



DIGI4: A MULTI-PLATFORM ASSET MANAGEMENT AND TRACKING
SYSTEM FOR DIGITAL TRANSFORMATION DIVISION AT PT XYZ

UNDERGRADUATE THESIS

Submitted as one of the requirements to obtain
Sarjana Komputer (S.Kom.)

By:

SHEREN YANG

012202200038

FACULTY OF COMPUTER SCIENCE
INFORMATION SYSTEM STUDY PROGRAM
CIKARANG
AUGUST, 2025

SIMILARIT INDEX REPORT

TURNITIN

Individual Report_Sheren Yang_012202200038

ORIGINALITY REPORT

6%

SIMILARITY INDEX

3%

INTERNET SOURCES

1%

PUBLICATIONS

4%

STUDENT PAPERS

PRIMARY SOURCES

1

Submitted to Brunel University

Student Paper

<1%

2

Submitted to universititeknologimara

Student Paper

<1%

3

Submitted to Asia Pacific University College of
Technology and Innovation (UCTI)

Student Paper

<1%

4

Submitted to University of Greenwich

Student Paper

<1%

5

Submitted to British University in Egypt

Student Paper

<1%

6

repository.usd.ac.id

Internet Source

<1%

7

Submitted to City University of Hong Kong

Student Paper

<1%

8

hdl.handle.net

Internet Source

<1%

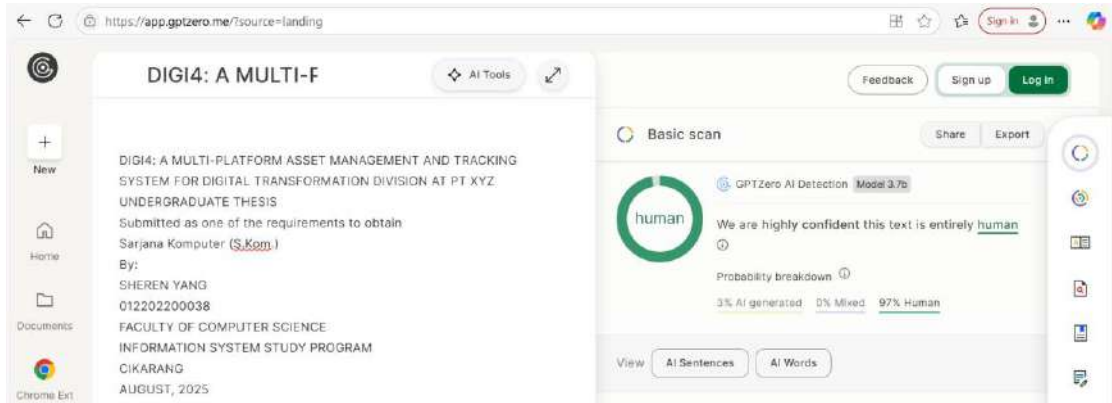
9

provasimo.iep.edu.gr

Internet Source

<1%

ZEROGPT



ABSTRACT

PT XYZ's Digital Transformation division encountered persistent inefficiencies in managing consumable and reusable assets. Manual processes, lack of real-time tracking, and disorganized storage resulted in delays, over-purchasing, and poor asset utilization. These issues disrupted project timelines and increased operational costs.

To address these challenges, this project developed DIGI4, a multi-platform asset management and tracking system accessible via web and mobile applications. Key features include QR code-based tracking, check-in/check-out functionality, visual asset locators, real-time stock alerts, and transaction history. The system allows users to efficiently locate, track, and manage assets across two plant locations.

DIGI4 was developed using Flutter for mobile and ASP.NET MVC for web, supported by SQL Server for centralized data management. The implementation followed an agile methodology, with testing conducted across various devices to ensure seamless synchronization and usability. The system successfully reduced manual errors, improved asset visibility, and streamlined inventory processes. By optimizing asset control and reducing waste, DIGI4 supports the division's digital transformation goals and provides a scalable solution for inventory management in dynamic project environments.

TABLE OF CONTENTS

DEDICATION.....	II
ACKNOWLEDGMENTS.....	III
LIST OF TABLES.....	VII
LIST OF FIGURES.....	IX
CHAPTER I PROPOSAL.....	1
1.1 PROBLEM FORMULATION.....	1
1.1.1 Background of the Problem.....	1
1.1.2 Problem Statement.....	2
1.1.3 Objective.....	2
1.1.4 Problem from a Customer Perspective.....	2
1.2 PROBLEM CONSTRAINT ANALYSIS.....	2
1.2.1 Aspect 1: Operational.....	3
1.2.2 Aspect 2: Resource Management.....	3
1.2.3 Aspect 3: Financial and Scheduling.....	3
1.3 PROBLEM FUNCTIONAL ANALYSIS.....	4
1.3.1 QR Code-Based Inventory Tracking.....	4
1.3.2 Inventory Locator System.....	4
1.3.3 Asset Movement Logs and Analytics.....	4
1.3.4 Asset Procurement and Maintenance.....	5
1.4 SOLUTION SELECTION.....	5
1.4.1 Manual Spreadsheet-Based Asset Tracking.....	5
1.4.2 Integrated Multi-Platform Asset Management and Tracking.....	5
1.4.3 Physical Tagging and Logbook System.....	6
1.4.4 Solution Selection.....	6
1.5 DEVELOPMENT EFFORT.....	7
1.5.1 Man-Months.....	7
1.5.2 Machine Months.....	8
1.5.3 Development Tools.....	8
1.5.4 Test Equipment.....	9
1.5.5 Expert Needs.....	9
1.5.6 Cost Estimation.....	9
1.5.7 Timeline.....	9
1.6 CONCLUSION.....	10
CHAPTER II SPECIFICATION.....	12
2.1 EXISTING AND PROPOSED SYSTEM.....	12
2.1.1 Current Business Process.....	12
2.1.2 Improvement Business Process.....	13
2.2 GLOBAL DESCRIPTION OF THE PRODUCT.....	14
2.2.1 Main Functionality.....	14
2.2.2 User Characteristics.....	15

2.2.3	Constraints	16
2.2.4	Product Development Environment.....	17
2.2.5	Product Operational Environment	18
2.3	REQUIREMENT ANALYSIS	18
2.3.1	External Interfaces	18
2.3.2	Functional Description.....	19
2.3.3	Data Requirement from User's Perspective.....	45
2.3.4	Functional Requirement from user's perspective	61
2.3.5	Non-Functional Requirement.....	66
2.4	SPECIFICATION TESTING	66
2.4.1	Testing Environment.....	66
2.4.2	Testing Scenario.....	68
CHAPTER III DESIGN		69
3.1	ALTERNATIVE SOLUTION DESIGNS	69
3.1.1	Alternative Solution 1: RFID-Based Asset Tracking for Asset Management System.....	69
3.1.2	Alternative Solution 2: A Web-based Barcode-Based Asset Tracking System.....	71
3.1.3	Alternative Solution 3: A Multi-platform IT Asset Tracking System (DIGI4 Application).....	74
3.2	RATIONAL/SYSTEMATIC DESIGN	78
3.2.1	Comparison Table.....	78
3.2.2	Quantitative Solution Selection	79
3.3	SOLUTION SELECTION.....	83
3.4	HIERARCHICAL/ITERATIVE DESIGN	84
3.4.1	Data Flow Diagram.....	84
3.4.2	Interface Information Between Block Diagrams	101
3.4.3	Implements Steps in Software Engineering Design.....	105
3.4.4	Libraries for Web Development (ASP.NET MVC)	106
3.4.5	Libraries for Mobile Development (Flutter)	107
3.5	FLOWCHART AND UNIFIED MODEL LANGUAGE	108
3.5.1	Flowchart	108
3.5.2	Class Diagram.....	109
3.5.3	Use Case Diagram.....	111
3.5.4	Activity Diagram	111
3.5.5	Sequence Diagram	125
3.5.6	Entity Relationship Diagram.....	131
3.6	VERIFICATION DEMONSTRATION AND PROOF OF DESIGN PROCESS	131
3.7	STANDARDS USED	135
3.7.1	Data Standards	135
3.7.2	Application Standards.....	136
3.7.3	Platform-Specific Standards	137
3.8	IMPLEMENTATION AND TESTING.....	138
3.8.1	Gantt Chart.....	138
3.8.2	S-Chart	138
CHAPTER IV IMPLEMENTATION		140

4.1	DESIGN IMPLEMENTATION	140
4.1.1	Functions/Procedure/Class Implementation	140
4.1.2	Database Implementation.....	176
4.1.3	Integration Among Every Module	196
4.2	PRODUCT DISPLAY.....	198
4.2.1	Website	198
4.2.2	Mobile Apps.....	225
4.3	COMPONENT COST ANALYSIS	233
4.4	MANUAL GUIDE.....	234
4.4.1	System Build Documentation from The Source (Developer Perspective) 234	
4.4.2	System Installation.....	244
4.4.3	User Guide Per User Role.....	245
4.5	VIDEO DEMONSTRATION	252
CHAPTER V TESTING		254
5.1	RESTATE THE PROBLEM AS STATED IN THE F-100 DOCUMENT	254
5.2	RESTATE THE SPECIFICATIONS STATED IN THE F-200 DOCUMENT.....	255
5.2.1	Main Functionality	255
5.2.2	User Characteristics	256
5.2.3	Constraints	257
5.2.4	Product Development Environment.....	258
5.2.5	Product Operational Environment	259
5.3	FUNCTIONAL TESTING	260
5.3.1	Testing Results of Every Function in the Specification	260
5.3.2	Qualitative Testing.....	288
5.3.3	Testing Procedures That are Carried Out According to the Design	291
5.3.4	Procedures for the Demo are Created and Verified	291
5.3.5	Testing Other Specifications.....	291
REFERENCES.....		293

LIST OF TABLES

Table 1.1 Cost Estimation.....	9
Table 1.2 Timeline	9
Table 2.1 User Characteristic.....	15
Table 2.2 External Interfaces	18
Table 2.3 Use Case Login Scenario	21
Table 2.4 Use Case Logout Scenario	21
Table 2.5 Use Case View Dashboard Scenario	22
Table 2.6 Use Case View Assets Scenario	23
Table 2.7 Use Case Create New Asset Scenario.....	24
Table 2.8 Use Case Ask Purchase New Asset Scenario	25
Table 2.9 Use Case View Instance Detail Scenario.....	26
Table 2.10 Use Case Bulk Operations Scenario	27
Table 2.11 Use Case Scan QR Scenario	28
Table 2.12 Use Case Check-Out Asset Scenario	29
Table 2.13 Use Case Check-In Scenario.....	30
Table 2.14 Use Case Ask Reusable Repair Scenario.....	32
Table 2.15 Use Case Edit Asset Scenario	33
Table 2.16 Use Case Edit Instance Information Scenario	34
Table 2.17 Use Case Ask Repurchase Asset Scenario	36
Table 2.18 Use Case View Locator Scenario	36
Table 2.19 Use Case Add New Locator Scenario.....	37
Table 2.20 Use Case Edit Locator Scenario	38
Table 2.21 Use Case View User Profile Scenario	39
Table 2.22 Use Case Generate QR Code Scenario	40
Table 2.23 Use Case View Transaction History Scenario	41
Table 2.24 Use Case View Analytical Scenario	42
Table 2.25 Use Case Approve Reusable Repair Request Scenario	43
Table 2.26 Use Case View Purchase Request Scenario	43
Table 2.27 Use Case View and Edit User Scenario	44
Table 2.28 Data Dictionary.....	46
Table 2.29 Entity Table Plant	52
Table 2.30 Entity Table Cabinet	53
Table 2.31 Entity Table Shelf	53
Table 2.32 Entity Table Asset.....	54
Table 2.33 Entity Table AssetCategory	54
Table 2.34 Entity Table Instance	54
Table 2.35 Entity Table ConsumableInstance	55
Table 2.36 Entity Table ReusableInstance.....	55
Table 2.37 Entity Table QRCode.....	56
Table 2.38 Entity Table TransactionType	56
Table 2.39 Entity Table TransactionLog	57
Table 2.40 Entity Table ConsumableTransLog	57
Table 2.41 Entity Table ReusableTransLog	58
Table 2.42 Entity Table RepairRequest	58

Table 2.43 Entity Table PurchaseRequest	58
Table 2.44 Entity Table PurchaseRequestAttachment.....	59
Table 2.45 Entity Table AssetImage.....	59
Table 2.46 Entity Table User	60
Table 2.47 Non-Functional Requirement of DIGI4.....	66
Table 3.1 Comparison Between Alternative Solutions.....	78
Table 3.2 Rubric Comparison Between Alternative Solutions.....	79
Table 3.3 Alternative Solution Using RFID	81
Table 3.4 Alternative Solution Using Barcode	82
Table 3.5 Alternative Solution Using QR Code	82
Table 3.6 Implements Steps in Software Engineering Design	106
Table 3.7 Verification Demonstration And Proof of Design Process.....	132
Table 4.1 Create Role Table	177
Table 4.2 Create Asset Table	178
Table 4.3 Create Asset Category Table	178
Table 4.4 Create Asset Image Table	179
Table 4.5 Create Cabinet Table	180
Table 4.6 Create Consumable InstanceTable.....	181
Table 4.7 Create Consumable Transaction Log Table.....	182
Table 4.8 Create Instance Table.....	183
Table 4.9 Create Plant Table.....	184
Table 4.10 Create Purchase Request Table.....	185
Table 4.11 Create Purchase Request Attachment Table	186
Table 4.12 Create QR Code Table	187
Table 4.13 Create Repair Request Table	188
Table 4.14 Create Reusable Repair Table.....	189
Table 4.15 Create Reusable Transaction Log Table.....	190
Table 4.16 Create Shelf Table	190
Table 4.17 Create Transaction Log Table.....	191
Table 4.18 Create Transaction Type Table.....	192
Table 4.19 Create Unit of Measure Table.....	192
Table 4.20 Component Cost Analysis Table	234
Table 5.1 Connectivity and Function Table.....	259
Table 5.2 QR Code-Based Tracking Testing Result.....	260
Table 5.3 Locator System Testing Result	266
Table 5.4 Stock and Maintenance Monitoring and Alerts Testing Result	269
Table 5.5 Transaction History and Reporting Testing Result.....	277
Table 5.6 Real-time Asset Visibility and Monitoring Testing Result	278
Table 5.7 Transaction in Instance Page Testing Result	280
Table 5.8 Bulk Transactions Testing Result	282
Table 5.9 Locator and Asset Mapping Testing Result.....	283
Table 5.10 Scan History and Audit Trails Testing Result	286
Table 5.11 Data-Driven Decision Support Testing Result	287

LIST OF FIGURES

Picture 2.1 Current Business Process.....	13
Picture 2.2 Improvement Business Process	14
Picture 2.3 Use Case Diagram	20
Picture 2.4 Entity Relationship Diagram	46
Picture 2.5 Context Diagram.....	61
Picture 2.6 Activity Diagram	62
Picture 2.7 Data Flow Diagram DIGI4	64
Picture 3.1 Alternative Solution 1.....	69
Picture 3.2 Alternative Solution 2.....	72
Picture 3.3 Alternative Solution 3.....	75
Picture 3.4 Data Flow Diagram Level 0	85
Picture 3.5 Data Flow Diagram Level 1	86
Picture 3.4 Data Flow Diagram Level 2 Process 1 DIGI4.....	87
Picture 3.5 Data Flow Diagram Level 3 Process 1.1 and 1.2 DIGI4	87
Picture 3.6 Data Flow Diagram Level 2 Process 2 DIGI4.....	88
Picture 3.7 Data Flow Diagram Level 3 Process 2.1 and 2.2 DIGI4	88
Picture 3.8 Data Flow Diagram Level 2 Process 3 DIGI4.....	88
Picture 3.9 Data Flow Diagram Level 3 Process 3.1 DIGI4.....	89
Picture 3.10 Data Flow Diagram Level 3 Process 3.2 DIGI4.....	89
Picture 3.11 Data Flow Diagram Level 3 Process 3.3 DIGI4.....	89
Picture 3.12 Data Flow Diagram Level 3 Process 3.4 DIGI4.....	90
Picture 3.13 Data Flow Diagram Level 2 Process 4 DIGI4.....	90
Picture 3.14 Data Flow Diagram Level 2 Process 4 DIGI4.....	91
Picture 3.15 Data Flow Diagram Level 3 Process 4.2 DIGI4.....	91
Picture 3.16 Data Flow Diagram Level 2 Process 5 DIGI4.....	92
Picture 3.17 Data Flow Diagram Level 3 Process 5.1 and 5.2 DIGI4	92
Picture 3.18 Data Flow Diagram Level 2 Process 6 DIGI4.....	92
Picture 3.19 Data Flow Diagram Level 3 Process 6.1 DIGI4.....	93
Picture 3.20 Data Flow Diagram Level 3 Process 6.2 DIGI4.....	93
Picture 3.21 Data Flow Diagram Level 2 Process 7 DIGI4.....	93
Picture 3.22 Data Flow Diagram Level 3 Process 7.1, 7.2, and 7.3 DIGI4	94
Picture 3.23 Data Flow Diagram Level 2 Process 7 DIGI4.....	94
Picture 3.24 Data Flow Diagram Level 3 Process 7.1 DIGI4.....	95
Picture 3.25 Data Flow Diagram Level 3 Process 7.2 DIGI4.....	95
Picture 3.26 Data Flow Diagram Level 3 Process 7.3 DIGI4.....	95
Picture 3.27 Data Flow Diagram Level 3 Process 7.4 DIGI4.....	96
Picture 3.28 Data Flow Diagram Level 3 Process 7.5 DIGI4.....	96
Picture 3.29 Data Flow Diagram Level 2 Process 8 DIGI4.....	96
Picture 3.30 Data Flow Diagram Level 3 Process 8.1 DIGI4.....	97
Picture 3.31 Data Flow Diagram Level 3 Process 8.2 DIGI4.....	97
Picture 3.32 Data Flow Diagram Level 2 Process 9 DIGI4.....	98
Picture 3.33 Data Flow Diagram Level 3 Process 9.1 DIGI4.....	98
Picture 3.34 Data Flow Diagram Level 3 Process 9.2 DIGI4.....	99
Picture 3.35 Data Flow Diagram Level 3 Process 9.3 DIGI4.....	99

Picture 3.36 Data Flow Diagram Level 2 Process 10 DIGI4.....	100
Picture 3.37 Data Flow Diagram Level 3 Process 10.1 DIGI4.....	100
Picture 3.38 Data Flow Diagram Level 3 Process 10.2 DIGI4.....	101
Picture 3.41 Scrum Software Development Methodology	106
Picture 3.39 Flowchart DIGI4.....	109
Picture 3.40 Class Diagram DIGI4	110
Picture 3.41 Use Case Diagram DIGI4.....	111
Picture 3.42 Activity Diagram DIGI4.....	112
Picture 3.43 Activity Diagram Edit Asset Information (Mobile User).....	113
Picture 3.44 Activity Diagram Request Reusable Repair (Mobile User)	114
Picture 3.45 Activity Diagram Check-Out Consumable Asset (Mobile User).....	115
Picture 3.46 Activity Diagram Check-Out Reusable Asset (Mobile User)	116
Picture 3.47 Activity Diagram Check-In Reusable Asset (Mobile User).....	117
Picture 3.48 Activity Diagram Add New Asset (Web Admin)	117
Picture 3.49 Activity Diagram Add New Instance and Generate QR (Web Admin)	118
Picture 3.50 Activity Diagram Request Purchase New Asset (Web Admin)	119
Picture 3.51 Activity Diagram Check-Out Consumable Asset (Web Admin)	119
Picture 3.52 Activity Diagram Check-Out Reusable Asset (Web Admin).....	120
Picture 3.56 Activity Diagram Check-In Reusable Asset (Web Admin)	120
Picture 3.57 Activity Diagram Request Reusable Repair (Web Admin).....	121
Picture 3.58 Activity Diagram Edit Instance (Web Admin).....	122
Picture 3.59 Activity Diagram Request Repurchase Asset (Web Admin)	123
Picture 3.60 Activity Diagram Add Locator (Web Admin)	123
Picture 3.61 Activity Diagram Approve Repair Request (Web Admin)	124
Picture 3.62 Activity Diagram Approve Purchase Request (Web Admin)	124
Picture 3.63 Sequence Diagram Locator Management (Mobile User and Web Admin)	125
Picture 3.64 Sequence Diagram Scan QR (Mobile User).....	125
Picture 3.65 Sequence Diagram Update Instance Data (Mobile User and Web Admin)	126
Picture 3.66 Sequence Diagram Check-Out Consumable Asset (Mobile User and Web Admin).....	126
Picture 3.67 Sequence Diagram Check-Out Reusable Asset (Mobile User and Web Admin).....	127
Picture 3.68 Sequence Diagram Check-In Reusable Asset (Mobile User and Web Admin).....	127
Picture 3.69 Sequence Diagram Purchase Request Asset (Mobile User and Web Admin).....	128
Picture 3.70 Sequence Diagram Repurchase Request Asset (Mobile User and Web Admin).....	129
Picture 3.71 Sequence Diagram Reusable Repair (Mobile User and Web Admin) ..	130
Picture 3.72 Sequence Diagram Generate QR (Web Admin).....	130
Picture 3.73 Sequence Diagram Add New Asset (Web Admin)	131
Picture 3.74 Entity Relationship Diagram DIGI4.....	131
Picture 3.75 Gantt Chart	138
Picture 3.76 S-Chart.....	139
Picture 4.1 Implementation View Locator Mobile	141

Picture 4.2 Implementation QR Code Management User Mobile	143
Picture 4.3 Implementation Asset Management Edit Mobile	145
Picture 4.4 Implementation Asset Management Check-Out Consumable Mobile	147
Picture 4.5 Implementation Asset Management Check-Out Reusable Asset Mobile	149
Picture 4.6 Asset Management Check-In Reusable Mobile	151
Picture 4.7 Ask Reusable Repair Mobile	153
Picture 4.8 Locator Management Web Admin	155
Picture 4.9 Generate QR Code	158
Picture 4.10 Instance Management Check-Out Consumable Asset Web Admin	160
Picture 4.11 Instance Management Check-Out Reusable Asset and Check-In Reusable Asset Web Admin	163
Picture 4.12 Asset Instance Management Ask Reusable Repair Web Admin	165
Picture 4.13 Asset Management Add New Asset	167
Picture 4.14 Asset Management Update Asset Web Admin	169
Picture 4.15 Request Repurchase Asset and Request Purchase New Asset	172
Picture 4.16 Approve Purchase Request Web Admin	174
Picture 4.17 Start Repair Reusable Repair Request (Web Admin)	175
Picture 4.18 Create Role Table Codes	177
Picture 4.19 Create Asset Table Codes	177
Picture 4.20 Create AssetCategory Table Codes	178
Picture 4.21 Create AssetImage Table Codes	179
Picture 4.22 Create Cabinet Table Codes	180
Picture 4.23 Create ConsumableInstance Table Codes	181
Picture 4.24 Create ConsumableTransLog Table Codes	182
Picture 4.25 Create Instance Table Codes	183
Picture 4.26 Create Plant Table Codes	184
Picture 4.27 Create Purchase Request Table Codes	185
Picture 4.28 Create PurchaseRequestAttachment Table Codes	186
Picture 4.29 Create QRCode Table Codes	187
Picture 4.30 Create RepairRequest Table Codes	188
Picture 4.31 Create ReusableInstance Table Codes	189
Picture 4.32 Create ReusableTransLog Table Codes	190
Picture 4.33 Create Shelf Table Codes	190
Picture 4.34 Create TransactionLog Table Codes	191
Picture 4.35 Create TransactionType Table Codes	192
Picture 4.36 Create UnitOfMeasure Table Codes	192
Picture 4.37 Create Trigger Codes	196
Picture 4.38 Create WebApiConfig Codes	197
Picture 4.39 Create Web Api Controllers	197
Picture 4.40 AssetApiController Codes	198
Picture 4.41 UI Website Login Page	199
Picture 4.42 UI Website Register Page	200
Picture 4.43 UI Website Profile	200
Picture 4.44 UI Website Dashboard	201
Picture 4.45 UI Website Analytical Page	202
Picture 4.46 UI Website Asset List Page	203
Picture 4.47 UI Website Create New Asset	203

Picture 4.48 UI Website Edit Asset	204
Picture 4.49 UI Website Delete Asset.....	204
Picture 4.50 UI Website Ask Repurchase Asset.....	205
Picture 4.51 UI Website Bulk Operations Asset Instance	205
Picture 4.52 UI Website Asset Reusable Instance List.....	206
Picture 4.53 UI Website Check-Out Consumable	206
Picture 4.54 UI Website Create Consumable Instance	207
Picture 4.55 UI Website View Transaction Logs Consumable Instance	207
Picture 4.56 UI Website Asset Reusable Instance List.....	208
Picture 4.57 UI Website Check-Out Reusable Instance	208
Picture 4.58 UI Website Create Reusable Instance	209
Picture 4.59 UI Website Edit Reusable Instance	209
Picture 4.60 UI Website Delete Reusable Instance	210
Picture 4.61 UI Website Ask Repair Reusable Instance.....	210
Picture 4.62 UI Website QR Print Tag	211
Picture 4.63 UI Repair Request Website	213
Picture 4.64 UI Purchase Request Website.....	218
Picture 4.65 UI Transaction History List Website.....	219
Picture 4.66 UI Transaction History Export Example Website	220
Picture 4.67 UI Locator Website	224
Picture 4.68 UI User Page Website.....	225
Picture 4.69 UI Mobile Register and Login	226
Picture 4.70 UI Mobile Dashboard	227
Picture 4.71 UI Mobile Asset and Instance Pages	229
Picture 4.72 UI Mobile Repair Request.....	230
Picture 4.73 UI Mobile Scan QR Code.....	231
Picture 4.74 UI Mobile Create Repair Request	231
Picture 4.75 UI Mobile Locator List, Add, and Edit Plant	232
Picture 4.76 UI Mobile List Cabinet List and Add New Cabinet.....	233
Picture 4.77 UI Mobile Edit and Delete Shelf	233
Picture 5.1 User Acceptance Testing Survey Result	290