## **Table of Contents**

1 Mobile Devices and Technology Enhanced Learning	13
2 Terminology and Related Work	. 23
2.1 Mobile, Ubiquitous and Pervasive Learning	23
2.2 Heterogeneous Learning Environments	30
2.3 Related Work	32
3 Technical Integration of Mobile Devices	
in Heterogeneous Learning Environments	41
3.1 Characteristics of Architectures of Heterogeneous Learnin	ng
Environments with Mobile Devices	42
3.1.1 Loose Coupling vs. Tight Coupling	42
3.1.2 Centralised vs. Replicated	
Synchronisation Architectures	44
3.1.3 Integration of Analysis Components	46
3.1.4 Interoperability of	
Language Heterogeneous Components	47
3.2 Architectures for Integrating Mobile Devices	
in Learning Environments	49
3.2.1 Sending Short Messages with PDAs:	
The SMS Scenario	50
3.2.2 Classroom Discussion Support with Mobile Devices:	:
Mobile Notes	56

## **Table of Contents**

3.2.3 MobileQOC – Supporting Design Discussion	
with Mobile Devices	69
4 Activity Structuring in Learning Environments	
- Device Roles and Differentiation	71
4.1 Explicit Activity Structuring	71
4.2 Implicit Activity Structuring and Functional Assignm	ent78
5 Activity Monitoring, Analysis and Feedback	85
5.1 Aspects and Goals of Activity Monitoring and Feedbac	ck
in Computer Supported Learning Environments	87
5.2 Activity Analysis Methods in	
Computer Supported Learning Environments	95
5.2.1 Classification Scheme of Analysis approaches	95
5.2.2 Additional Aspects of Analysis Methods	99
5.3 Specific Features of Analysis Approaches	
in Learning Environments with Mobile Devices	109
6 MobileQOC: Approach and Architecture	113
6.1 Background and Approach	113
6.2 MobileQOC Architecture	122
6.2.1 Communication and Synchronisation Infrastructus	re123
6.3 Analysis in MobileQOC	131
6.3.1 Tuples schemes	132
6.3.2 Creation and Integration of Analysis Patterns	137
6.3.3 Domain Dependent State Patterns,	
Domain Independent Action Patterns	143

7 Evaluat	ion of MobileQOC1	47
7.1 Se	tup of Study1	47
7.1.1	Technical and Spatial Setup	47
7.1.2	Personnel and Procedural Setup	49
7.1.3	Evaluation: Technology Acceptance Model	
	Questionnaires, Interviews and Observations 1	152
7.2 Eva	luation Outcomes: Questionnaire Results,	
Inte	erview Conclusions and Observation Findings1	161
7.2.1	Questionnaire Results	161
7.2.2	Interview Conclusions	l 66
7.2.3	Observation Findings	l <b>68</b>
7.2.4	Results from Logfile Analyses	l <b>7</b> 1
8 Conclus	sion and Outlook1	175
8.1 Di	scussion and Conclusion	175
8.2 Fu	ture Prospects1	178
Reference	es1	181
List of Fig	gures1	195
List of Ta	bles1	199
Annex A	- Translations	201
A.1 Ger	rman Translations of Task Descriptions2	201
<b>A</b> .1.1	Alternative 1: Software Company	201
A.1.2	Alternative 2: Marketing Company	201

## Table of Contents

A.2 German Translation of TAM Questionnaire Items	
for PU / PEoU and Interview Questions	202
A.2.1 Perceived Usefulness	202
A.2.2 Perceived Ease-of-Use	202
A.2.3 German translation of interview questions	203
Annex B - Common Format DTD	205
Annex C - Implemented Analysis Predicates	209
Annex D – Descriptive Statistics	
for MobileQOC Evaluation	215
D.1 Descriptive Statistics for Perceived Usefulness	215
D.2 Descriptive Statistics for Perceived Ease-of-Use	216
D.2 Descriptive Statistics Summarising all Items	216
D.4 Descriptive Statistics for Perceived Usefulness	216
D.5 Descriptive Statistics for Perceived Ease-of-Use	218
D.6 Descriptive Statistics Summarising all Items	218