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Abstract- Newspaper companies have been providing online services to readers through the online newspaper for the last decade. Today, the newspaper companies are facing many challenges when readers start to access information via Mobile Internet by using various mobile devices such as mobile phones or personal digital assistants (PDAs). Thus, a major concern in the industry is on creating a usable mobile portal to serve the increasingly diverse array of devices used in Mobile Internet. The Mobile Newspaper Development Framework (MNDF) is a framework created (i) analyse the existing services of online newspaper, (ii) outline an appropriate design approach for Mobile Newspaper, (iii) develop a Mobile Newspaper application and (iv) evaluate the usability of the Mobile Newspaper application. MNDF aims to provide useful guidelines to newspaper companies before marching into the Mobile Internet market with minimal effort.

I. INTRODUCTION

In 1995, traditional media such as newspapers are scared of losing their readership and circulation because more and more readers started looking up information on the Internet. Hence, newspaper companies started setting up their own news portals, which is then classified as a new medium called online newspaper. The online newspaper is there to complement with newspaper company’s core product – the newspaper. Through the online newspaper, these companies could provide their readers with the latest news, stock market information, classifieds listing and searching services; WashingtonPost.com and NYTimes.com from the United States, SCMP.com from Hong Kong, AsiaOne.com from Singapore and The Star Online (http://thestar.com.my) from Malaysia are examples of established online newspapers around the world.

Today, the Internet has become one of the main media used by information seekers. With new revenues streamed from online advertising, newspaper companies have proved that getting into the Internet business is a good decision. For instance, New York Times Digital, a unit owned by New York Times Co., is growing at 30% to 40% a year with a revenue of USD 53.1 million during the first half of 2004 [2]. While the Internet has been experiencing tremendous growth in the last decade, the means of accessing it is no longer via desktop PCs only. There are numerous readers accessing the Internet wirelessly by using various types of mobile devices, such as mobile phones or PDAs. Thus, one of the biggest challenges the newspaper companies face is on delivering information to readers who are using different mobile devices in the Mobile Internet environment.

A. Mobile Newspaper: what is it?

After the success of online newspapers, newspaper companies are keen to move into mobile information business because the quantity of Mobile Internet users surpasses that of Stationary Internet users in a few years, as predicted by Merrill Lynch report [9]. Therefore, newspaper companies have to evolve with the times and offer a new product called Mobile Newspaper, which is set to reach a broader range of readers. Mobile Newspaper can be defined as a mobile portal offering newspaper content such as news, classifieds, advertisements and so on. Users usually access Mobile Newspaper by using mobile devices like mobile phones and via General Packet Radio Service (GPRS) or Wi-Fi. Mobile Newspapers are different from the existing mobile portals like Yahoo! Wap (http://wap.yahoo.com) or MSN Mobile (http://mobile.msn.com) because international portals like Yahoo! or MSN normally syndicate news content from news agencies such as Reuters. The focus of their content is more international-based. Nevertheless, newspaper companies generally provide more localised content, which is more appealing to users.

The major concerns of a newspaper company who wish to create their Mobile Newspapers include:
(i) How to leverage the existing online setup for the use of the development of the Mobile Newspaper?
(ii) How to deliver information that is adaptable to the different types of mobile devices, which have different characteristics in terms of display, operating system, browser and markup language engine?
(iii) How to create a usable mobile news portal?

Hence, this paper aimed to create a development framework entitled “Mobile Newspaper Development Framework” (MNDF) which is be used by a newspaper company that owns online newspaper before entering into the Mobile Internet market. It explores various possibilities of Mobile Internet services from the perspective of newspaper companies and evaluates the usability facet of the Mobile Newspaper application. MNDF consists of the following four phases:
(i) Analysis - Phase 1 is to analyse the current online presence of the company and its online newspaper service. With the analysis, the company will then understand its current strengths and weaknesses in order to identify the services that will make sense to mobile users.
(ii) Design - Phase 2 is to create a proper design which developers can adopt for the project before implementation.
technology trends: upon Mobile Internet, researchers are predicting four mobileStationary Internet. While WAP 2.0 may potentially improve Thus, WAP 2.0 is believed to bring Mobile Internet closer to
which has the new XHTML Mobile Profile specification, evolved from WAP 1.1, WAP 1.2 to WAP 2.0. WAP 2.0, WAP sites. Throughout the last few years, WAP has
phones, the slow connection speed and the low availability of
factors were overlooked, such as the screen size of WAP
services. In the late 90's, mobile operators believed that WAP
networking, which consists of potential applications like e-mail, games, shopping, banking and real-time news. “Mobile Internet” is defined as the use of the Internet via
mobile devices such as mobile phones or PDAs. Mobile Internet has two aspects which are significantly different from Stationary Internet. The first aspect is that Stationary Internet is mostly used in a predetermined environment such as cybercafés, homes, offices, while Mobile Internet can be used in various environments such as Wi-Fi hotspots or anywhere with telecommunication services like GPRS and WAP (Wireless Application Protocol). The second difference is that users generally use hardware with limited system resources to access Mobile Internet compared to Stationary Internet. The devices used to access Mobile Internet such as mobile phones and PDAs typically have less resourceful hardware specifications. For example, mobile phones have smaller screens while PDAs have lower processing power when compared to a desktop PC which is used in the Stationary Internet environment. Needless to say, both mobile phones and PDAs do not have a convenient input method if no add-on accessories, like the keyboard accessory, are used with them. Another limited system resource of Mobile Internet is its network – telephony infrastructure – which is still slower than Stationary Internet infrastructure like broadband or leased line services. In the late 90’s, mobile operators believed that WAP could make Mobile Internet a success. However, some key factors were overlooked, such as the screen size of WAP phones, the slow connection speed and the low availability of WAP sites. Throughout the last few years, WAP has evolved from WAP 1.1, WAP 1.2 to WAP 2.0. WAP 2.0, which has the new XHTML Mobile Profile specification, can create sites for both desktop PCs and mobile devices. Thus, WAP 2.0 is believed to bring Mobile Internet closer to Stationary Internet. While WAP 2.0 may potentially improve upon Mobile Internet, researchers are predicting four mobile technology trends:

(i) Mobile devices will have better processors and higher-resolution screens.
(ii) The GPRS and the newly-available of 3G (Third Generation mobile technology) will offer higher bandwidth.
(iii) E-commerce is moving into m-commerce (mobile commerce).
(iv) The PDA display will remain the same size for a longer period as PDAs are still required to be pocket-sized.

Currently, m-commerce mainly provides the following services: (i) purchase of physical goods, (ii) purchase of services and (iii) information delivery. Among the three services, information delivery has the potential to provide a more valuable market while the other two m-commerce applications – purchase of physical goods and services – are facing strong competitions with substitutes including e-commerce. Information delivery provides users current information like latest news headlines and stock market information via Mobile Internet. In order to make m-commerce a hit, content providers should pay more attention to the usability issues raised by the use of Mobile Internet. Generally, WAP-based phones have three perceived usability problems: they are screen size, navigation and site structure, and input methods.

While screen size is the most popular target for criticism, some researches indicate that small displays of devices that could only show a few lines would not badly affect users’ ability to read and understand the information. A good analogy would be the Post-it note, a small piece of paper that carried a specific and focused message. This example actually challenges the belief that small displays do not have the capability to present information adequately. Nonetheless, a small screen that only display one line of information and does not provide more options would adversely affect the result. Thus, we can safely assume that the current WAP phones that display four to six lines of information would not create real problems to users. On navigation, the higher number of clicks needed to get information, the more discouraged the users become. On input methods, users’ efforts are required while the predictive T9 method or cursor keys are used in order to input to the mobile applications. As usability is one of the main issues in m-commerce, researchers have identified design guidelines for WAP usability:

(i) Develop services that provide simple access to focused content.
(ii) Minimise the navigation level.
(iii) Simplify the displayed text.
(iv) Reduce the number of keystrokes by providing convenient input methods like a list of selection.
(v) Conduct evaluation, both theoretical and empirical evaluation, on the use of the application.

Usability could be extended and used as design guidelines for other mobile devices environment which are made up of various markup languages like HTML, cHTML, WAP and XHTML. The usability findings indicate that simplicity rules...
the Mobile Internet application development. A good example is iMode service, which has a simple interface for navigation because its provider, NTT DoCoMo, believes in “reach” and not “richness” [1]. Moreover, the success of iMode service has also challenged the myth that Mobile Internet services cannot succeed without high bandwidth network [1]. The reason the Mobile Internet content has to be simple and focused is due to the characteristics of mobile users. Mobile users tend to have less attention while they are on the move [5]. The environment distracts them and affects their ability to digest the content if compared to a user who is sitting in front of a desktop PC in a predetermined environment. Mobile users also wish to accomplish their task in a shorter time, thus personalised services that required less steps to accomplish their tasks are compelling to them.

III. RESEARCH DESIGN AND METHODOLOGY

A. Cybergenre

In order to turn the online newspaper into a mobile newspaper, one has to understand how the newspaper evolves from its print to online edition. To examine this, the cybergenre model which is a new class of genre created by the combination of computer and the Internet [16] is used. Cybergenre comprises of content, form and functionality. Functionality is defined as the new feature offered by the new medium. An example that illustrates how content, form and functionality relate to each other is “sound item”. “Sound item” is content that presented in different forms such as an icon or link, and it has the functionality of “playing sound”. Cybergenre divides genre characteristics into two groups: “Inheritance” and “New”. “Inheritance” refers to the genre characteristics which exist in the print edition, while “New” refers to the new characteristics of the online edition. Based on the genre characteristics of online newspapers [7], a table of genre characteristics for 3-generation of newspapers is developed (Table 1). The first generation of newspaper is the print edition while the second is the online edition. Mobile newspaper is the 3rd generation and it offers readers on the move information. The new content for mobile newspapers are short video or audio clips that readers can download via 3G network, EDGE or GPRS. The forms of mobile content also take on a shorter and simpler format so readers can quickly get an idea of the latest happenings. For the functionality aspects, Mobile Newspaper can offer advertising services like location-based ads, which are more targeted at readers. With the use of cybergenre, newspaper companies can understand more about the relationship between content, form and functionality while newspapers evolve from print to online and finally to mobile. Hence, it benefits them to analyze the requirements and develop the right design for Mobile Newspaper.

B. Requirements

There are three requirements to consider when newspaper companies plan to develop Mobile Newspapers:

(i) Business Requirement – Since 1995, the Internet has been providing a platform to deliver information to readers in a timelier manner. However, the information landscape has changed drastically within last few years with the combination of the Internet.

TABLE I

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>FORM</th>
<th>FUNCTIONALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inheritance</strong></td>
<td><strong>New</strong></td>
<td><strong>Inheritance</strong></td>
</tr>
<tr>
<td>Navigation</td>
<td>Search item</td>
<td>Table of Content</td>
</tr>
<tr>
<td>Nameplate</td>
<td>Video item</td>
<td>Menu</td>
</tr>
<tr>
<td>Advertisement</td>
<td>Sound item</td>
<td>Logotype</td>
</tr>
<tr>
<td>Classifieds</td>
<td>Web TV</td>
<td>Photograph</td>
</tr>
<tr>
<td>News article</td>
<td>Web radio</td>
<td>Image</td>
</tr>
<tr>
<td>Feature material</td>
<td>News stream</td>
<td>Section head</td>
</tr>
<tr>
<td>Hard composite</td>
<td>News archive</td>
<td>Body text</td>
</tr>
<tr>
<td>Soft composite</td>
<td>Added service</td>
<td>Caption</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Poll</td>
<td>Headline</td>
</tr>
<tr>
<td>Traditional service</td>
<td>Forum for chat</td>
<td>Date</td>
</tr>
<tr>
<td>Issue</td>
<td>Membership</td>
<td>e-mail link</td>
</tr>
<tr>
<td>Contact</td>
<td>Debate</td>
<td>Link list</td>
</tr>
<tr>
<td>Letter to editor</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTENT</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Inheritance</strong></td>
<td><strong>New</strong></td>
<td><strong>Inheritance</strong></td>
</tr>
<tr>
<td>News stream (Latest News)</td>
<td>Short Video / Audio clips</td>
<td>Menu</td>
</tr>
<tr>
<td>Advertisement</td>
<td>Logotype</td>
<td>Shorter stories</td>
</tr>
<tr>
<td>Classifieds</td>
<td>Caption</td>
<td>Personalisation</td>
</tr>
<tr>
<td>News article</td>
<td>Headline</td>
<td>Searching</td>
</tr>
<tr>
<td>Feature material</td>
<td>Date</td>
<td>Showing video</td>
</tr>
</tbody>
</table>
As information providers, reporting yesterday’s news today is considered late. With today technology, readers will be receiving new flashes via SMS (Simple Messaging Services) alert or WAP channel instantly and more detailed reports can be found in the following day’s print.

(ii) User Requirement – Users of the Mobile Newspaper are always on the move. Hence, they will access the application anywhere and at anytime. Due to the constraints of the mobile devices in terms of screen size, processors and memory, a simple interface and brief information should be sufficient for the users.

(iii) Functional Requirements – The Mobile Newspaper must perform the following functions for the users:

a. Users must be able to read the latest news.

b. Users must be able to search the classifieds based only on keyword and not sift through the full listing like browsing through the whole newspaper.

c. Users must be able to personalise the applications of Mobile Newspaper. For example, users can personalise the classifieds page and make it only display the classifieds that related to houses sold in Kuala Lumpur.

d. A user id and password are needed to authenticate the user.

C. Use Case Analysis

In order to have a high-level picture of the functionality of Mobile Newspaper, use case analysis – a systematic approach to work out what tasks users should be able to do with the application. In use case analysis, users of the system are defined as actors and the tasks carried out by the actors when they use the system are the use cases [12]. In this specific case, the actors of Mobile Newspaper are the subscribers of the service. (see Figure 1) The subscribers can only access Mobile Newspaper after subscribing to the service. Tasks that the subscribers needed to do with Mobile Newspapers are:

(i) Check out the latest news

(ii) Search the news

(iii) View the classifieds listing

(iv) Search the classifieds

(v) Personalise the services – Subscribers can personalise news and classifieds so they will only be shown the content in which they are interested

D. Architecture

The clients used by subscribers to access Mobile Newspaper are mainly:

(i) Mobile phones with WML browsers

(ii) PDAs with HTML/WML browsers

![Use Case Diagram](image)

Fig. 1. Use case diagram for subscribers of Mobile Newspaper.

The Mobile Newspaper application requires 3-layered. “Layering” is a concept that differentiates various code functionalities within an application. It is used in software development, especially in server-side coding because it helps code re-usability and it is more secure and convenient [11]. The Mobile Newspaper consists of the following layers:

(i) Presentation Layer – The first layer handles the user interface of the application and it interacts most closely with the users of the application.

(ii) Business Layer – The second layer handles the business logic of the application.

(iii) Data Access Layer – The third layer helps the application to communicate with the data source or database.

![Architecture Diagram](image)

Fig. 2. Architecture of Mobile Newspaper.

Source: Extracted and modified from [10]
E. How Information is Organised

Apart from the architecture, another Mobile Newspaper design concern is the organisation of information. Based on the requirements and analysis, three main areas are outlined below:

(i) Content – No one will go to a mobile site if it does not offer useful and updated content. For mobile users, content like latest news and classifieds are useful.

(ii) Personalisation – It is difficult for mobile users to page through all the content on most mobile devices because of the limited screen size. A good example is the classifieds listing. Many users find it difficult to browse through the long list by using mobile devices. Thus, it is very important to present personally relevant information to the users on the initial screen [3]. Personalisation can solve this problem because it allows mobile users to customise the content, and only content that interest them are presented. Also, users can download content they want quickly since only personalised content – and not all – is downloaded.

(iii) Advertising – With the use of personalisation, newspaper companies can know more about their readers and can deliberately deliver relevant advertisements to them and increase the effectiveness of advertisements. For example, if users personalise the classifieds listing to only display listings on “BMW”, the targeted advertisement engine will only display “BMW”-related advertisements while users are accessing the personalised classifieds section. Figure 3 exemplifies the relationship of the newspaper organisation.

\[
\text{Fig. 3. The relationship between content, personalisation and advertising.}
\]

F. Modules of Mobile Newspaper

There are four modules for the Mobile Newspaper:

(i) News – The module carries all the latest news.
(ii) Classifieds – The module lets subscribers browse through classifieds advertisements.
(iii) Personalisation – The module enable subscribers to customise both news and the classifieds section and make them “Personalised News” and “Personalised Classifieds”.
(iv) Targeted Advertising – Based on the subscribers’ personalisation profile, the module can deliver the targeted advertisements to subscribers.

IV. RESULTS AND DISCUSSIONS

A. Implementation

Microsoft ASP.NET Mobile Controls was chosen to develop Mobile Newspaper. ASP.NET is made up of the classes for web application and web services in Microsoft .NET Framework. It is a platform that runs under Microsoft Internet Information Services (IIS), the Windows’ Web server that handles requests from clients on the Internet. With the technology, developers can build mobile applications which run on mobile phones and PDAs that has any WML, cHTML, HTML or XHTML-MP browser. Moreover, the developers could isolate the business logic and data access codes from the presentation layer codes. The database server used for the implementation was Microsoft SQL Server 2000. Figure 4 illustrates the result after the implementation.

B. Testing and Evaluation

The prototype of Mobile Newspaper was tested on different mobile devices:

(i) Pocket Internet Explorer in Pocket PC 2003 Emulator
(ii) Nokia Mobile Browser Simulator
(iii) HP iPAQ rx3715 Pocket PC (PDA)
(iv) Nokia 6510 Phone (Mobile Phone)
Testing platforms (i) and (ii) were simulators installed in a personal computer. The (iii) and (iv) were mobile devices which access the prototype via Wi-Fi and GPRS respectively. Pocket Internet Explorer displays both HTML and WML pages while Nokia Mobile Browser Simulator is a WAP browser. Nokia 6510 Phone was used to test the application via GPRS connection. It comes with a WAP 1.2.1 browser and all pages of the prototype worked fine with its browser. It is important to test the prototype with this phone because:

(i) The Nokia WAP browser is not Microsoft-based. If the test is a success, it proves that the solution implemented by using Microsoft ASP.NET is vendor-independent.

(ii) The simulators are not able to show the real scenario connecting to Mobile Internet through the Telecommunication operators’ WAP gateway. So the real test is to use a mobile phone, like Nokia 6510, to access the prototype via the operators’ WAP gateway because sometimes the WAP gateway may have some unexpected impact on the rendering of the pages. In this particular case, the application worked fine with Nokia 6510 Phone when the phone used GPRS to access the application. The tests typically rendered the application in both HTML and WML. It showed that the prototype worked fine in various environments, including both simulators and mobile devices. This proved that the design and development of MNDF are workable and feasible. The questionnaire strategy was employed to perform further and to complete the evaluation process. The questionnaire began with a background paragraph to explain what it is about and later participants are required to sign the consent form. The second page of the questionnaire contains general questions such as age rank, gender, occupation and brand of phones that participants currently use. The questionnaire asked if the participants have accessed any WAP sites before. The demographic information is useful to in providing a general background on the participants. Later, participants were asked to rate their agreement in relation to seven statements about the prototype of Mobile Newspaper. All statements were positively phrased and the concerns of the statements were:

(i) Is the prototype easy to use?
(ii) Do users like the short-story format of News?
(iii) Is the Classifieds useful for mobile users?
(iv) Is it easy to personalise the content?
(v) Is Personalisation useful?
(vi) Is the targeted ad useful?
(vii) If money is not a problem, will users subscribe to the Mobile Newspaper?

The style of the questions was scalar. With the scalar-styled questions, participants were asked to judge a specific statement on a numeric scale. The numeric scales of 1 (Strongly Disagree) to 5 (Strongly Agree) effectively correspond to a measure of agreement or disagreement with the statements. Here, scales of 1 to 5 were used because they were middle ground and participants could differentiate them adequately [6]. The main questions to review the usability of the prototype of Mobile Newspaper were made up of closed questions. Closed questions, like scalar or multiple choices, are effective because they reduce participants’ efforts required as it provides participants with alternative responses. Needless to say, the data collected by closed questions are easier to analyse if compared to open-ended questions [6]. Finally, an open-ended question (“Please state below if you have any recommendations on the overall design and navigation”) was asked in the questionnaire. The open-ended question gives participants a chance to suggest ideas or identify mistakes that the application designer may have overlooked. Even though the answers to the open-ended question are difficult to analyse, they do provide a general subjective opinion that is useful for the overall design and navigation of the prototype.

The participants were asked to complete the following tasks before answering the questionnaire:

(i) Browse the “News” section and read any news stories.
(ii) Browse the “Classifieds” section and read any classifieds items.
(iii) Explore the Personalisation feature by personalising the Classifieds section.
(iv) Browse “Personalised Classifieds” and see the outcome of the personalisation.
(v) Check out the change of the “Sponsor’s Link” which is the targeted advertisement, and its changes based on the user’s personalisation profile.

The evaluation took about two weeks, and 30 participants took part in it. The basic criterion of taking part in the evaluation is participants should own at least one mobile device, either a mobile phone or a PDA. The age range of the participants is 13 to 59. Their occupations are listed below:

(i) Student – 6 of the participants.
(ii) Executives – 12 of the participants.
(iii) Managerial Level – 6 of the participants.
(iv) Others (including business owners) – 6 of the participants.

Among the 30 participants, 19 of them have not accessed any WAP sites while 11 of them have done so before. Below is a summary of the participants’ responses:

(i) 28 participants (93%) agreed that Mobile Newspaper is easy to use.
(ii) 24 participants (80%) like the short-story format of News in Mobile Newspaper.
(iii) 21 participants (70%) felt that Classifieds section is useful for mobile users while 9 participants (30%) are neutral.
(iv) 25 participants (83%) agreed that it is easy to personalise the Mobile Newspaper content.
(v) 27 participants (90%) agree that personalisation is useful.

Among the 30 participants, 23 of them have not accessed any WAP sites while 7 of them have done so before. Below is a summary of the participants’ responses:

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(ii) 24 participants (80%) like the short-story format of News in Mobile Newspaper.
(iii) 21 participants (70%) felt that Classifieds section is useful for mobile users while 9 participants (30%) are neutral.
(iv) 25 participants (83%) agreed that it is easy to personalise the Mobile Newspaper content.
(v) 27 participants (90%) agree that personalisation is useful.
(vi) 22 participants (73%) agreed that the targeted advertisements shown in Personalised Classifieds section are useful while one participant (3%) disagrees.

(vii) 26 participants (86%) showed interest to subscribe to the service if money is not a problem, but 3 participants (10%) do not want to subscribe to the service.

“Agree” as mentioned above includes both “Agree” and “Strongly Agree” options in the questionnaire. When asked about other services the participants would like to see in Mobile Newspaper after they have tested the News, Classifieds and Personalisation, 19 participants (63%) suggested “Search function” and 8 participants (26%) would like to see “Video” in future implementation. As expected, the only open-ended question asked in the questionnaire (“Please state below if you have any recommendations on the overall design and navigation”) did not generate much of feedback because the participants have an option of not answering it. However, it has generated a few constructive opinions:

(i) Participant number “S06” suggested having a “Home” and other navigation buttons at the top of all pages so users do not have to scroll to the bottom of the pages.

(ii) Participant number “S15” suggested making the personalisation link accessible from every page so users can click on less links to personalise the content.

In short, most of the participants found that the prototype of Mobile Newspaper was easy to use. They also like the way the information was presented, such as the short-story format of news stories. Personalisation has also impressed 90% of the participants and they found it useful for mobile users. 86% of the participants even showed a certain level of interests in subscribing to Mobile Newspaper, if the service is available in the market.

V. CONCLUSIONS

The number of mobile phone users worldwide reached one billion in June 2002 [1]. And the growth has never stopped. The change has already created a new media landscape and mobile devices have formed a new medium. Therefore, the role traditional media, such as newspapers, play today is not the same as in the “old days”. In order for newspaper companies to get onto the mobile bandwagon, they need to adopt an appropriate approach and Mobile Newspaper Development Framework (see Figure 5) provides them an appropriate solution. By employing MNDF, newspaper companies could enter safely to the Mobile Internet market easily as it creates, develops and structures their news in a usable mobile news portal.

VI. RECOMMENDATIONS

The research outcome indicates that “search function” is essential (63% of the participants agreed) because it saves time when looking and finding for targeted information. Apart from the targeted advertisements shown in the prototype of Mobile Newspaper, location-aware advertisements have great potential due to the nature of mobile devices used by the mobile users. It definitely assists the advertisers to reach their target audience instantly.

![Diagram of Mobile Newspaper Development Framework and its phases.](image-url)

REFERENCES


