Cognitive model construction of college students' mobile learning based on altruistic preference

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Abstract. With popularity of smart mobile terminal, mobile learning (M-learning) and large-scale online education (MOOCs) enter practical stage. At present, mobile learning mainly includes two kinds of accessing modes: access mode based on browser (Web App) and native App (Native App). They both realize mobile learning by accessing data in cloud server by procedure on mobile terminal, which have advantages and disadvantages. A kind of client terminal realization scheme of mobile learning has been put forward herein to make mobile learning client terminal has favorable interaction of native App and can utilize efficiency and flexibility of browser, which can better integrate advantages of browser mode and mobile learning App.

Key words. Mobile learning, Browser, Native APP, Mixed mod.

1. Introduction

With acceleration of educational informatization process, there are diversified learning forms. From remote learning to electronic learning to mobile learning, learning mode transforms with common "cloud computing" and "Internet thinking". Development of mobile communication technology from 2G, 3G and 4G, makes communication rate promote continuously and flow expense in unit time decreases continuously. Performance of multinuclear, large internal storage and large screen smart mobile terminal is similar to personal computer and the price is acceptable by the public and client terminal hardware performance used by mobile learning has satisfied requirement. There is a kind of efficient, quick and low-flow client terminal system in mixed mode to access mobile learning resource on mobile terminal.

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2. M-learning (mobile learning)

Concept: there are many explanations for mobile learning at home and abroad and representative model based on technical explanation is definition of Director of Recognition System Department in Knowledge Planet Subsidiary: mobile learning is digital learning realized by IA equipment. [1]

Present M-learning allow learners learn by utilizing incontinuous, intermittent and fragmented time section. For students, it is a valid supplement for class learning; for staff, they not only acquire new knowledge, but also can solve problems in work in the quickest and the most efficient way.

Mode: learners access the Internet by wireless terminal and access digital learning platform and browse and inquire contents; learn interactively in real time with teachers and students and there are many kinds of mobile learning modes, while mobile learning can only be realized by deploying mobile learning resources with mobile terminal finally.

2.1. It is feasible for mobile learning to enter practical stage from research stage

CNNIC China Internet Network Information Centre has issued the 33rd China Internet Development Condition Statistics Report in January 2014 and it is stressed that the number of mobile phone netizens in China is 500 million, up to December 2013, which has increased 80090000 people and people who surf the Internet with mobile phone rises from 74% to 81% compared with 2012 in the same term, as shown in Fig. 1[2].
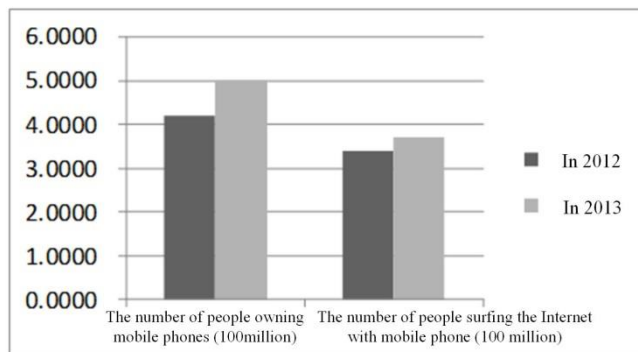

Fig. 1. The Number of people owning mobile phones and of people surfing the internet with mobile phone in china up to december 2013

According to Development Tendency Report of Mobile Internet Network 2013Q3 issued by Baidu on September 31, 2013, investigation for mobile phone Internet users shows that each mobile phone client refers to on-line resources for 53 times, which has increased 6 times compared with 2012Q3 in the same term and the frequency to refresh SNS (Social Networking Services, a kind of network resource condensed according to the same topic) with mobile phone has increased by 13%, as shown in
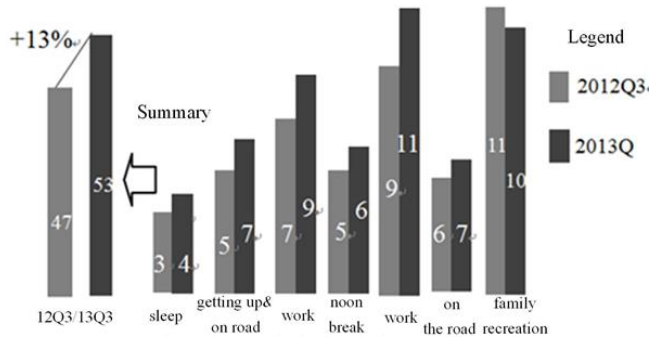
Fig. 2[3] daily on average.

Fig. 2. Total times and time interval distribution for android mobile phone user to refer mobile phone daily

Above two investigation reports show that mobile terminal Internet has become an indispensable part of daily life; no matter what to refer to per time, from generalized definition of learning, it is over and over fragmentization learning process. Therefore, establishing mobile learning resource platform that meets learning requirements of people and letting client terminal have efficient and flexible operation performance with favorable experience are important guarantee to realize real mobile learning.

Client terminal plays an very important role in realizing transfer of mobile learning platform contents on various mobile client terminals efficiently and quickly without obstacle and learning efficiently.

3. Realizing two kinds of modes on present mobile terminal

3.1. Learning on mobile terminal by accessing network learning platform resource by browser

(1) Learn on mobile terminal by accessing learning resource based on http agreement by browser.

Learners enter Internet; refer to learning resource on learning platform server under http agreement and browse, refer to and interact simply after system gateway of mobile Internet access provider by mobile terminal equipment whenever and wherever possible. Download resources, such as microlecture, etc. and learn under off-line condition, which is a kind of mobile learning application mode that is applicable to all mobile learners, while it is mainly applicable to WIFI environment as it consumes much flow.

(2) Mobile learning mode based on WAP APP

WAP (Wireless Application Protocol) is global uniform open agreement standard that provides Internet contents and advanced value-added services to mobile terminal and main intention of WAP is to make pocket-size wireless terminal equipment acquire function similar to web browser; therefore, its function is limited [4]. For

mobile learning platform based on WAPI.X technology, its page content is compiled by WML (a kind of XML provincialism), which can use client terminal browser access supporting WAP agreement and realize learning of general forms, such as referring to material, doing homework, answering question, acquiring message of push service form, receiving and dispatching e-mail and issuing Microblog, etc. and can realize on-line test management, evaluation management, learning resource management and user information management, etc. While supporting strength of mobile learning mode based on WAP technology to learning resources of multimedia types is extremely limited.

(3) Mobile learning realized based on 3G communication technology WAP2.0 browser

3G mobile communication technology has been well welcomed for its stability and high transmission rate since occurrence and WAP2.0 browser technology is adopted under 3G technology frame compared with WAP browser way, which is designed to strengthen WAP practicability and is the second edition of WAP in fact and supports XHTML, TCP/IP and hypertext transfer protocol (HTTP/1.1)[5]. Browser based on WAP2.0 can support various applications based on the Internet perfectly and learners can acquire learning resource with more abundant contents including multimedia information compared with WAP learning platform only by applying mobile client terminal supporting WAP2.0 and realize actually mobile learning.

The three kinds of equipment all require page access by browser on mobile terminal; therefore, such method is called as browser-based mode and Fig.3 shows Google Voice and Gmail terminal interfaces[6].

Fig. 3. Google voice and google gmail is design model of web App

3.2. Learn by Native App developed by various platforms (Native App Mode)

Native App refers to application for operation on native interface mobile phone. There are three current mobile operation systems with maximal mobile terminal market occupancy: [IOS; Android; Windows Phone (WP)]. Native App is developed aiming at various mobile operation systems and these APPs are installed to mobile terminal by being directly packed into installation procedures and special users can acquire by network shops or application market, such as App Store of Apple Inc and Google Play of Android, etc. Such mode develops mobile learning client terminal by utilizing SDK (Software Development Kit) provided by mobile operation system and dispatches App by application market and other channels. Developed languages mainly include Java (Android), Objective-C (IOS) and C# (Windows Phone), etc. Cross-platform application for App on various platforms is not allowed. Learners can search learning contents, communicate with teachers and apply accessory functions of courses by utilizing the client terminal procedure and can realize all functions of browser mode and Native App application is similar to mobile client terminals, such as Gowalla and Awesome Note and its interface is shown as Fig. 4 [7].
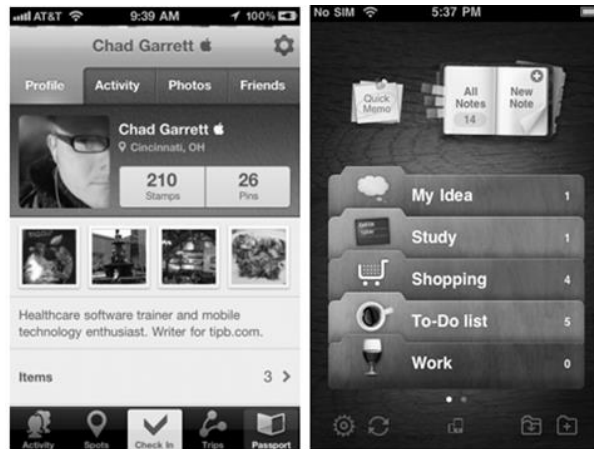

Fig. 4. Gowalla and awesome note are classic design cases of mobile client

4. Advantages and disadvantages for mobile learning by mobile terminal

4.1. Advantages and disadvantages of access based on Web App mode

Advantages: main carrier of mobile teaching resource is learning platform of industry platform, which is assessed and used by intelligent terminal browser. Advantage of Web is that it can be used without installation of independent client

terminal, especially adaptive ability of equipment fragmentization is superior to Native App and it can be implemented in browser of any mobile terminal by XHTML, CSS and JavaScript [8]; it can be issued and rectified in real time with low development cost and it can be easily updated. A website of learning platform can be compatible with most of operation systems.

Disadvantages: firstly, under current technical condition, it is very difficult to reach fluency and experience of native App procedure. Secondly, when mobile terminal browser applies mobile terminal, confined by page API provided by browser, it is relatively to realize sharing of terminal and interactive function of learning resources. Thirdly, it shall provide off-line use function, while it is difficult for browser satisfy the demand. Fourthly, many causes may lead to browser occupying too many memory resource of mobile equipment and therefore implementation efficiency of Web App to mobile learning contents will be influenced, such as virtual simulation animation effect, large-data video content decoding and complex interactive mode based on three-dimensional contents, etc. Fifthly, popularity of Moocs (large-scale online learning), manufacture and transmission of micro-video can be realized by mobile terminal, while browser cannot acquire hardware resources, such as camera and pickup. Besides, with strengthening of intelligent terminal hardware function, Web App is not applicable to applications, such as fingerprint identifier, gyroscope visual operation controller, etc. At present, only native client terminal APP can realize foresaid functions.

4.2. Advantages and disadvantages based Native App (native APP) mode access

Advantages: Native App is located on upper part of platform layer; because its downward access and compatible capability are stronger compared with other applications, different optimal experiences can be provided aiming at different platforms; hardware capability realization function provided by all terminals can be adopted and interaction is completely controllable and content resource can be downloaded natively for off-line use to save flow cost and at the same time, Native App can realize payment loading mode easily, which is obviously beneficial for developers.

Disadvantages: there are severe defects in Native App advantages; because of fragmentization of various mobile terminal equipment, aiming at Native App developed aiming at certain terminal, it is difficult to transfer to different platforms and client terminal development of each platform shall be realized by SDK of various platforms and there SDK shall be confirmed by store or market, which will lead to profit division of developers by the third party. Special Native App cannot realize cross-platform application and development cost is relatively high and delivery of function depends on iteration and issuance of App procedure and flexibility is inferior to network, so that procedures shall be installed on mobile equipment to apply client terminal.

Seen from above analysis, during development of mobile learning system, there are obvious disadvantages in the two kinds of modes.

See Fig. 5 for system frame of the mobile learning client terminal based on
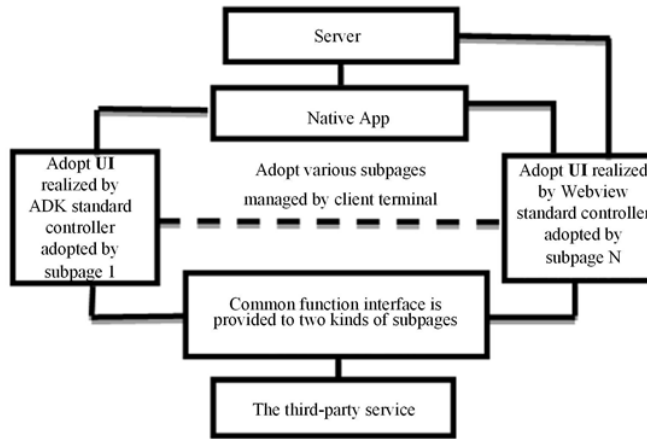
foresaid three technical key points:

Fig. 5. System frame of complete mobile learning client terminal

Seen from figure, mobile learning client terminal takes native App as container and various subpages or modules by it can be realized by native SDK and also by webpage. Native App code manages their interaction and life cycle.

Considerable learning resources can be packed into webpage only by developing frame part aiming at various platforms, which can not only ensure favorable experience of native app and adopt webpage programming on development of learning contents occupying maximal development cost, but also inherits another development of web app. See Table 1 for contrast of advantages and disadvantages of various platforms sharing.

Table 1. Contrast of development cost and user experience of the three kinds of development modes

Development model of learning client terminal	Development cost	User experience
Native app	High (developing all pages in cross-platform way) development cost=t (development time of single platform)* n platforms	Well
Web app	Low (one-time development and multi-platform sharing) development cost=t (based on development time of webpage) *1	Poor
Hybrid app	Middle (cross-platform development of frame part + one-time development of content page) development cost= t0 (development time of frame part)*n platforms +t1 (development time of contents page)*1	Well

Mobile learning client terminal based on webpage rendering and native APP hybrid mode has flexibility, as well as better experience performance. It has solved

experience problem of pure website based on browser mode; adopts webpage programming and has solved development cost and flexibility problem of mobile learning client terminal by utilizing cross-platform characteristics of webpage rendering. Based on the system frame, for various sub-modules or subpages in client terminal, developers can find balance point between native App mode and webpage; accelerate development and issuance of mobile learning system and promote experience of learners. Characteristics of mobile learning client terminal ensure that it conforms to such hybrid app model.

5. Conclusion

Native App part can interact with server and can connect with server by webpage characteristics. Various common interfaces or the third-party interface can be packed into API for application of two parts by both way application scheme of native App and webpage, which can solve native interaction of App code and webpage code and integrates the two parts into a whole.

System is divided into several sub-modules and mode to be adopted can follow the following key points:

(1) It is suggested to be realized by adopting native App for hardware equipment of gravity accelerator and camera, etc.

(2) Adopt webpage rendering if contents in pages are relatively independent and are used for content display and review.

(3) Realize with native App for part irrelevant to network.

(4) When performance requirement is strict, it shall be realized by adopting native App.

Advantages to adopt Web App and hybrid mode of native App (Hybrid App) also: although native frame is only taken as container of page layout view, it can still provide authority to access hardware equipment and relevant function if required because its core is native, which cannot be realized by Web App. In realized technology, it can communicate with hardware by technologies, such as js2java by native application frame, such as applying fingerprint identifier, gyroscope, pickup and camera, etc.

Acknowledgement

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