The enormous usage of mobile gadget in this era gives opportunity to use this facility to improve the communication between researchers or students for sharing scientific paper citation data. Users can access easily electronic scientific journal data using their mobile gadget via internet connection. This research proposes to build mobile client-server application based on Android Operating System. Mobile application also equipped with social network feature, where users can share paper citation through Facebook. The integration with social network improves paper dissemination and facilitates collaborative research works between communities or groups on social network.

Keywords: Mobile Application, Paper Citation, Social Network, Mobile Learning

1. INTRODUCTION

Scientific journal is one of a medium for researchers or students to publish their works. More than 10 years ago, scientific journal has been published online via the internet in form of digital, called electronic journal (e-journal). Nowadays more than 80 percents international journals are published in form of e-journal. Researchers or students are able to search and download various e-journals from journal directory website, for example Google Scholar, Web of Knowledge, and PubMed¹.

In recent year, the usage of mobile gadget (smartphones and computer tablets) also improves significantly. People can access website, download and read files from the internet via their gadget. The mobility is the important key. People can access online contents anytime and anywhere.

Based on two conditions above, it is important to build one integration application, where researchers or students may access scientific journal via mobile

application that run on mobile gadget. The application is built to run on mobile gadget with Android Operating System environment.

Through this application, people can search scientific journal based on title, read article's metadata (title, author identity, abstract, keywords), browse citation data, and download full text paper file.

Mobile application also equipped with social network connection feature. Facebook is chosen to connect with this application. From statistical history, on December 2012, Facebook has been accessed by 1 million active users per month. Especially in Indonesia, Facebook gets the second rank position as the most accessed website and the first rank position as the most social network accessed².

This feature helps researchers or students to share research work among their friends and colleagues easily. This integration also improves paper dissemination because of big number of potential Facebook's users. People can also sharing their idea and join to the collaborative research works via group or community in Facebook.

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2. OPEN ARCHIVE INITIATIVE – PROTOCOL FOR METADATA HARVESTING (OAI-PMH)

This research proposes a harvester system that is part of a larger research project to develop Indonesian Scientific Citation Database (ISCD) System³. ISCD system try to provide a database system consists of Indonesian papers and journals from Indonesian researchers, and also to build citation network among papers, and citation analysis that analyses researcher’s and journal’s impact factor, citation statistics, topic of interest, and other metrics. To achieve this goal the project can not run in solitary but must utilize scientific article databases held by many institutions in Indonesia as content providers. The ISCD will harvest articles’ metadata from several journal database in Indonesia, parse each article’s PDF files, store and then link citation to the original article. The server also provide the web services for Android application to access the paper’s information & citation from mobile devices (smartphones or computer tablets), based of Android operating system. The overview of the project is shown at Figure 1.

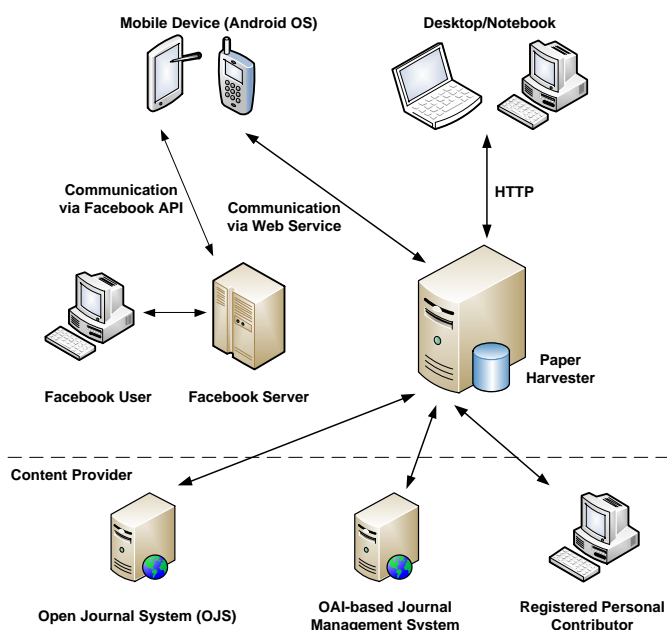


Fig.1. System Scheme of ISCD Project

The harvester part of the project is using Open Harvester System (OHS). OHS is a free open source metadata harvester and indexing system developed by Public Knowledge Project (PKP). PKP was established in 1998 by John Willinsky at the University of British Columbia. Since that time PKP has expanded and evolved into an international and virtual operation with two institutional anchors at Stanford University and Simon Fraser University Library.

OHS implements Protocol for Metadata Harvesting from Open Archive Initiative (OAI-PMH)⁴. By using OAI-PMH, OHS collects paper and journal’s metadata

from journal database that also implement OAI-PMH. Originally OHS does not support citation database, but in earlier research, OHS has been improved by adding capability to store citations and link them to build citation network⁵.

OAI-PMH is basically an implementation of REST (Representational State Transfer) based Web services protocols. REST architecture consists of a server and a client. REST client in the OAI-PMH uses GET and POST operations to retrieve metadata collections that are stored by the REST server. Data is sent from the server to the client in the form of XML documents as shown in Figure 2.

```
<OAI-PMH
xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/ http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd">
<request identifier="oai: 10.1.1.40.5588"
metadataPrefix="oai_dc"
verb="GetRecord">oai2</request>
<GetRecord>
<record>
<header>
<identifier>10.1.1.40.5588</identifier>
<timestamp>2009-04-11</timestamp>
</header>
<metadata>
<oai_dc:dc
xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/oai_dc/
http://www.openarchives.org/OAI/2.0/oai_dc.xsd">
<dc:title>A Method for Obtaining Digital
Signatures and Public-Key
Cryptosystems</dc:title>
<dc:creator>R.L. Rivest</dc:creator>
<dc:creator>A. Shamir</dc:creator>
<dc:subject>the difficulty of factoring the
published divisor</dc:subject>
<dc:description>An encryption method is
presented ...</dc:description>
<dc:date>2009-04-11</dc:date>
<dc:format>application/postscript</dc:format>
<dc:type>text</dc:type><dc:identifier>http://cite
seerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.40.5
588</dc:identifier>
<dc:source>http://www.matha.mathematik.uni-
dortmund.de/~fv/diplom_i/ars78.ps</dc:source>
<dc:language>en</dc:language>
<dc:relation>10.1.1.116.2833</dc:relation>
<dc:relation>10.1.1.115.3569</dc:relation>
<dc:rights>Metadata may be used without
restrictions as long as the oai identifier
remains attached to it.</dc:rights>
</oai_dc:dc>
</metadata>
</record>
</GetRecord>
</OAI-PMH>
```

Fig.2. XML Document as Server’s Respond for Client’s Get Record Request.

OAI-PMH uses verbs to to identify the type of operation requested by the client to the server⁵. Verbs is used to determine the metadata formats that are supported by the repository, to fetch paper metadata from the server, or to know the categories provided by the repository server. Complete verb list is shown in Table 1.

Table.1. Request Verb List Used in OAI-PMH.

Verb	Function
GetRecord	Retrieve one metadata record from the server
Identify	Getting the OAI-PMH protocol versions supported by the server, the email administrator, record removal system, and the level of date detail
ListIdentifiers	Retrieve a list of papers' header.
ListMetadataFormats	Get metadata format supported by server
ListRecords	Retrieve papers' metadata based on date or set criteria
ListSets	Get paper's set (category)

3. MOBILE APPLICATION SERVICE

Users can also access the citation information from their Android based mobile device. Mobile application communicates with PHP web service (server) through HTTP protocol for requesting the database data.

Server gives response with deliver the JavaScript Object Notation (JSON) containing the requested data (Figure 3). Then mobile application extract the JSON and get the information to be displayed to users (Figure 4).

```
{
  "products": [
    {
      "article_id": "111",
      "title": "PENGARUH ELEKTROKINETIK TERHADAP DAYA DUKUNG PONDASI TIANG DI LEMPUNG MARINA"
    },
    {
      "article_id": "120",
      "title": "THE PERFORMANCE OF TRADITIONAL CONTRACT PROCUREMENT ON HOUSING PROJECTS IN NIGERIA"
    },
    {
      "article_id": "125",
      "title": "Exploring Public Perception of Paratransit Service Using Binomial Logistic Regression"
    },
    {
      "article_id": "195",
      "title": "Seismic Properties of Moment-resisting Timber Joints with a Combination of Bolts and Nails"
    },
    {
      "article_id": "260",
      "title": "Effect of Staurosporine on the Intracellular Localization of Hepatitis B Virus Core Protein"
    },
    {
      "article_id": "291",
      "title": "Expression and Intracellular Localization Study of Wild Type HBV Core Protein and its Mutants Which Block Nucleocapsid Envelopment in HuH-7 Cells"
    },
    {
      "article_id": "495",
      "title": "Preparation Methods and Applications of CuO-CeO2 Catalysts: A Short Review"
    },
    {
      "article_id": "544",
      "title": "Design of a Compact and Versatile Bench Scale Tubular Reactor"
    },
    {
      "article_id": "22",
      "title": "ALTERNATE PRICING STRATEGIES IN CONSTRUCTION"
    },
    {
      "article_id": "57",
      "title": "PRICING STRATEGY IN THE INDONESIAN CONSTRUCTION INDUSTRY"
    }
  ],
  "success": 1
}
```

Fig.3. Example of Javascript Object Notation (JSON) Format.

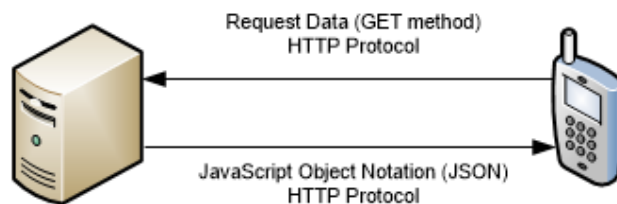


Fig.4. Data Flow Between Web Service (Server) and Mobile Device.

From mobile application interface, users can browse list of journal or conference data. This section provides to users the list of collection of journal or conference papers. Users may also search papers by some keywords.

After users find desired paper, they can see detail metadata of that paper, download full text paper file, open data in full site preview, and share the citation data (title, abstract, venue, and link of a paper) to their Facebook's wall (Figure 5).



Fig.5. Detail Of Paper With Download Full Paper And View Full Site Button

4. FACEBOOK CONNECTION SERVICE

To enable communication with Facebook's server, mobile application has to setup a facebook connection. To do that function, Facebook provides Application Programming Interface (API), a framework that enable developer to build service and application interact with Facebook's server⁶.

For the first time, developer needs to create application account in Facebook by accessing webpage <http://developers.facebook.com>. Developer creates an account, set the permission and other parameters there. Facebook then create App ID and App Secret for

verification process with mobile application (Figure 6).



Fig.6. Facebook Application Developer Page.

Facebook also equipped with Facebook Android SDK. This SDK provides all server-side function to be integrated with Android IDE programming framework (Android Studio IDE). Facebook Android SDK simplify user authentication and authorization process, create and destroy user session, create access token to enable communication process between Facebook’s server and mobile application.

This Facebook Android SDK then connect to Facebook Graph API. This Graph API provides method to call and/or send user data from/to Facebook’s server, for example query data, post new stories, and upload photo. User data that interchanged with Facebook’s server are sent selectively based on application permission setting in Facebook developer account and must be granted by user in the first time access. If developer changes this permission setting later, user have to be reconfirmed to meet the new permission agreement between mobile application with Facebook account.

Graph API is HTTP based communication and uses GET/POST method to communicate with server (Figure 7). Most Graph API requests will require the use of access tokens which your application can generate by implementing Facebook login process. Access token is a variable length of characters that have to be verified by Facebook’s server, each time mobile application request or send data.

```
GET graph.facebook.com
  /facebook/picture?
  redirect=false

POST graph.facebook.com
  /{node-id}/{edge-name}
```

Fig.7. Example of Graph API GET and POST Method.

User who wants to share the information of paper citation, need to login first to their Facebook account via Facebook Login Button in the Main Page (Figure 8). After authentication success and session active, for the first time user have to confirm the permission to enable communication between Facebook application with user

Facebook account. If user granted the permission, application will run action script to post information to the wall (Figure 9). Information about paper citation data, hyperlink to open full paper data in website interface, and optional user comment will be added to the user’s wall (Figure 10).

From this posting, user’s Facebook friends can re-share again the information to their wall, give comments in comment dialog box, or give ‘like’ to the information. This features give interaction between researchers or students about paper citation.

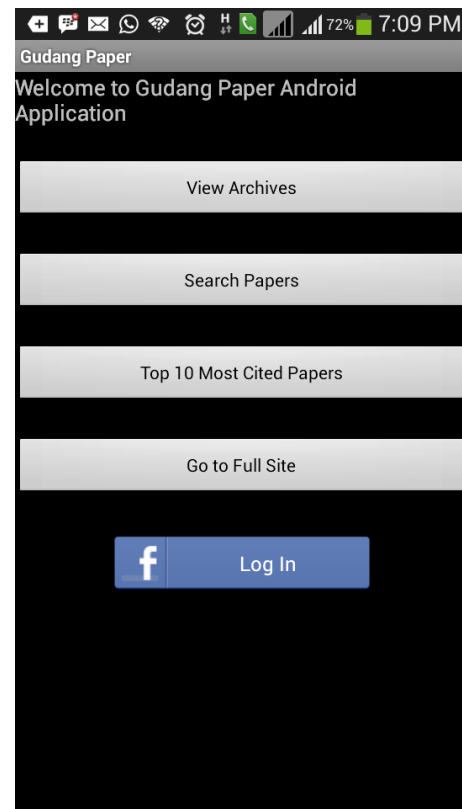


Fig.8. Main Page of Android Application.

```
if(!isSubsetOf(PERMISSIONS,
permissions)) {
    pendingPublishReauthorization = true;
    Session.NewPermissionsRequest
        newPermissionsRequest=new Session
        .NewPermissionsRequest(this,
        PERMISSIONS);
    session.requestNewPublishPermissions
        (newPermissionsRequest);
    return;
}

Bundle postParams = new Bundle();
postParams.putString("message", "Paper
Collection from GudangPaper.net");
postParams.putString("name", title1);
postParams.putString("caption", venue);
postParams.putString("description",
abstrak);
postParams.putString("link",
"http://203.189.120.189/gudangpaper/inde
x.php/record/view/"+article id );
```

Fig.9. Action Script for Posting Information to Facebook.

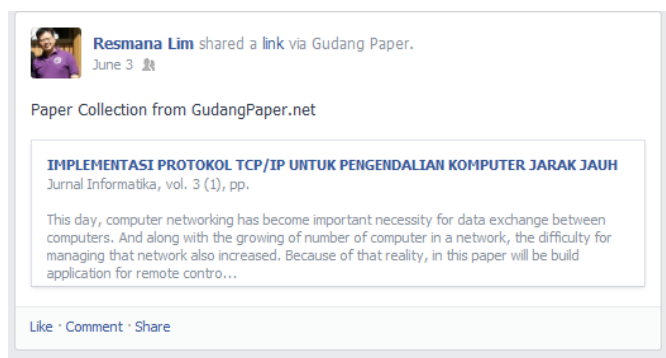


Fig.10. Link Sharing Result on Facebook Page.

5. CONCLUSION

This research is able to extend the capability of PKP-OHS with mobile application. Through an Android mobile application, users can access paper citation data more easily via their gadget.

The Mobile application also integrate with social network feature, where users can share paper citation data through Facebook's wall. This feature facilitate the researchers or students to share paper works with their friends or colleague and open opportunities for collaborative research works among them.

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