Table of Contents

	List of Figures	ΑV
	List of Tables	XIX
Chapt	er One: Overview	1
1.1	Introduction	3
1.2	Research Motivations	4
	1.2.1 Pedagogical Problems	5
	1.2.2 Technical Problems	6
1.3	Dissertation Objectives	7
1.4	Contribution of Dissertation	8
1.5	Dissertation Structure	8
Chapt	ter Two: e-Learning Pedagogical and Technical Problems	11
2.1	Introduction	13
2.2	Pedagogical Problems	14
2.3	Adaptive and Intelligent e-Learning Systems	17
	2.3.1 Adaptive e-Learning Approaches	19
	2.3.2 Intelligent e-Learning Systems	21
2.4	Utilizing Service Oriented Architecture in e-Learning Systems	22
	2.4.1 Web services as main SOA enabler	23
	2.4.2 SOA and e-Learning Systems	24
2.5	Technical Problems with Services based e-Learning Systems	31
	2.5.1 Evaluation of Utilizing SOA in integrating e-Learning Systems	32
	2.5.2 Technical Evaluation Quality Parameters	35
2.6	Summary	38
	ter Three: Proposed Adaptive e-Learning Models	39
3.1	Introduction	41
3.2	Adaptive e-Learning Model as a Solution	41
	3.2.1 Adaptive e-Learning Model Components	42
	3.2.2 Adaptive e-Learning Model Learning Scenarios	43
	3.2.3 Adaptive Features in Adaptive e-Learning Model	50
3.3	Adaptive Online Lecture Model	52
	3.3.1 Phase One: Preparing Online Lecture	53
	3.3.2 Phase Two: During Online Lecture	54
	3.3.3 Phase Three: Upcoming Lecture	55
3.4	IT Architecture to Enable Presented Adaptive Models	56
	3.4.1 Utility, Middleware, and Load Balancing Servers	56
	3.4.2 Learning Content Management System and Content Servers	57
	3.4.3 Adaptive LMS Servers	58
	3.4.4 Adaptive Online Lecture Servers	58
3.5	Integration of Proposed Models Services Via SOA	58
3.6	Learning Objects in Presented Adaptive Models	64
3.7	Exam Management System and Cheating Challenges	71
	3.7.1 Problem Domain Analysis	72
	3.7.2 Comparative Study Between Supervised and Non-Supervised	74
	Quizzes	= ^
	3.7.3 Comments on Results	79
	3.7.4 Proposed Solution to Cheating Problems	80
3.8	Summary	82

Table of Contents

Chapt	er Four: Proposed Intelligent Features	85
4.1	Introduction	87
4.2	Instructor Intelligent Services	90
	4.2.1 Intelligent LOs Classifier	90
	4.2.2 Intelligent Online Lecture LOs Advisor	91
	4.2.3 Intelligent Student Tracker Service	94
	4.2.4 Intelligent Cheat Depressor Service	98
4.3	Student Intelligent Services	98
	4.3.1 Intelligent Study Plan Advisor	98
	4.3.2 Intelligent Time-to-Learn Topic Calculation	101
	4.3.3 Intelligent LOs Recommender	103
	4.3.4 Intelligent Agenda Study Time Planner	111
	4.3.5 Intelligent Meeting Manager for Suspended Students	113
4.4	Summary	115
Chapt	er Five: Technical Details and Implementation	117
5.1	Introduction	119
5.2	Intelligent Student Tracking Service	120
5.3	Student Manager Service	122
5.4	Students' Usage Data Manager	127
5.5	Learning Objects Manager Service	128
5.6	Intelligent LOs Recommender	131
	5.6.1 Pending LOs for Recommendation Manager Module	131
	5.6.2 Crawler Module	132
	5.6.3 Document Processor Service	134
5.7	Intelligent Meeting Manager for Suspended Students Service	141
5.8	Intelligent Document Classifier Service	144
5.9	Student e-Learning Environment and Adaptive Features	146
5.10	Instructor Portal	147
5.11	Summary	149
Chapt	er Six: Optimization and Evaluation	151
6.1	Introduction	153
6.2	Addressing Problems	154
	6.2.1 Pedagogical Problems	154
	6.2.2 Technical Problems	155
6.3	Presenting Proposed Solution	155
	6.3.1 Pedagogical Solutions	156
	6.3.2 Technical Solutions	158
6.4	Optimizing Selected Solution	159
	6.4.1 Intelligent LOs Recommender Challenges	160
	6.4.2 Intelligent LOs Recommender Optimization Techniques and	167
	Comments on Results	
6.5	Evaluation of Optimized Solution	168
	6.5.1 User Satisfaction	169
	6.5.2 Information Retrieval Evaluation	170
	6.5.3 Intelligent LOs Classifier Evaluation	173
6.6	Summary	177 179
Chapter Seven: Conclusion and Future Work		
References		