EXPLORING HEALTH INFORMATION USING WAP TECHNOLOGY:
MATERNITY AND CHILDREN GUIDE

A project submitted to Dean of Research and Postgraduate Studies Office in partial
Fulfillment of the requirement for the degree
Master of Science (Information Technology)
Universiti Utara Malaysia

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Abstract

The present study attempts to investigate WAP based application for pregnancy and after the birth of the baby. The system highlights the development of the fetus to the pregnant mother and the required physical exercises that the mother should go through during pregnancy. The system also provides information regarding the child’s immunization which can be stored for future reference or course of action. This entire information is made available to the mothers through their mobile devices throughout the process. The system is evaluated by enabling selected respondents to test drive the developed prototype. The findings show that the respondents consider the benefit, usefulness, and ease of use of the Maternity and Children Guide (MCG).
Acknowledgement

All Praise to ALLAH for helping me to accomplish this humble study. Also, my thanks to ALLAH who has seen me through to this level in my academic achievement,

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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AnC</td>
<td>Antenatal Care</td>
</tr>
<tr>
<td>ARIs</td>
<td>Acute Respiratory Information</td>
</tr>
<tr>
<td>ASP</td>
<td>Active Server Pages</td>
</tr>
<tr>
<td>BLS</td>
<td>Basic Life Support</td>
</tr>
<tr>
<td>CHF</td>
<td>Congestive Health Failure</td>
</tr>
<tr>
<td>ECG</td>
<td>Electrocardiogram</td>
</tr>
<tr>
<td>EMD</td>
<td>Electronic Miscellaneous Document</td>
</tr>
<tr>
<td>GMDS</td>
<td>General Methodology Design Science</td>
</tr>
<tr>
<td>GSM</td>
<td>Global System for Mobile communication</td>
</tr>
<tr>
<td>HDML</td>
<td>Handheld Devices Markup Language</td>
</tr>
<tr>
<td>HTML</td>
<td>Hyper Text Markup Language</td>
</tr>
<tr>
<td>HTTP</td>
<td>Hyper Text Transfer Protocol</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IEC</td>
<td>International Engineering Consortium</td>
</tr>
<tr>
<td>IEHMS</td>
<td>Integrated Emergency Healthcare And Medication Information System</td>
</tr>
<tr>
<td>IEEE</td>
<td>Electrical and Electronic Engineers</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>MBTS</td>
<td>Mobile Based Bus Ticketing Service</td>
</tr>
<tr>
<td>MCG</td>
<td>Maternity and Children Guide</td>
</tr>
<tr>
<td>MIME</td>
<td>Multipurpose Internet Mail Extensions</td>
</tr>
<tr>
<td>MIDP</td>
<td>Mobile Information Device Profile</td>
</tr>
<tr>
<td>MMS</td>
<td>Multimedia Messaging Service</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry Of Health</td>
</tr>
<tr>
<td>PDAs</td>
<td>Personal Digital Assistants</td>
</tr>
<tr>
<td>PHC</td>
<td>Primary Health Care</td>
</tr>
<tr>
<td>PnC</td>
<td>Postnatal Care</td>
</tr>
<tr>
<td>RAD</td>
<td>Rapid Application Development</td>
</tr>
<tr>
<td>SMS</td>
<td>Short Message Service</td>
</tr>
<tr>
<td>TCP/IP</td>
<td>Transmission Control Protocol/Internet Protocol</td>
</tr>
</tbody>
</table>
TLS .......................................................... Transport Layer Security
UDP .................................................................. User Datagram Protocol
UML ........................................................... Unified Modeling Language
VPN .................................................................. Virtual Private Network
WAE .......................................................... WAP Application Layer
WAP .......................................................... Wireless Application Protocol
WBMP .......................................................... Wireless Bit Map Protocol
WDP .................................................................. Wireless Datagram Protocol
WHO .......................................................... World Health Organization
WML .......................................................... Wireless Markup Language
WMLScript .................................................. Wireless Markup Language Script
WSE .......................................................... WAP Session Layer
WSP .................................................................. Wireless Transaction Layer
WTE .......................................................... WAP Transaction Layer
WTLS .......................................................... Wireless Transport Layer Security
WTP .......................................................... Wireless Transaction Layer
XML .................................................................. Extensible Markup Language
CHAPTER ONE
INTRODUCTION

The chapter presents the general explanatory view of the study. It introduces the topic of study and elaborates on the problem statement. It also includes the research questions and the study’s objectives. This is followed by the significance of the study and the final part deals with the content organization of the chapters.

1.1 Introduction

The dynamic and significant development of Internet and communication technologies during the past two decades has transformed the lifestyle of human beings all over the world. People residing in urban and rural areas have similar access to lifestyles of high quality owing to the presence of communication technologies’ improvement of education, health and economics of people residing in all parts of the world.

The number of mobile phone users in the world was recorded around 2.2 billion in 2005 and the number of Internet users was reported to be 1 billion (ITU, 2006). This development in the usage of phones has resulted in the development of mobile’s reach to a wider population. Equipped with higher speed, easy usage and affordable rates, subscribers to mobile phones are enabled to acquire high quality pictures, multimedia content like movies and news and they are also enabled to connect to the Internet. Along the same lines, relevant and accurate information regarding pregnancy can be accessed through mobile phones at any time or place. The service
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REFERENCES


ARC Group and the Wireless Advertising Association (October 15, 2001). Privacy is not a Barrier to the Success of Mobile Advertising (survey summary). Guildford, Surrey, UK: ARC.

Barclay, K., & Savage, J. (2004). Object-Oriented Design with UML and Java.


Specifications. From: http://ieeexplore.ieee.org/stamp/stamp.jsp?
ampnumber=720574&isnumber=15571

InfoDev (2006). Improving health, connecting people: the role of ICTs in the health sector of

Keeping Pace with Market Trends? International Telecommunication Union

International Conference on Primary Health Care hold on 1-4 November 2008,
Doha.


Johan, 2004 information system analysis and design retrieved (2005) retrieved from;

system using ASP.Net. IFMBE Proceedings, 14(1).

Kamel, Boulos (2003), Location-based health information services: a new paradigm in
personalised information delivery. International Journal of Health Geographics

Kustin, S. (2002). The Proliferation of Wireless Internet Access Devices and its Effect on
Consumer Behaviour Patterns. New York: Free Press

Mallat et al. (2004), Exploring consumer adoption of mobile payments - A qualitative
study, Journal of Strategic Information Systems.

support system.ICT R&D Centre, School of Computer Technology, Sunway
University College.


Health and Reproductive Health strategy held on 2-7 June 2004 at the Al-Rasheed Hotel- Baghdad.
