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Fakultät II - Informatik, Wirtschafts- und Rechtswissenschaften

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Khalil Omar

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

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

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M.Sc. Khalil Omar

Gutachter:
Prof. Dr.-Ing. habil. Jorge Marx Gómez

Prof. Dr. rer. nat. habil. Klaus Turowski

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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 Mobilen 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 verschieden Typen von Benutzeroberflächen (UIs) untersucht worden, um diese auf die identifizierten Herausforderungen zur Benutzerfreundlichkeit von Mobilen 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.

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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

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