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A Conceptual Framework for Devising Adaptive User Interfaces to Improve the Usability of Mobile ERP





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Department für Informatik

A Conceptual Framework for Devising Adaptive User Interfaces to Improve the Usability of Mobile ERP

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Khalil Omar

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Abstract

One of the major types of enterprise applications is enterprise resource planning systems (ERP systems), and many research works have pointed out that ERP systems suffer from poor usability due to their complex, rigid, and bloated user interfaces.

Nowadays, the increasing demands to access ERP systems via mobile devices, such as smart phones, mobile full-screen phones, tablet computers, and mobile handheld computers are noted. Thus, mobile applications that are able to manipulate ERP functionalities, to perform flexible actions and reactions are called mobile ERP applications.

Mobile ERP has become a core requirement for enterprises that have ERP systems, due to the benefits that can be reaped from this model, such as higher operational efficiencies and effectiveness, reducing some costs, real-time visibility and traceability, and better decision making.

However, mobile ERP is still a young topic in research and practice, and there is a knowledge gap in the literature regarding the usability of the mobile ERP, while usability is considered a critical success factor for any software application.

Mobile ERP is an extension of ERP systems, and thus, several potential usability challenges might hinder the sustainability of the mobile ERP model, due to the usability challenges that could be inherited from ERP systems, and the impact of the mobile context of use.

Consequently, this research study aims to improve the usability of mobile ERP apps by addressing their potential usability challenges. Therefore, five research studies were conducted in order to construct a conceptualisation of the usability challenges of mobile ERP apps through:

1. Identifying the usability challenges of mobile HCI and ERP systems.
2. Identifying the usability challenges of mobile ERP apps from the reality of business practices.
3. Identifying a usability evaluation method that can be used to evaluate the usability of mobile ERP apps.

Adaptive user interfaces (AUIs) have been exploited in several research works as a means to improve the usability of software applications. Therefore, these types of user interfaces (UIs) have been exploited in this research study to address the identified usability challenges of mobile ERP apps, which have been identified from the aforementioned research studies. Consequently, a computational framework was developed for devising AUIs for mobile ERP apps by determining the following components regarding the context of this research study:

1. The adapted constituents that can be exploited.
2. The information that is considered for the adaptation processes.
3. The adaptation methods and techniques that can be exploited for mobile ERP apps.
4. The adaptive system architecture that can operate the determined adaptation processes for mobile ERP apps.

The final phase of this research study aims to evaluate the usability improvements of the prototypical implementation after incorporating the developed computational framework and its components.

Zusammenfassung

Einer der wichtigsten Unternehmensanwendungen sind Enterprise-Resource-Planning Systeme (ERP-Systeme). Viele wissenschaftliche Arbeiten haben gezeigt, dass ERP-Systeme aufgrund ihrer komplexen, starren und aufgeblähten Benutzeroberflächen unter einer schlechten Benutzerfreundlichkeit leiden.

Dabei wird heutzutage ein ansteigender Bedarf wahrgenommen, auf ERP-Systeme mit mobilen Endgeräten, wie Smartphones, Tablets und mobilen Handhelds, zuzugreifen. Mobile Anwendungen, die in der Lage sind ERP-Funktionalitäten, durch flexible Aktionen und Reaktionen, auszuführen, werden Mobile ERP-Anwendungen genannt.

Mobile ERP ist für Unternehmen, die ERP-Systeme einsetzen, zu einer Kernanforderung an die ERP-Systeme geworden. Das Resultiert aus den Vorteilen, die sich durch diesen Ansatz ergeben. Als Vorteile zeichnen sich insbesondere eine höhere operationale Effizienz und Effektivität, die Reduzierung einiger Kosten, Echtzeit Sichtbarkeit sowie die Nachverfolgbarkeit und Entscheidungsfindung, aus.

Dabei ist Mobile ERP immer noch ein neues Thema in Wissenschaft und Praxis und es existiert eine Wissenslücke in der Literatur in Bezug auf die Benutzerfreundlichkeit von Mobile ERP. Dabei ist die Benutzerfreundlichkeit ein kritischer Erfolgsfaktor für jede Software.

Als Erweiterung von ERP-Systemen sind Herausforderungen an die Benutzerfreundlichkeit von Mobile ERP für die Nachhaltigkeit dieses Ansatzes ebenfalls von entscheidender Bedeutung. Dabei sind insbesondere auch die geerbten Anforderungen an die Benutzerfreundlichkeit von ERP-Systemen für den mobilen Einsatzzweck relevant.

Deshalb hat sich diese Arbeit zum Ziel gesetzt die Benutzerfreundlichkeit von Mobile ERP Apps zu verbessern. Dafür werden die potentiellen Herausforderungen untersucht. Es wurden 5 Forschungsstudien durchgeführt, mit dem Ziel eine Konzeptionierung der Anforderungen an Benutzerfreundlichkeit für Mobile ERP Apps zu konstruieren. Dafür sind folgende Teilziele erreicht worden:

1. Identifizierung der Herausforderungen zur Benutzerfreundlichkeit bei Mobilien HCI- (Mensch Computer Interaktion) und ERP-Systemen.
2. Identifizierung der Herausforderungen zur Benutzerfreundlichkeit bei Mobile ERP Apps anhand von realen Gegebenheiten in Unternehmen.
3. Identifizieren einer Methode für die Evaluierung der Benutzerfreundlichkeit von Mobile ERP Apps.

Adaptive User Interfaces (AUIs) sind in verschiedenen Forschungsarbeiten als Mittel zur Verbesserung der Benutzerfreundlichkeit von Software identifiziert worden. Deshalb sind in dieser Arbeit verschiedenen Typen von Benutzeroberflächen (UIs) untersucht worden, um diese auf die identifizierten Herausforderungen zur Benutzerfreundlichkeit von Mobilien ERP Apps zu überprüfen. Es ist ein rechnergestütztes Framework entwickelt worden, um AUIs für Mobile ERP Apps zu entwickeln. Dafür werden die folgenden Komponenten entsprechend der Vorgaben dieser Arbeit festgelegt:

1. Die anpassbaren der Bestandteile die ausgewertet werden können.
2. Die Informationen, die für den Anpassungsprozess beachtet werden müssen.

3. Die Anpassungsmethoden und -techniken, die für Mobile ERP Apps genutzt werden können.
4. Die Adaptive Systemarchitektur, die den festgelegten Anpassungsprozess für Mobile ERP Apps, ausführen kann.

Die finale Phase dieser Forschungsarbeit befasst sich mit der Evaluation der Benutzerfreundlichkeitsverbesserungen bei einer prototypischen Implementierung nach Anwendung des rechnergestützten Frameworks und seiner Komponenten.

Table of Contents

Acknowledgements	I
Abstract	II
Zusammenfassung	III
Table of Contents	V
List of Abbreviations and Acronyms	X
List of Figures	XII
List of Tables	XIX
List of Listings.....	XXIII
1 Introduction	1
1.1 Background	1
1.2 Motivation	2
1.2.1 Importance of Enterprise Applications.....	2
1.2.2 High Rates of Adopting Mobile ERP Apps.....	3
1.2.3 Usability of Mobile ERP Apps in Research	4
1.2.4 Usability Challenges of ERP Systems and Mobile ERP	5
1.2.5 AUIs as a Means to Improve the Usability of Mobile ERP Apps	6
1.2.6 Immaturity of the Development of Mobile ERP Apps.....	6
1.3 Problem Definition	7
1.4 Research Objectives	7
1.5 Research Questions	9
1.6 Research Methodology.....	11
1.6.1 DSRM Process Model	11
1.6.2 Information Systems Research Framework.....	14
1.7 Dissertation Structure	17
2 ERP Systems	19
2.1 Enterprise Resource Planning (ERP) Systems	19
2.1.1 Enterprise and Enterprise Applications	20
2.1.2 ERP System Definitions	21
2.1.3 Characteristics of ERP Systems	22

2.1.4	Conceptual Model for ERP	23
2.1.5	Evolution of ERP Systems	24
2.1.5.1	Material Requirements Planning (MRP) Systems	25
2.1.5.2	Closed-loop MRP Systems	25
2.1.5.3	MRP II Systems	25
2.1.5.4	ERP Systems	26
2.1.5.5	ERP II	28
2.1.5.6	Alternative ERP Solutions	28
2.1.6	ERP Systems Benefits	29
2.1.7	Shortcomings and Drawbacks of ERP Systems	31
2.2	Selection Model of an ERP System in Mobile ERP Design Science Research	32
2.3	Odoo ERP System	34
2.3.1	Historical Background	34
2.3.2	Odoo Core Modules	38
2.3.3	Odoo ERP System Architecture	39
2.4	Summary	41
3	Usability of Mobile ERP Apps	43
3.1	Mobile Computing and Related Concepts	43
3.2	Mobile ERP Apps	46
3.2.1	Overview	46
3.2.2	Benefits of Mobile ERP	47
3.2.3	Mobile ERP System Architecture	48
3.2.4	Selection of a Mobile ERP App for Experimental Purposes	49
3.3	Usability of Mobile Apps	50
3.3.1	Usability Models	51
3.3.2	Benefits of Usability	54
3.3.3	Usability Measures and Evaluations	54
3.4	Usability Challenges of Mobile ERP Apps	56
3.4.1	Literature Review to Identify the Usability Challenges of Mobile HCI	57
3.4.2	Literature Review to Identify the Usability Challenges of ERP Systems	63

3.4.3	Structured Interviews with Mobile ERP Vendors	66
3.4.3.1	Methodology.....	67
3.4.3.2	Instruments	67
3.4.3.3	Procedure.....	68
3.4.3.4	Data Analysis.....	68
3.4.3.5	Discussion.....	74
3.4.4	Preliminary Construct of the Conceptualisation of the Usability Challenges of Mobile ERP Apps.....	75
3.4.5	Usability Evaluation Method for Mobile ERP Apps.....	77
3.4.5.1	Methodology.....	79
3.4.5.2	Applying the Developed Checklist on mERP App.....	84
3.4.5.3	Results	85
3.4.5.4	Discussion.....	87
3.4.6	Survey Questionnaire for mERP App's End-users.....	89
3.4.6.1	Methodology.....	89
3.4.6.2	Data Analysis.....	90
3.4.6.3	Discussion.....	92
3.5	Summary	94
4	Adaptive User Interfaces	97
4.1	Overview of Adapted Systems	98
4.2	Adaptive User Interfaces (AUIs).....	100
4.2.1	Overview and Definitions.....	100
4.2.2	Benefits and Disadvantages of AUIs.....	103
4.3	Computational Framework for Devising AUIs for Mobile ERP Apps	105
4.3.1	Adapted Constituents (What?).....	107
4.3.2	Knowledge Models Considered in AUIs Processes (To What?).....	111
4.3.2.1	User Model	117
4.3.2.2	Environment Model.....	123
4.3.2.3	Technology Model.....	124
4.3.2.4	Task Model.....	127

4.3.2.5	Dialog Model.....	129
4.3.2.6	Domain Model.....	130
4.3.2.7	Presentation Model.....	130
4.3.2.8	Adaptation Model.....	131
4.3.3	Adaptation Methods and Techniques (How?).....	131
4.3.4	Proposed Adaptive System Architecture (Who? Where? When?).....	138
4.4	Summary	141
5	Adaptive User Interfaces for mERP App	143
5.1	Purchase Orders in Odoo ERP System and mERP app.....	143
5.2	Prototype as a Proof of Concept.....	146
5.2.1	Monitoring and Acquiring Contextual Information	147
5.2.1.1	Modelling of the Currently Performed Task	147
5.2.1.2	End-user Modelling.....	148
5.2.1.3	Device Modelling.....	153
5.2.1.4	Environment Modelling.....	154
5.2.2	Analysing the Acquired Contextual Information	159
5.2.3	Performing the Adaptation Dimensions	162
5.2.3.1	Activity Selector.....	163
5.2.3.2	Dialog Selector.....	167
5.2.3.3	UIs' Widget Adaptor	171
5.2.4	Additional Adaptation Patterns	176
5.2.5	Knowledge and Adaptation Rules API.....	178
5.2.6	Database Schema Diagram.....	182
5.3	Summary	185
6	Evaluation.....	187
6.1	AUIs Evaluation Methodologies	188
6.2	Empirical Evaluations	188
6.2.1	Planning Phase.....	188
6.2.1.1	Research Question Identification.....	189
6.2.1.2	Research Hypothesis Development	189

6.2.1.3	Research Instruments Construction	191
6.2.1.4	Participant Selection	192
6.2.1.5	Task Selection	192
6.2.2	Execution Phase	193
6.2.2.1	Designing the Experiment	193
6.2.2.2	Conducting the Experiment	193
6.2.3	Analyses Phase	194
6.2.3.1	Time on Tasks	195
6.2.3.2	Errors Committed	201
6.2.3.3	Rate of UI's Widgets that Got Focused.....	207
6.2.3.4	Satisfaction Metrics	213
6.2.4	Hypotheses Testing	216
6.2.4.1	Efficiency	216
6.2.4.2	Errors Rate.....	217
6.2.4.3	Memorability and Learnability.....	217
6.2.4.4	Satisfaction	218
6.2.4.5	Overall Usability	218
6.3	Summary	218
7	Conclusion and Outlook	221
7.1	Research Summary.....	221
7.2	Future Research Directions	222
	References	225
	Appendix A	241
	Appendix B.....	242
	Appendix C.....	243
	Appendix D	252
	Appendix E.....	277
	Appendix F.....	283
	Appendix G	287
	Appendix H	288
	Appendix I.....	292
	Publications	295

List of Abbreviations and Acronyms

AI	Artificial Intelligence
AH	Adaptive Hypermedia
AISeL	AIS Electronic Library
API	Application Program Interface
APM	Abstract Presentation Model
APS	Advance Planning and Scheduling
AUIs	Adaptive User Interfaces
BI	Business Intelligence
BOM	Bill of Material
CC/PP	Composite Capabilities/Preferences Profile
CMS	Content Management System
CPM	Concrete Presentation Model
CRM	Customer Relation Management
CSS	Cascading Style Sheets
CTT	Concurtasktrees
DBMS	Database Management Systems
DDR	Device Description Repository
DDWG	Device Description Working Group
DS	Design Science
DSRM	The Design Science Research Methodology
ECA	Event-Condition-Action
ERP	Enterprise Resource Planning
GPL	General Public License
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GUI	Graphical User Interface
HCI	Human Computer Interaction
HCM	Human Capital Management
HR	Human Resources
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
ICT	Information and Communications Technology
IDE	Integrated Development Environment
IHS	Intelligent Help System
IJHCI	The International Journal of Human-Computer Interaction
IJHCS	The International Journal of Human-Computer Studies
IJMHCI	The International Journal of Mobile Human Computer Interaction
IS	Information Systems
ISO	International Organisation for Standardisation
ITs	Interaction Techniques
ITS	Intelligent Tutoring System

IUIs	Intelligent User Interfaces
JSON	Javascript Object Notation
KSA	Kingdom of Saudi Arabia
MFU	Most Frequently Used Item
MPS	Master Production Schedule
MRP	Material Requirements Planning
MRP II	Manufacturing Resource Planning
MRU	Most Recently Used Item
MSS	Mobile Satellite Services
MVC	Model-View-Controller
ORM	Object Relational Mapping
OS	Operating System
PACMAD	People At The Centre Of Mobile Application Development
PC	Personal Computer
PDA	Personal Digital Assistant
POS	Point of Sale
PUC	The Personal and Ubiquitous Computing Journal
R&D	Research and Development
RDBMS	Relational Database Management Systems
RDF	The Resource Description Framework
RFQ	Request For Quotation
RPC	Remote Procedure Call
SaaS	Software As A Service
SCM	Supply Chain Management
SDLC	Systems Development Life Cycle
SFA	Sales Force Automation
SOA	Service Oriented Architecture
SOUPA	Standard Ontologies for Ubiquitous and Pervasive Applications
SQL	Structured Query Language
SRM	Supplier Relationship Management
TLX	Task Load Index
TOCHI	Transactions On Computer-Human Interaction
TOCs	Table Of Contents
UAProf	User Agent Profile
UI	User Interface
UML	Unified Modelling Language
W3C	World Wide Web Consortium
WLANs	Wireless Local Area Networks
WSGI	Web Server Gateway Interface
WURFL	Wireless Universal Resource File
WWW	World Wide Web
XML	Extensible Markup Language

List of Figures

Fig. 1.1: Worldwide revenues forecast for enterprise application software, comparison by segment between the years 2011 and 2016	3
Fig. 1.2: Percentages of adopting mobile ERP in different enterprise classes	4
Fig. 1.3: Research sub-objectives	9
Fig. 1.4: Research sub-objectives, questions, and processes	10
Fig. 1.5: DSRM process model	11
Fig. 1.6: DSRM process for this research study	13
Fig. 1.7: Information systems research framework	14
Fig. 1.8: Structure of the dissertation mapped to the DSRM process model.....	18
Fig. 2.1: Research objectives status; sub-objectives that will be achieved in Chapter 2.....	19
Fig. 2.2: Dimensions of ERP systems characteristics	22
Fig. 2.3: Conceptual components of ERP	23
Fig. 2.4: Anatomy of an enterprise system.....	24
Fig. 2.5: Worldwide ERP software market share for 2013	27
Fig. 2.6: Chronological evolution of ERP systems	29
Fig. 2.7: Tangible benefits of ERP systems	30
Fig. 2.8: Intangible benefits of ERP systems	30
Fig. 2.9: Relative number of Google searches for Odoo ERP system and other ERP systems.....	36
Fig. 2.10: Relative number of Google searches for Odoo ERP system and other ERP systems... 37	
Fig. 2.11: Odoo system architecture for embedded web deployment	39
Fig. 3.1: Research objectives status; sub-objectives that will be achieved in Chapter 3.....	43
Fig. 3.2: Architecture for mobile ERP.....	48
Fig. 3.3: System architecture for mobile ERP system based on SOA concept	49
Fig. 3.4: Research objectives status; selection of a mobile ERP app for experimental purposes.. 49	
Fig. 3.5: mERP app installed and operated on different form factors.....	50
Fig. 3.6: Proposed model of the attributes of system acceptability by Nielsen	51
Fig. 3.7: Comparison among the ISO, Nielsen and PACMAD usability models.....	53
Fig. 3.8: Taxonomy of software usability evaluation methods	56

Fig. 3.9: Research objectives status; construction of a conceptualisation of the usability challenges of mobile ERP	57
Fig. 3.10: Research objectives status; literature review to identify the usability challenges of mobile HCI.....	57
Fig. 3.11: Ontology of literature reviews	58
Fig. 3.12: Cyclic literature search process.....	58
Fig. 3.13: Research objectives status; literature review to identify the usability challenges of ERP systems	63
Fig. 3.14: Research objectives status; structured interviews with mobile ERP vendors.....	66
Fig. 3.15: Research objectives status; the first version of the construct of the conceptualisation for the usability challenges of mobile ERP apps	75
Fig. 3.16: Research objectives status; identifying a method to evaluate the usability of mobile ERP apps	77
Fig. 3.17: Proposed heuristics list by Yáñez Gómez et al. for designing a usable mobile UI.....	80
Fig. 3.18: Proposed heuristics list for mobile ERP apps by Omar et al.	81
Fig. 3.19: Proposed categorisation of the detected heuristics and sub-heuristics by Yáñez Gómez et al.	82
Fig. 3.20: Proposed categorisation of the detected heuristics and sub-heuristics for mobile ERP apps by Omar et al.....	83
Fig. 3.21: Research objectives status; identifying the usability challenges of the selected mobile ERP app (mERP app).....	85
Fig. 3.22: Median ratings of the identified usability problems in mERP app for each heuristic (n=3).....	86
Fig. 3.23: Identified numbers of the usability problems for each heuristic with their severity classification.....	86
Fig. 3.24: Research objectives status; a survey questionnaire for mERP app’s end-users.....	89
Fig. 3.25: Highest percentage rates of the respondents’ answers to questions 1 to 10 in the survey questionnaire for mERP app’s end-users (n=31).....	91
Fig. 4.1: Research objectives status; sub-objectives that will be achieved in Chapter 4.....	97
Fig. 4.2: Examples of adaptable and adaptive systems	98
Fig. 4.3: Basic principle of adaptation systems.....	99
Fig. 4.4: Stages of the adaptation process and their agents that perform and control it	99
Fig. 4.5: Most interesting types of adaptation	100
Fig. 4.6: Example of adaptable UIs	101

Fig. 4.7: AUIs and Intelligent Interfaces	101
Fig. 4.8: Multi-disciplinary research area.....	101
Fig. 4.9: Contents of a user model (user characteristics).....	102
Fig. 4.10: Proposed classification for AH methods and techniques by Brusilovsky.....	106
Fig. 4.11: Classification of AH methods and techniques, adaptation process highlights.....	106
Fig. 4.12: Research objectives status; identifying the adapted constituents in AUIs for mobile ERP apps	107
Fig. 4.13: Research objectives status; mapping the identified adapted constituents in AUIs as a solution to the identified usability challenges of mobile ERP apps	110
Fig. 4.14: Research objectives status; determining the knowledge models that will be utilised for adaptation processes in the context of this research	111
Fig. 4.15: Proposed qualitative review framework of empirical mobile usability studies by Coursaris & Kim	115
Fig. 4.16: Classified dimensions of user models	118
Fig. 4.17: Excerpt of the analysed CTT of the creation RFQ task in the purchasing module of the mERP app.....	129
Fig. 4.18: Research objectives status; determining the adaptation methods and techniques for mobile ERP apps	132
Fig. 4.19: Proposed taxonomy of adaptation methods and techniques for AH systems by Knutov et al	133
Fig. 4.20: Proposed adaptation taxonomy for ERP systems by Singh & Wesson.....	134
Fig. 4.21: Updated version of the proposed taxonomy of content adaptation methods and techniques by Omar & Marx Gómez.....	135
Fig. 4.22: Updated version of the proposed taxonomy of presentation adaptation methods and techniques by Omar & Marx Gómez.....	135
Fig. 4.23: Updated version of the proposed taxonomy of navigation adaptation methods and techniques by Omar & Marx Gómez.....	136
Fig. 4.24: Research objectives status; determining an adaptive system architecture for mobile ERP apps	139
Fig. 4.25: Proposed adaptive system architecture for mobile ERP apps	140
Fig. 5.1: Research objectives status; sub-objectives that will be achieved in Chapter 5.....	143
Fig. 5.2: Screenshot of the main required information and products details of the RFQ form in the purchases module of the Odoo ERP system.....	144
Fig. 5.3: Screenshot of the RFQ & Bid tab of the RFQ form in the purchases module of the Odoo ERP system.....	144

Fig. 5.4: Screenshot of the Deliveries and Invoices tab of the RFQ form in the purchases module of the Odoo ERP system	144
Fig. 5.5: Screenshots of the RFQ form in the purchases module of the mERP app.....	145
Fig. 5.6: Referential integrity constraints between the task, and goal tables in the proposed relational database schema	147
Fig. 5.7: Screen shoot of the modelling process for the physiological characteristics of the end-users in the developed prototype	149
Fig. 5.8: Complete example of using MFU item pattern in the developed prototype	150
Fig. 5.9: Predefined rules for the knowledge classification for the “the create purchase order” task	151
Fig. 5.10: Referential integrity constraints between the “userknowledgetask” and “knowldgecategory” tables in the proposed relational database schema	152
Fig. 5.11: Two helping patterns for the end-users to create RFQ; the screenshot on the left is for novice end-users, and the one on the right is for moderate end-users.....	152
Fig. 5.12: Referential integrity constraints between the “adaptiveprev”, and “ruleaction” tables in the proposed relational database schema.....	153
Fig. 5.13: Acquired information regarding the available memory percentage and the battery percentage level of the mobile device at a running time	153
Fig. 5.14: Different screenshots that show the acquired environment-specific context information in different environmental contexts of use	155
Fig. 5.15: Measured acceleration value of the mobile device at a specific time	156
Fig. 5.16: Measured illumination value of the mobile device at a specific time	157
Fig. 5.17: Measured ambient sound intensity value of the mobile device at a specific time	158
Fig. 5.18: Predefined classifications for acceleration.....	160
Fig. 5.19: Predefined classifications for ambient sound intensity.....	160
Fig. 5.20: Predefined classifications of the illumination levels under various conditions	161
Fig. 5.21: Predefined battery plans for Huawei Y3II mobile device.....	161
Fig. 5.22: Predefined memory plans for Huawei Y3II mobile device.....	162
Fig. 5.23: Example of the relation between the identified goals and their associated tasks, and the relation between these tasks and their associated activities.....	163
Fig. 5.24: Referential integrity constraints for the activity, task, and goal tables in the proposed relational database schema	164
Fig. 5.25: Excerpt from the predefined adaptation rules for selecting an appropriate activity for a specific context of use	164
Fig. 5.26: Example of the applied concept of the general rule and its specialised rules	165

Fig. 5.27: Example of selecting an identified activity by the activity selector component based on the acquired and interpreted contextual information.....	166
Fig. 5.28: Applied rule by the activity selector component for selecting “RFQForm2_1video” activity.....	166
Fig. 5.29: Example of the relation between the identified activities and their associated dialogs, which are invoked based on a specific context of use.....	167
Fig. 5.30: Referential integrity constraints for the dialog, activity, task, and goal tables in the proposed relational database schema.....	168
Fig. 5.31: Excerpt from the predefined adaptation rules for selecting an appropriate dialog for a specific activity for a specific context of use	168
Fig. 5.32: Applied rule for selecting “fragment_rfq2main_dialog1”, “fragment_rfq2main_dialog2” dialogs by the dialog selector component.....	170
Fig. 5.33: Invoking “fragment_rfq2main_dialog1” dialog for case 1	171
Fig. 5.34: Invoking “fragment_rfq2main_dialog2” dialog for case 2	171
Fig. 5.35: Referential integrity constraints for the presentation, component, and dialog tables in the proposed relational database schema.....	172
Fig. 5.36: Set of the identified adaptation processes in the “adaptationprocess” table in the developed computational framework	172
Fig. 5.37 Set of the identified actions in the developed computational framework	173
Fig. 5.38: Set of the identified adaptation rules in the adaptation rule.....	173
Fig. 5.39: Adapting UI’s widgets based on the current context of use.....	174
Fig. 5.40: Adapting screen brightness based on the ambient light level (Presentation adaptation)	176
Fig. 5.41: Wizard pattern by automatically open the next UI’s widget (Navigation adaptation)	176
Fig. 5.42: Highlighting the next UI’s component for interaction (Navigation and presentation adaptation).....	177
Fig. 5.43: Adapting the presentation of the add button (Predominant done button), once all the required information is inserted (Navigation and presentation adaptation)	177
Fig. 5.44: Example of the responsive disclosure pattern, once the desired destination is selected from the destination spinner, a set of main actions buttons will appear (Navigation and presentation adaptation).....	177
Fig. 5.45: Example of the responsive enabling pattern; the “enter supplier reference” edit text remains disabled until the supplier is selected from the select “supplier spinner” (Navigation and presentation adaptation).....	178
Fig. 5.46: Example of auto complete pattern (Content adaptation).....	178
Fig. 5.47: Administration page of the developed AUIs management module	179

Fig. 5.48: Task model administration page	179
Fig. 5.49: Activity model administration page	179
Fig. 5.50: Dialog model administration page	180
Fig. 5.51: Presentation model administration page	180
Fig. 5.52: Platform model administration page	180
Fig. 5.53: Environment model administration page	181
Fig. 5.54: Intelligent help administration page.....	181
Fig. 5.55: Adaptation models administration page.....	182
Fig. 5.56: Database schema diagram for the mobile ERP app	183
Fig. 5.57: Database schema diagram in the mobile ERP app server	184
Fig. 6.1: Research objectives status; sub-objectives that will be achieved in Chapter 6.....	187
Fig. 6.2: Proposed evaluation protocol for empirical evaluations by Singh.....	189
Fig. 6.3: Chronology of the conducted evaluation’s experiments.....	194
Fig. 6.4: Mean comparison for time on task in the walking experiments (n=20).....	196
Fig. 6.5: Mean comparison for time on task in the high ambient sound experiments (n=20).....	197
Fig. 6.6: Mean comparison for time on task in the experiments of the high ambient sound with walking (n=20)	199
Fig. 6.7: Mean comparison for time on task in the experiments of direct sunlight (n=20)	200
Fig. 6.8: Mean comparison for errors committed in the walking experiments (n=20).....	202
Fig. 6.9: Mean comparison for errors committed in the high ambient sound experiments (n=20)	203
Fig. 6.10: Mean comparison for errors committed in the experiments of the high ambient sound with walking (n=20)	205
Fig. 6.11: Mean comparison for errors committed in the direct sunlight experiments (n=20)....	206
Fig. 6.12: Mean comparison for the UIs’ widgets that got focused in the walking experiments (n=20).....	208
Fig. 6.13: Mean comparison for the UIs’ widgets that got focused in the high ambient sound experiments (n=20).....	209
Fig. 6.14: Mean comparison for the UIs’ widgets that got focused in the experiments of the high ambient sound with walking (n=20).....	211
Fig. 6.15: Mean comparison for the UIs’ widgets that got focused in the direct sunlight experiments (n=20).....	212

Fig. 6.16: Comparison of overall reactions between the adaptive and non-adaptive versions of the developed prototype (n=20)	214
Fig. 6.17: Comparison of attitudes towards the identified usability challenges in the developed construct between the adaptive and non-adaptive versions of the developed prototype (n=20) .	215
Fig. 7.1: Completed sub-objectives in this research study	221

List of Tables

Tab. 1.1: Classified topics of mobile ERP that can be found in the literature.....	5
Tab. 1.2: Research questions.....	10
Tab. 1.3: Design-Science research guidelines proposed by Hevner et al.....	17
Tab. 2.1: MRP systems processes.....	25
Tab. 2.2: Updated results of the comparisons analysis among some of the prominent ERP systems.....	34
Tab. 3.1: Explanation of how native and mobile web apps presumably address key characteristics of app usage and development.....	46
Tab. 3.2: Examples of usability measures.....	55
Tab. 3.3: Identified usability factors and challenges of mobile HCI.....	59
Tab. 3.4: Impact of the identified usability challenges of mobile HCI on the selected attributes of the PACMAD usability model.....	62
Tab. 3.5: Prominent studies that focused on UI aspects in ERP usability.....	64
Tab. 3.6: Identified categories of the usability challenges of ERP systems mapped with the selected attributes of the PACMAD usability model.....	65
Tab. 3.7: Results of the central tendency (mean) for each business category that was assessed in question number one (n=22).....	70
Tab. 3.8: Negative impact of the identified usability challenges from the structured interviews on the selected attributes of the PACMAD usability model.....	73
Tab. 3.9: Inherited usability challenges from ERP systems into mobile ERP apps.....	74
Tab. 3.10: Summary of the business sectors that are extensively adopting mobile ERP for each enterprise category.....	74
Tab. 3.11: First version of the construct of a conceptualisation for the usability challenges of mobile ERP apps.....	76
Tab. 3.12: Summarisation of the added numbers of the heuristics, categories, and sub-heuristics to the Yáñez Gómez et al. checklist by Omar et al.....	84
Tab. 3.13: Mapping between the identified usability challenges in the resulted first version of the developed construct and the identified major usability challenges from the conducted heuristic evaluation research study.....	87
Tab. 3.14: Mapping the identified usability problems of ERP systems from the conducted literature review to the identified major usability problems from the conducted heuristic evaluation research study.....	87
Tab. 3.15: Second version of the construct of a conceptualisation for the usability challenges of mobile ERP apps.....	88

Tab. 3.16: Goals behind the identified questions in the developed survey questionnaire for mERP app's end-users	90
Tab. 3.17: Usability challenges that were affirmed in the conducted survey questionnaire for mERP app's end-users, which were previously identified in the conducted research studies in this dissertation.....	92
Tab. 3.18: Final version of the desired construct of a conceptualisation for the usability challenges of mobile ERP apps	93
Tab. 4.1: Comparison between adaptive and adaptable systems	99
Tab. 4.2: Adaptation types as a solution for the usability challenges of mobile ERP apps.....	110
Tab. 4.3: Related works to AUIs that were analysed and the models that have been utilised in them	112
Tab. 4.4: Contextual parameters in the analysed works that are related to context modelling ...	116
Tab. 4.5: End-user properties that were considered in the analysed works that are related to AUIs	120
Tab. 4.6: Modelled parameters and their dynamism types in the desired user model.....	122
Tab. 4.7: Utilised modelling approaches for the determined parameters of the desired user model	123
Tab. 4.8: Sensor types supported by the Android platform.....	124
Tab. 4.9: Advantages and drawbacks of CC/PP technique	125
Tab. 4.10: DDRs comparisons.....	126
Tab. 4.11: Determined parameters of the desired device model in the proposed computational framework	127
Tab. 4.12: Proposed solutions for the identified usability challenges	137
Tab. 5.1: Example that depicts the acquired contextual information for the end-user Ali while he is performing the create purchase order task	159
Tab. 5.2: Resulted contextual model from the modelling layer which will be used by the adaptive engine's components	162
Tab. 5.3: Contextual parameters that have not a specialised rule in the "dialogselector" table for case 1	170
Tab. 5.4: Contextual parameters that do not have a specialised rule in the "dialogselector" table for Case 2.....	171
Tab. 6.1: Instance of one of the tasks that were used on the first day of the evaluation	193
Tab. 6.2: P-values from the Wilcoxon Matched-Pairs Test for the time on task in the walking experiments (n=20).....	196
Tab. 6.3: Results of Mann-Whitney U Test for the time on task in the walking experiments (n=20)	197
Tab. 6.4: P-values from the Wilcoxon Matched-Pairs Test for the time on task in the high ambient sound experiments (n=20)	198

Tab. 6.5: Results of Mann-Whitney U Test for the time on task in the high ambient sound experiments (n=20).....	198
Tab. 6.6: P-values from the Wilcoxon Matched-Pairs Test for the time on task in the experiments of high ambient sound with walking (n=20)	199
Tab. 6.7: Results of Mann-Whitney U Test for the time on task in the experiments of high ambient sound with walking (n=20).....	200
Tab. 6.8: P-values from the Wilcoxon Matched-Pairs Test for the time on task in the direct sunlight experiments (n=20).....	201
Tab. 6.9: Results of Mann-Whitney U Test for the time on task in the direct sunlight experiments (n=20).....	201
Tab. 6.10: P-values from the Wilcoxon Matched-Pairs Test for the errors committed in the walking experiments (n=20).....	202
Tab. 6.11: Results of Mann-Whitney U Test for the errors committed in the walking experiments (n=20).....	203
Tab. 6.12: P-values from the Wilcoxon Matched-Pairs Test for the errors committed in the high ambient sound experiments (n=20)	204
Tab. 6.13: Results of Mann-Whitney U Test for the errors committed in the high ambient sound experiments (n=20).....	204
Tab. 6.14: P-values from the Wilcoxon Matched-Pairs Test for the errors committed in the experiments of the high ambient sound with walking (n=20).....	205
Tab. 6.15: Results of Mann-Whitney U Test for the errors committed in the experiments of the high ambient sound with walking (n=20).....	206
Tab. 6.16: P-values from the Wilcoxon Matched-Pairs Test for the errors committed in the direct sunlight experiments (n=20).....	207
Tab. 6.17: Results of Mann-Whitney U Test for the errors committed in the direct sunlight experiments (n=20).....	207
Tab. 6.18: P-values from the Wilcoxon Matched-Pairs Test for the number of the UI's widgets that got focused in the walking experiments (n=20)	208
Tab. 6.19: Results of Mann-Whitney U Test for the number of UI's widgets that got focused in the walking experiments (n=20).....	209
Tab. 6.20: P-values from the Wilcoxon Matched-Pairs Test for the number of the UI's widgets that got focused in the high ambient sound experiments (n=20).....	210
Tab. 6.21: Results of Mann-Whitney U Test for the number of UI's widgets that got focused in the high ambient sound experiments (n=20)	210
Tab. 6.22: P-values from the Wilcoxon Matched-Pairs Test for the number of the UI's widgets that got focused in the experiments of the high ambient sound with walking (n=20).....	211
Tab. 6.23: Results of Mann-Whitney U Test for the number of UI's widgets that got focused in the experiments of the high ambient sound with walking (n=20)	212

Tab. 6.24: P-values from the Wilcoxon Matched-Pairs Test for the number of the UI's widgets that got focused in the direct sunlight experiments (n=20)	213
Tab. 6.25: Results of Mann-Whitney U Test for the number of UI's widgets that got focused in the direct sunlight experiments (n=20).....	213
Tab. 6.26: Calculated α values for the responses of each group of participants regarding the "Overall reactions to the application" category (n=20).....	214
Tab. 6.27: Results from the Mann-Whitney U Test for each item in the "Overall reactions to the application" category (n=20).....	214
Tab. 6.28: Calculated α values for the responses of each group of participants regarding the "Attitudes towards the identified usability challenges in the developed construct" category (n=20)	215
Tab. 6.29: Results from the Mann-Whitney U Test for each item in the "Attitudes towards the identified usability challenges in the developed construct" category (n=20).....	216
Tab. 6.30: Statistical significance results for efficiency metrics ticked with "✓" symbol (Mann Whitney U Test).....	217
Tab. 6.31: Statistical significance results for the average error numbers committed ticked with "✓" symbol (Mann Whitney U Test).....	217
Tab. 6.32: Statistical significance results for the determined subjective metrics over the two-day evaluation period ticked with "✓" symbol (Mann Whitney U Test).....	218
Tab. 6.33: Testing results for the determined hypotheses of the selected attributes of the PACMAD usability model.....	218

List of Listings

Listing 5.1: Excerpt from the written code in the Login class.....	148
Listing 5.2: Excerpt from the written code that shows the implementation of MFU item pattern	150
Listing 5.3: Excerpt from the written code that shows the initialisation of the new items for the spinner of suppliers when it's rendered again for the current end-user.....	150
Listing 5.4: Excerpt from the written code to determine the knowledge class for a specific task	151
Listing 5.5: Excerpt from the written code of the developed MemoryInfo class	154
Listing 5.6: Excerpt from the written code of the developed Broadcast class	154
Listing 5.7: Excerpt from the written code to detect the connection speed and status.....	155
Listing 5.8: Excerpt from the written code of the developed AccelerometerSensor class	156
Listing 5.9: Excerpt from the written code of the developed Light class.....	157
Listing 5.10: Excerpt from the written code to detect the ambient sound intensity	158
Listing 5.11: Excerpt from the written code to apply the median filter technique for the detected sound intensities	159
Listing 5.12: Excerpt from the written code of the ActivitySelector class.....	165
Listing 5.13: Excerpt from the written code for running the activity selector module.....	166
Listing 5.14: Excerpt from the written code of the DialogSelector class.....	169
Listing 5.15: Excerpt from the written code for running the dialog selector component.....	169
Listing 5.16: Excerpt from the written code for invoking the selected dialog from the dialog selector component in "RFQForm2" activity.....	169
Listing 5.17: Excerpt from the written code of the developed adaptive class.....	175
Listing 5.18: Developed code for running the UI Widget Adaptor	175