Intelligent Academic Planner

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1. Abstract

IBM wants to use "natural language processing and machine learning to reveal insights from large amounts of unstructured data." (http://www.ibm.com/watson/what-is-watson.html) IBM Watson is the technology that IBM uses to achieve this goal.

Our project seeks to help guide first year students and their advisors by using their questions about the CSSE majors at Behrend as input and providing a structured analysis of possible academic careers built from Watson's insights.

We will increase Watson's domain to include insight related to the CSSE majors at Penn State Behrend. This will reveal more insights about majors in Penn State Behrend for Watson, achieving a small portion of IBM's goal. In addition, this will assist advisors with giving advice to new students to Penn State Behrend as well as being able to answer some questions for students without them having to go hunting for information.

In this report, we breakdown our goals into user and system requirements showing the engineering process of this project. UML Diagrams are also provided for further detail and explanation of this process.

3. Problem Statement

3.1. Business Background

IBM Watson's services, including Bluemix's APIs and other services from 3rd parties or developers, can be utilized to conduct textual analysis and output a numerical scale of performance factor. Web Experience Management (WEM) can be trained to answer many open-ended questions. The question we are trying to answer is whether we can create a system to assist with the enrollment process, through use of Bluemix and WEM.

3.2. Needs

To increase the effectiveness of the IBM Watson services, a larger domain is needed. Additionally, students are often unsure of which fields would coincide with their interests and talents.

3.3. Objectives

The objective of this project is to increase Watson's domain to include Penn State Behrend's academic information related to the CSSE majors, such as recommended courses, FAQs, and advisor information. The project will enable students to make a better decision as to which careers they might be interested in pursuing and what each path would entail. It will also help advisors to accurately guide the students.

4. Requirements

4.1. User Requirement

4.1.1. Glossary of Relevant Domain Terminology

4.1.1.1. Watson - An IBM supercomputer that combines artificial intelligence (AI) and sophisticated analytical software for optimal performance as a "question answering" machine.

4.1.1.2. Big Data Analysis - The process of examining large datasets to uncover hidden patterns, unknown correlations, customer preferences

4.1.1.3. Textual Analysis - A research method that requires the researcher to closely analyze the content of communication rather than the structure of the content.

4.1.1.4. Web Experience Management - A process of managing the all-round experience of the web user across various touch points in the journey through an organization's web presence.

4.1.2. User Groups

4.1.2.1. Visitors

4.1.2.2. Students

4.1.2.3. Advisors

4.1.2.4. System Developers

4.1.3. Functional Requirements

4.1.3.1. Project Scope

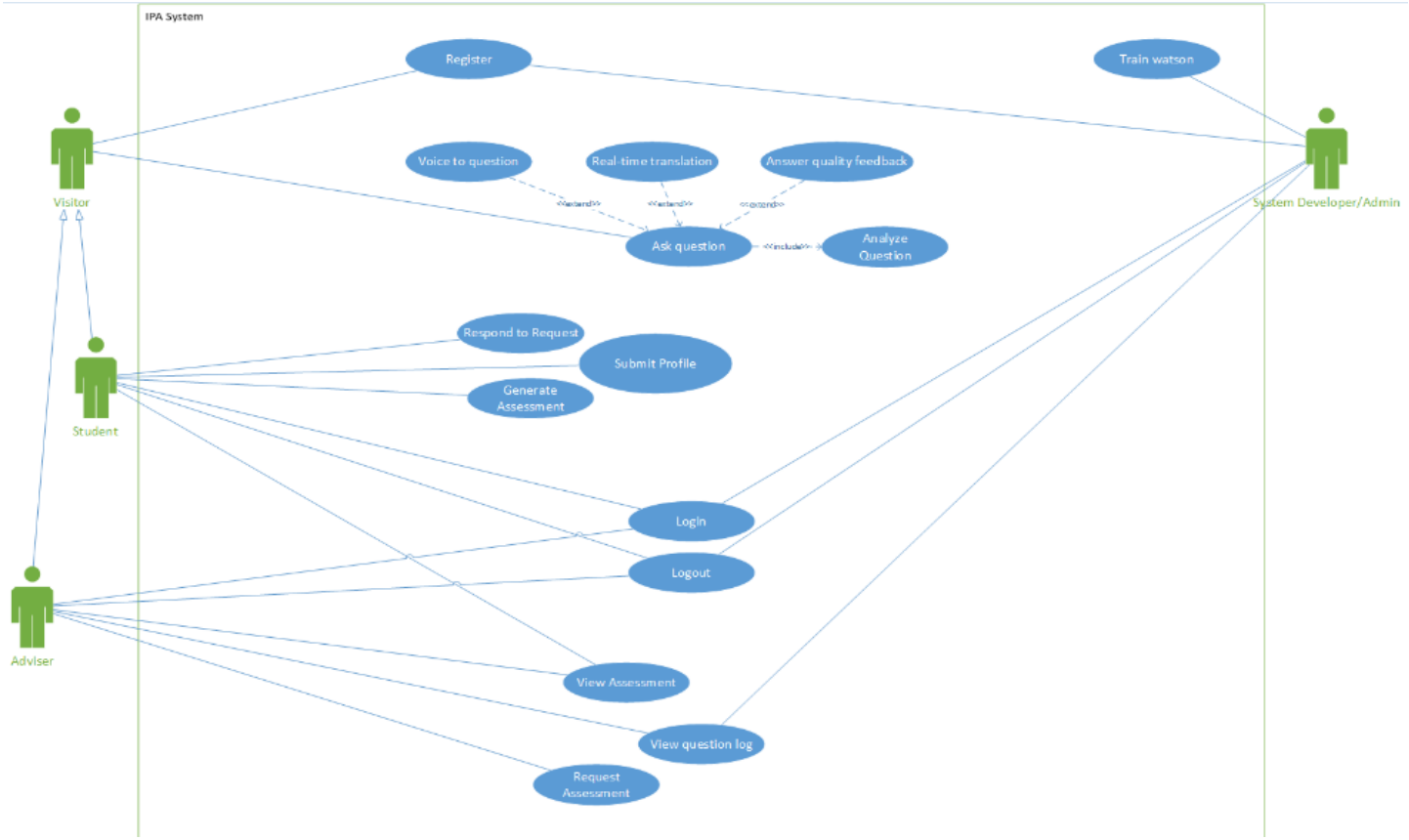

Figure 1: Use Case Diagram version 1 (subject to change)

4.1.3.2. User Scenarios

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-001
Use Case Name:	Respond to Request
User Goal:	User approves of advisor viewing assessment
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-E
Relevant System Reqs:	SF-E-05
Primary Actor:	Student
Precondition:	User has a request awaiting approval
Minimal Guarantee:	User's assessment are non-view-able
Success Guarantee:	User's assessment becomes view-able for advisor that requested
Trigger:	User requests to respond to request
Success Scenario:	Step Actions 1 The user requests to respond to request 2 The system asks for user's response 3 The user responds
Extensions:	Branching Scenarios
3A	Condition: If request is declined
	Step Actions 1 The system sends notification to advisor 2 Exit out of functionality
3B	Condition: If request is accepted
	Step Actions 1 The system sends notification to advisor 2 The system allows advisor to view assessment of student
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Figure 2: Description of Use Case "Respond to Request", which is related to requirements UF-E and SF-E-05

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-005
Use Case Name:	View assessment
User Goal:	User is able to view assessment
Scope:	IPA System
Level:	Subfunction
Relevant User Reqs:	UF-E
Relevant System Reqs:	SF-E-03
Primary Actor:	student, advisor
Precondition:	The user is logged in
Minimal Guarantee:	System does not display student's assessment
Success Guarantee:	system display student's assessment
Trigger:	User requests to view assessments
Success Scenario:	Step Actions 1 The user requests to view assessments 2 The system displays assessments that can be viewed
Extensions:	Branching Scenarios
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Figure 4: Description of Use Case "View Assessment", which is related to requirements UF-E and SF-E-03

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-004
Use Case Name:	Register
User Goal:	To be recognized by the system.
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-F
Relevant System Reqs:	SF-F-01
Primary Actor:	Visitor, System Devleoper
Precondition:	User is viewing program
Minimal Guarantee:	User is not recognized by system
Success Guarantee:	User is recognized by system
Trigger:	User requests to register
Success Scenario:	Step Actions 1 The user requests to register 2 The system asks for registration information 3 The user inputs registration information 4 The system validates information 5 The system accepts user registration
Extensions:	Branching Scenarios
4A	**Condition:** Information is invalid
	Step Actions 1 The system notifies user of invalid information 2 Return to step 2
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Figure 3: Description of Use Case "Register", which is related to requirements UF-F and SF-F-01

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-007
Use Case Name:	Train Watson
User Goal:	User be able to train watson with new questions that user asked but hasn't been answered
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-H
Relevant System Reqs:	SF-A-01
Primary Actor:	System Developer
Precondition:	User is logged in
Minimal Guarantee:	Watson is not further trained
Success Guarantee:	Watson is further trained
Trigger:	User requests to train Watson
Success Scenario:	Step Actions 1 The user request system export new questions 2 The system export new question list as a text file 3 The user request system export incorrect answered questions 4 The system export downvotes answered questions 5 The user request view answer quality 6 The system display the statistical analysis of the answer for each of the questions 7 The user request view the feedback of answer from user 8 The system display the most up voted help feedback for the answer 9 The user request the analysis of a specific question 10 The system display analysis of a question by keyterm
Extensions:	Branching Scenarios
1A	Condition: User request system export all new questions from last time export
	Step Actions 1 The system export question list that is new from last time
1B	Condition: User request system export all new questions by major
	Step Actions
1C	Condition: User request system export all new questions other condition
	Step Actions 1 The system export top 10 unanswered FAQ 2 The system export top 10% unanswered FAQ
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Figure 6: Description of Use Case "Train Watson", which is related to requirements UF-H and SF-A-01

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-006
Use Case Name:	View question log
User Goal:	User is able to view the question log
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-G
Relevant System Reqs:	SF-G-01
Primary Actor:	Adviser, System Developer
Precondition:	User is logged in
Minimal Guarantee:	System does not display question log
Success Guarantee:	System displays question log
Trigger:	User requests to view question log
Success Scenario:	Step Actions 1 The user requests to view question log 2 The system asks for filter information 3 The user enters filter information 4 The system displays all questions based on filter information
Extensions:	Branching Scenarios
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Figure 5: Description of Use Case "View Question Log", which is related to requirements UF-G and SF-G-01

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-010
Use Case Name:	Answer quality feedback
User Goal:	User is able to provide feedback on question response.
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-H
Relevant System Reqs:	SF-H-01
Primary Actor:	Visitor, Student, Advisor
Precondition:	User is asking a question
Minimal Guarantee:	Feedback is not stored
Success Guarantee:	Feedback is stored
Trigger:	User requests to submit feedback
Success Scenario:	Step Actions 1 The user requests to submit feedback 2 The system allows user to enter feedback 3 The user submits feedback 4 The system stores feedback
Extensions:	Branching Scenarios
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Figure 7: Description of Use Case "Answer Quality Feedback", which is related to requirements UF-H and SF-H-01

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-008
Use Case Name:	Voice to question
User Goal:	User receives text based on voice input
Scope:	IPA System
Level:	Subfunction
Relevant User Reqs:	UF-C
Relevant System Reqs:	SF-C-07
Primary Actor:	Visitor, Student, and Advisor
Precondition:	User is asking a question
Minimal Guarantee:	System does not convert voice to text
Success Guarantee:	System converts voice to text
Trigger:	User requests to convert voice to text
Success Scenario:	Step Actions 1 The user request voice to text function 2 The system start listening user's voice 3 The user stop recording voice 4 The system upload voice to server 5 The system return translated text to user
Extensions:	Branching Scenarios
3A	**Condition:** user recording more than 30 seconds
	Step Actions 1 The system prompts over time recording and start converting previous 30 seconds' voice
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Figure 8: Description of Use Case "Voice To Question", which is related to requirements UF-C and SF-C-07

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-011
Use Case Name:	Ask question
User Goal:	User is able to ask questions
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-C
Relevant System Reqs:	SF-C-01,SF-C-02,SF-C-03,SF-C-04,SF-C-05,SF-C-07
Primary Actor:	Visitor, Student, Advisor
Precondition:	User is viewing program
Minimal Guarantee:	Question is not logged
Success Guarantee:	Question is logged
Trigger:	The user requests to ask a question
Success Scenario:	Step Actions 1 The user requests to ask a question 2 The system requests user's question 3 The user enters question and requests answer 4 The system analyzes question <<Analyze Question>> 5 The system displays answer 6 The system logs question to question log 7 The system asks user if they would like to submit feedback on answer quality
Extensions:	Branching Scenarios
3A	Condition: If user requests to enter question by voice
	Step Actions 1 The system converts voice to question <<Voice to Question>>
3B	Condition: If user requests translation
	Step Actions 1 The system translates text <<Realtime Translation>>
7A	Condition: If user requests to provide feedback
	Step Actions 1 The system requests feedback information <<Answer Quality Feedback>>
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Figure 9: Description of Use Case "Ask Question", which is related to requirements UF-C, SF-C-01, SF-C-02, SF-C-03, SF-C-04, SF-C-05, and SF-C-07

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-009
Use Case Name:	Real-time translation
User Goal:	User is able to see input/output in english
Scope:	IPA System
Level:	Subfunction
Relevant User Reqs:	UF-C
Relevant System Reqs:	SF-C-02
Primary Actor:	Visitor, Student, Advisor
Precondition:	User is asking a question
Minimal Guarantee:	Input/output is not translated
Success Guarantee:	System displays translated text
Trigger:	User requests translation
Success Scenario:	Step Actions 1 The user input non-english input 2 The system determines what language is being used 3 The system translates text to english 4 The system displays english answer
Extensions:	Branching Scenarios
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Figure 10: Description of Use Case "Real-time Translation", which is related to requirements UF-C and SF-C-02

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-015
Use Case Name:	Generate Assessment
User Goal:	User receives assessment of profile information
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-E
Relevant System Reqs:	SF-E-04,SF-E-05
Primary Actor:	Student
Precondition:	User has submitted information to profile
Minimal Guarantee:	No assessment generated
Success Guarantee:	System generate assessment and display to user
Trigger:	User requests to generate assessment
Success Scenario:	Step Actions 1 The user requests to generate assessment 2 The system analyzes profile and generates assessment 3 The system displays assessment
Extensions:	Branching Scenarios
3A	Condition: keep assessment on user's record
	Step Actions 1 The user request system save the assessment 2 The system upload assessment to server and relate to user account
3B	Condition: The user request assessment to be viewable by advisers
	Step Actions 1 The user request assessment to be viewable by advisers 2 The system mark user's assessment as public and save to user's account
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Figure 11: Description of Use Case "Generate Assessment", which is related to requirements UF-E, SF-E-04, and SF-E-05

Use Case Name:	Submit Profile
User Goal:	User can create profile
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-E
Relevant System Reqs:	SF-E-01,SF-E-02,SF-E-03,SF-E-04,SF-E-05
Primary Actor:	student
Precondition:	User is logged in
Minimal Guarantee:	Profile is not stored
Success Guarantee:	Profile is stored
Trigger:	User requests to update profile
Success Scenario:	Step Actions 1 The user requests to update profile 2 The system verify the profile 3 The system upload the profile to server
Extensions:	Branching Scenarios
2A	Condition: If system detect invalid format of the profile
	Step Actions 1 The system notify user of problem 2 Return to step 1
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Figure 12: Description of Use Case "Submit Profile", which is related to requirements UF-E, SF-E-01, SF-E-02, SF-E-03, SF-E-04, and SF-E-04

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-012
Use Case Name:	Analyze Question
User Goal:	System determines answer for user
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-C,UF-D
Relevant System Reqs:	SF-C-01,SF-C-03,SF-C-04,SF-C-05,SF-D-01
Primary Actor:	N/A
Precondition:	User asks a question
Minimal Guarantee:	Question is not analyzed
Success Guarantee:	Question is analyzed
Trigger:	User submits a question
Success Scenario:	Step Actions 1 The user submits a question 2 The system performs textual analysis on the question 3 The system determines if another question could be asked to clarify answer 4 The system displays answer
Extensions:	Branching Scenarios
1A	Condition: If another question could be asked
	Step Actions 1 The system asks user the question 2 The user responds to question 3 Return to step 2 in main scenario using response given
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Figure 13: Description of Use Case "Analyze Question", which is related to requirements UF-C, UF-D, SF-C-01, SF-C-03, SF-C-04, SF-C-05, and SF-D-01

Use Case Name:	Login
User Goal:	User is able to log in
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-A
Relevant System Reqs:	SF-A-01
Primary Actor:	Student, Advisor, System Devel
Precondition:	User is registered
Minimal Guarantee:	User is not logged in
Success Guarantee:	User is logged in
Trigger:	User requests to log in
Success Scenario:	Step Actions 1 The user request to login to the system 2 The system verifies user's login credential 3 The system logs in user
Extensions:	Branching Scenarios
2A	Condition: login credential doesn't match account info
	Step Actions 1 The system notifies user of problem 2 Return to step 1
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Figure 14: Description of Use Case "Login", which is related to requirements UF-A and SF-A-01

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-019
Use Case Name:	Request Assessment
User Goal:	System notify student that an adviser wants to see his assessment
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-E
Relevant System Reqs:	SF-E-05
Primary Actor:	Advisor
Precondition:	User is logged in
Minimal Guarantee:	No request is sent
Success Guarantee:	Request is sent
Trigger:	User requests to send request to student
Success Scenario:	Step Actions 1 The user requests to send request to student 2 The system asks for student information 3 The user inputs student information 4 The system validates student information 5 The system sends request to student
Extensions:	Branching Scenarios
4A	Condition: If invalid student information
	Step Actions 1 The system notifies user of problem 2 Return to step 2
Acknowledgment: Generated from the CapStone process management system ©2015	

Figure 15: Description of Use Case "Request Assessment", which is related to requirements UF-E and SF-E-05

Project Name:	Intelligent Academic Planner
Use Case ID:	UC-018
Use Case Name:	Logout
User Goal:	User is able to log out
Scope:	IPA System
Level:	Primary task
Relevant User Reqs:	UF-B
Relevant System Reqs:	SF-B-01
Primary Actor:	Student, Advisor, System Devel
Precondition:	User is logged in
Minimal Guarantee:	User is not logged out
Success Guarantee:	User is logged out
Trigger:	User requests to log out
Success Scenario:	Step Actions 1 The user requests to logout 2 The system verifies all information is saved 3 The system logs users out
Extensions:	Branching Scenarios
2A	Condition: If some information is unsaved
	Step Actions 1 The system checks if user still wants to log out 2 The user responds 3 BRANCH - If user responds no exit functionality. Else - Continue on.
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Figure 16: Description of Use Case "Logout", which is related to requirements UF-B and SF-B-01

4.1.3.3. List of User Functional Requirements

Project Name:	Intelligent Academic Planner				
Requirement ID:	UF-B			Type	Functional	Non-Functional
Creation:	Sep 20 2016 04:17 PM			User	☒	☐
Modification:	Oct 05 2016 01:50 AM			System	☐	☐
Description:	A user can log out.				
Priority:	Highest	✓ High	Medium	Low	Lowest
This Req. is Refined Into:	SF-B-01				
Justify why UF-B can be completely covered by SF-B-01	If a user can log out within 5 seconds, they can log out properly				
Traceability:	Use cases cf.	UC-018			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 18: Description of user functional requirement UF-B, which is related to requirements SF-B-01 and use cases UC-018

Project Name:	Intelligent Academic Planner				
Requirement ID:	UF-A			Type	Functional	Non-Functional
Creation:	Sep 20 2016 01:25 PM			User	☒	☐
Modification:	Oct 05 2016 01:50 AM			System	☐	☐
Description:	A user can log in.				
Priority:	Highest	✓ High	Medium	Low	Lowest
This Req. is Refined Into:	SF-A-01				
Justify why UF-A can be completely covered by SF-A-01	If a user can login within 5 seconds, they can log in properly.				
Traceability:	Use cases cf.	UC-016			

Figure 17: Description of user functional requirement UF-A, which is related to requirements SF-A-01 and use cases UC-016

Project Name:	Intelligent Academic Planner				
Requirement ID:	UF-C			Type	Functional	Non-Functional
Creation:	Sep 20 2016 04:18 PM			User	☒	☐
Modification:	Sep 20 2016 04:58 PM			System	☐	☐
Description:	A user can ask the system questions.				
Priority:	✓ Highest	High	Medium	Low	Lowest
This Req. is Refined Into:	SF-C-01, SF-C-02, SF-C-03, SF-C-04, SF-C-05, SF-C-07				
Justify why UF-C can be completely covered by SF-C-01, SF-C-02, SF-C-03, SF-C-04, SF-C-05, SF-C-07	If the system is able to perform the functionality in SF-C-01 through SF-C-06 then a user will undoubtedly have been able to ask the system questions. The system would not be able to perform these functions without a user first asking it a question.				
Traceability:	Use cases cf.	UC-008, UC-009, UC-011, UC-012			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 19: Description of user functional requirement UF-C which is related to requirements SF-C-01, SF-C-02, SF-C-03, SF-C-04, SF-C-04, SF-C-05, and SF-C-07 and use cases UC-008, UC-009, UC-011, and UC-012

Requirement ID:	UF-E			Type	Functional	Non-Functional
Creation:	Oct 04 2016 11:51 PM			User	☒	☐
Modification:	Oct 05 2016 12:06 AM			System	☐	☐
Description:	A user can create a profile				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Refined Into:	SF-E-01, SF-E-02, SF-E-03, SF-E-04, SF-E-05				
Justify why UF-E can be completely covered by SF-E-01, SF-E-02, SF-E-03, SF-E-04, SF-E-05	All of the system requirements associated with this cover what can be put into their profile.				
Traceability:	Use cases cf.	UC-001, UC-005, UC-013, UC-015, UC-019			
	Test cases cf.	Yet to be completed in test case worksheet!			
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Figure 20: Description of user functional requirement UF-E which is related to requirements SF-E-01, SF-E-02, SF-E-03, SF-E-04, and SF-E-05 and use cases UC-001, UC-005, UC-013, UC-015, and UC-019

Project Name:	Intelligent Academic Planner				
Requirement ID:	UF-F			Type	Functional	Non-Functional
Creation:	Oct 05 2016 12:15 AM			User	☒	☐
Modification:	Oct 05 2016 01:51 AM			System	☐	☐
Description:	A user can register				
Priority:	Highest	✓ High	Medium	Low	Lowest
This Req. is Refined Into:	SF-F-01				
Justify why UF-F can be completely covered by SF-F-01	If a user can register within 5 seconds, they can register properly.				
Traceability:	Use cases cf.	UC-004			

Figure 21: Description of user functional requirement UF-F which is related to requirements SF-F-01 and use cases UC-004

Project Name:	Intelligent Academic Planner				
Requirement ID:	UF-D			Type	Functional	Non-Functional
Creation:	Sep 23 2016 12:52 PM			User	☒	☐
Modification:	Oct 05 2016 01:51 AM			System	☐	☐
Description:	A user should receive multiple responses to a question.				
Priority:	Highest	High	Medium	✓ Low	Lowest
This Req. is Refined Into:	SF-D-01				
Justify why UF-D can be completely covered by SF-D-01	By requiring a minimum of 1 response to be given, it is a given that multiple responses are given to a question.				
Traceability:	Use cases cf.	UC-012			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 22: Description of user functional requirement UF-D which is related to requirements SF-D-01 and use cases UC-012

Project Name:	Intelligent Academic Planner				
Requirement ID:	UF-G			Type	Functional	Non-Functional
Creation:	Oct 05 2016 12:36 AM			User	☒	☐
Modification:	Oct 05 2016 01:52 AM			System	☐	☐
Description:	A user can view a log of asked questions.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Refined Into:	SF-G-01				
Justify why UF-G can be completely covered by SF-G-01	If advisors and system developers can view the question log, then users can view the question log.				
Traceability:	Use cases cf.	UC-006			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 24: Description of user functional requirement UF-G, which is related to requirements SF-G-01 and use cases UC-006

Project Name:	Intelligent Academic Planner				
Requirement ID:	UF-H			Type	Functional	Non-Functional
Creation:	Oct 05 2016 02:12 AM			User	☒	☐
Modification:	Oct 05 2016 02:16 AM			System	☐	☐
Description:	A user can provide information to improve accuracy of the system.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Refined Into:	SF-H-01				
Justify why UF-H can be completely covered by SF-H-01	If answer quality feedback is submitted, accuracy of responses can be increased.				
Traceability:	Use cases cf.	UC-007, UC-010			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 23: Description of user functional requirement UF-H, which is related to requirements SF-H-01 and use cases UC-007 and UC-010

4.1.4. Non-functional Requirements

4.1.4.1. Product: Performance Requirements

Project Name:	Intelligent Academic Planner				
Requirement ID:	UP-03			Type / Functional / Non-Functional	
Creation:	Oct 05 2016 01:36 AM			User ☐ / ☒	
Modification:	Oct 05 2016 01:54 AM			System ☐ / ☐	
Description:	A user should receive a quick response after asking a question			Product (sub-type below)	
				Performance Requirements	
Priority:	Highest	High	Medium	✓ Low	Lowest
This Req. is Refined Into:	SP-03-01				
Justify why UP-03 can be completely covered by SP-03-01	By specifying performance requirements, it is ensured that the question will be answered in a quick manner.				
Traceability:	Use cases cf.	N/A			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 25: Description of user non-functional performance requirement UP-03 which is related to requirement SP-03-01

4.1.4.2. Product: Dependability/Reliability/Security

Project Name:	Intelligent Academic Planner				
Requirement ID:	UP-01			Type / Functional / Non-Functional	
Creation:	Oct 05 2016 12:10 AM			User ☐ / ☒	
Modification:	Oct 05 2016 01:53 AM			System ☐ / ☐	
Description:	A user's profile should be secure.			Product (sub-type below)	
				Dependability/Reliability/Security	
Priority:	Highest	✓ High	Medium	Low	Lowest
This Req. is Refined Into:	SP-01-01				
Justify why UP-01 can be completely covered by SP-01-01	Ensures only specific people can view a user's profile, making it secure.				
Traceability:	Use cases cf.	N/A			
	Test cases cf.	Yet to be completed in test case worksheet!			

Figure 26: Description of user non-functional security requirement UP-01, which is related to requirement SP-01-01

4.1.4.3. Organizational: Development Requirements

Project Name:	Intelligent Academic Planner				
Requirement ID:	UO-01			Type / Functional / Non-Functional	
Creation:	Sep 23 2016 12:42 PM			User ☐ / ☒	
Modification:	Oct 05 2016 01:53 AM			System ☐ / ☐	
Description:	A user's session should be managed.			Organizational (sub-type below)	
				Development Requirements	
Priority:	Highest	✓ High	Medium	Low	Lowest
This Req. is Refined Into:	SO-01-01				
Justify why UO-01 can be completely covered by SO-01-01	Ensures that a user can only be logged in for 1 hour, managing their session.				
Traceability:	Use cases cf.	N/A			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 27: Description of user non-functional developmental requirement UO-01, which is related to requirement SO-01-01

4.2. System Requirements

4.2.1. Functional Requirements

4.2.1.1. List of System Functional Requirements

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-A-01			Type / Functional / Non-Functional	
Creation:	Sep 23 2016 12:22 PM			User ☐ / ☐	
Modification:	Oct 05 2016 01:41 AM			System ☒ / ☐	
Description:	The system should log-in a user within 5 seconds.				
Priority:	Highest	High	Medium	✓ Low	Lowest
This Req. is Engineered From:	UF-A				
Justify why meeting SF-A-01 can contribute to the fulfilment of UF-A	Provides performance requirement for logging in.				
Traceability:	Use cases cf.	UC-007, UC-016			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 28: Description of system functional requirement SF-A-01 which is related to requirements UF-A and use cases UC-007 and UC-016

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-B-01			Type	Functional	Non-Functional
Creation:	Sep 23 2016 12:32 PM			User	☐	☐
Modification:	Oct 05 2016 01:41 AM			System	☒	☐
Description:	The system should log-out a user within 5 seconds.				
Priority:	Highest	High	Medium	✓ Low	Lowest
This Req. is Engineered From:	UF-B				
Justify why meeting SF-B-01 can contribute to the fulfilment of UF-B	Explains performance requirement.				
Traceability:	Use cases cf.	UC-018			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 29: Description of system functional requirement SF-B-01, which is related to requirements UF-B and use cases UC-018

Requirement ID:	SF-C-01			Type	Functional	Non-Functional
Creation:	Sep 20 2016 04:22 PM			User	☐	☐
Modification:	Oct 05 2016 01:42 AM			System	☒	☐
Description:	The system should conduct textual analyses.				
Priority:	Highest	✓ High	Medium	Low	Lowest
This Req. is Engineered From:	UF-C				
Justify why meeting SF-C-01 can contribute to the fulfilment of UF-C	In order to provide an answer to questions asked, system must be able to perform this function.				
Traceability:	Use cases cf.	UC-011, UC-012			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 30: Description of system functional requirement SF-C-01, which is related to requirements UF-C and use cases UC-011 and UC-012

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-C-03			Type: Functional / Non-Functional	
Creation:	Sep 20 2016 04:31 PM			User: ☐ / ☐	
Modification:	Oct 05 2016 01:44 AM			System: ☒ / ☐	
Description:	The system should recommend majors suitable for the user based on the personality assessment.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-C				
Justify why meeting SF-C-03 can contribute to the fulfilment of UF-C	This allows questions to be answered more accurately.				
Traceability:	Use cases cf.	UC-011, UC-012			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 32: Description of system functional requirement SF-C-03, which is related to requirements UF-C and use cases UC-011 and UC-012

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-C-02			Type: Functional / Non-Functional	
Creation:	Oct 05 2016 01:59 AM			User: ☐ / ☐	
Modification:	Oct 05 2016 02:00 AM			System: ☒ / ☐	
Description:	The system should be able to handle input from multiple well-known languages.				
Priority:	Highest	High	Medium	Low	✓ Lowest
This Req. is Engineered From:	UF-C				
Justify why meeting SF-C-02 can contribute to the fulfilment of UF-C	Allows users to ask a question in a variety of ways.				
Traceability:	Use cases cf.	UC-009, UC-011			

Figure 31: Description of system functional requirement SF-C-02, which is related to requirements UF-C and use cases UC-009 and UC-011

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-C-04			Type	Functional	Non-Functional
Creation:	Sep 20 2016 04:34 PM			User	☐	☐
Modification:	Oct 05 2016 01:44 AM			System	☒	☐
Description:	The system should gather data unique to each user.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-C				
Justify why meeting SF-C-04 can contribute to the fulfilment of UF-C	This allows questions to be answered more accurately.				
Traceability:	Use cases cf.	UC-011, UC-012			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 34: Description of system functional requirement SF-C-04 which is related to requirements UF-C and use cases UC-011 and UC-012

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-C-05			Type	Functional	Non-Functional
Creation:	Sep 20 2016 04:35 PM			User	☐	☐
Modification:	Oct 05 2016 01:44 AM			System	☒	☐
Description:	The system should recommend courses based on the recommended majors.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-C				
Justify why meeting SF-C-05 can contribute to the fulfilment of UF-C	This allows questions to be answered more accurately.				
Traceability:	Use cases cf.	UC-011, UC-012			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 33: Description of system functional requirement SF-C-05, which is related to requirements UF-C and use cases UC-011 and UC-012

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-D-01			Type	Functional	Non-Functional
Creation:	Sep 23 2016 12:54 PM			User	☐	☐
Modification:	Oct 05 2016 01:46 AM			System	☒	☐
Description:	The system should show a minimum of 1 related search/question.				
Priority:	Highest	High	Medium	✓ Low	Lowest
This Req. is Engineered From:	UF-D				
Justify why meeting SF-D-01 can contribute to the fulfilment of UF-D	This allows responses to be structured and more accurate.				
Traceability:	Use cases cf.	UC-012			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 36: Description of system functional requirement SF-D-01, which is related to requirements UF-D and use cases UC-012

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-C-07			Type	Functional	Non-Functional
Creation:	Oct 05 2016 01:20 AM			User	☐	☐
Modification:	Oct 05 2016 01:39 AM			System	☒	☐
Description:	The system should be able to handle both text and voice input.				
Priority:	Highest	High	Medium	✓ Low	Lowest
This Req. is Engineered From:	UF-C				
Justify why meeting SF-C-07 can contribute to the fulfilment of UF-C	Allows user to ask questions in multiple ways				
Traceability:	Use cases cf.	UC-008, UC-011			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 35: Description of system functional requirement SF-C-07 which is related to requirements UF-C and use cases UC-008 and UC-011

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-E-01			Type	Functional	Non-Functional
Creation:	Oct 04 2016 11:56 PM			User	☐	☐
Modification:	Oct 05 2016 01:46 AM			System	☒	☐
Description:	The system should allow between 100 and 600 words to describe a user's academic and professional interests.				
Priority:	✓ Highest	High	Medium	Low	Lowest
This Req. is Engineered From:	UF-E				
Justify why meeting SF-E-01 can contribute to the fulfilment of UF-E	Allows user to enter information about themselves to their profile				
Traceability:	Use cases cf.	UC-013			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 38: Description of system functional requirement SF-E-01, which is related to requirements UF-E and use cases UC-013

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-E-02			Type	Functional	Non-Functional
Creation:	Oct 04 2016 11:56 PM			User	☐	☐
Modification:	Oct 05 2016 01:47 AM			System	☒	☐
Description:	The system should allow a user to submit 100 words of self-description about their personality.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-E				
Justify why meeting SF-E-02 can contribute to the fulfilment of UF-E	Allows user to enter personality information on their profile				
Traceability:	Use cases cf.	UC-013			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 37: Description of system functional requirements SF-E-02, which is related to requirements UF-E and use cases UC-013

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-E-04			Type	Functional	Non-Functional
Creation:	Oct 05 2016 01:43 AM			User	☐	☐
Modification:	Oct 05 2016 01:48 AM			System	☒	☐
Description:	The system should create a personality assessment unique to each user based on the data gathered.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-E				
Justify why meeting SF-E-04 can contribute to the fulfilment of UF-E	Allows user to view information about themselves on their profile that they did not input.				
Traceability:	Use cases cf.	UC-013, UC-015			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 40: Description of system functional requirement SF-E-04, which is related to requirements UF-E and use cases UC-013 and UC-015

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-E-03			Type	Functional	Non-Functional
Creation:	Oct 05 2016 12:00 AM			User	☐	☐
Modification:	Oct 05 2016 01:47 AM			System	☒	☐
Description:	The system should allow a user to view their personality assessments.				
Priority:	Highest	✓ High	Medium	Low	Lowest
This Req. is Engineered From:	UF-E				
Justify why meeting SF-E-03 can contribute to the fulfilment of UF-E	Allows a user to learn about themselves based on profile information.				
Traceability:	Use cases cf.	UC-005, UC-013			

Figure 39: Description of system functional requirement SF-E-03, which is related to requirements UF-E and use cases UC-005 and UC-013

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-E-05			Type	Functional	Non-Functional
Creation:	Oct 05 2016 01:45 AM			User	☐	☐
Modification:	Oct 05 2016 01:45 AM			System	☒	☐
Description:	The system should summarize this data to be used by an advisor directing the student.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-E				
Justify why meeting SF-E-05 can contribute to the fulfilment of UF-E	Allows user to get assistance from advisors based on their profile.				
Traceability:	Use cases cf.	UC-001, UC-013, UC-015, UC-019			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 42: Description of system functional requirement SF-E-05, which is related to requirements UF-E and use cases UC-001, UC-013, UC-015, and UC-019

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-F-01			Type	Functional	Non-Functional
Creation:	Oct 05 2016 12:16 AM			User	☐	☐
Modification:	Oct 05 2016 01:49 AM			System	☒	☐
Description:	The system should register the user within 5 seconds.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-F				
Justify why meeting SF-F-01 can contribute to the fulfilment of UF-F	Places a performance requirement on registration.				
Traceability:	Use cases cf.	UC-004			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 41: Description of system functional requirement SF-F-01, which is related to requirements UF-F and use cases UC-004

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-H-01			Type	Functional	Non-Functional
Creation:	Oct 05 2016 02:15 AM			User	☐	☐
Modification:	Oct 05 2016 02:15 AM			System	☒	☐
Description:	A user can provide answer quality feedback after asking a question.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-H				
Justify why meeting SF-H-01 can contribute to the fulfilment of UF-H	Allows feedback to be submitted.				
Traceability:	Use cases cf.	UC-010			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 44: Description of system functional requirement SF-H-01, which is related to requirements UF-H and use cases UC-010

Project Name:	Intelligent Academic Planner				
Requirement ID:	SF-G-01			Type	Functional	Non-Functional
Creation:	Oct 05 2016 12:37 AM			User	☐	☐
Modification:	Oct 05 2016 12:37 AM			System	☒	☐
Description:	The system should only allow Advisors and System Developers to view the question log.				
Priority:	Highest	High	✓ Medium	Low	Lowest
This Req. is Engineered From:	UF-G				
Justify why meeting SF-G-01 can contribute to the fulfilment of UF-G	Adds security to the question log.				
Traceability:	Use cases cf.	UC-006			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 43: Description of system functional requirement SF-G-01, which is related to requirement UF-G and use cases UC-006

4.2.1.2. System Behavior

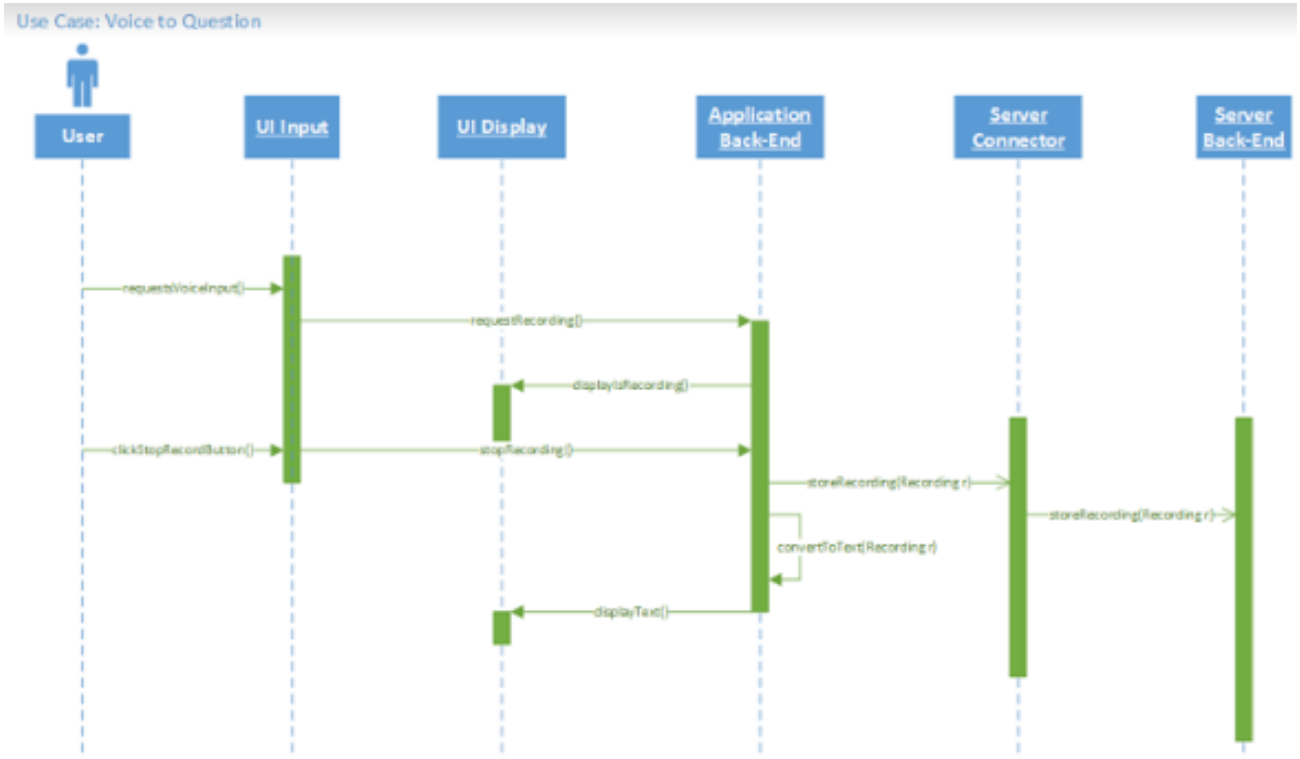

Figure 46: Sequence diagram for "View Question Log", related to UC-006

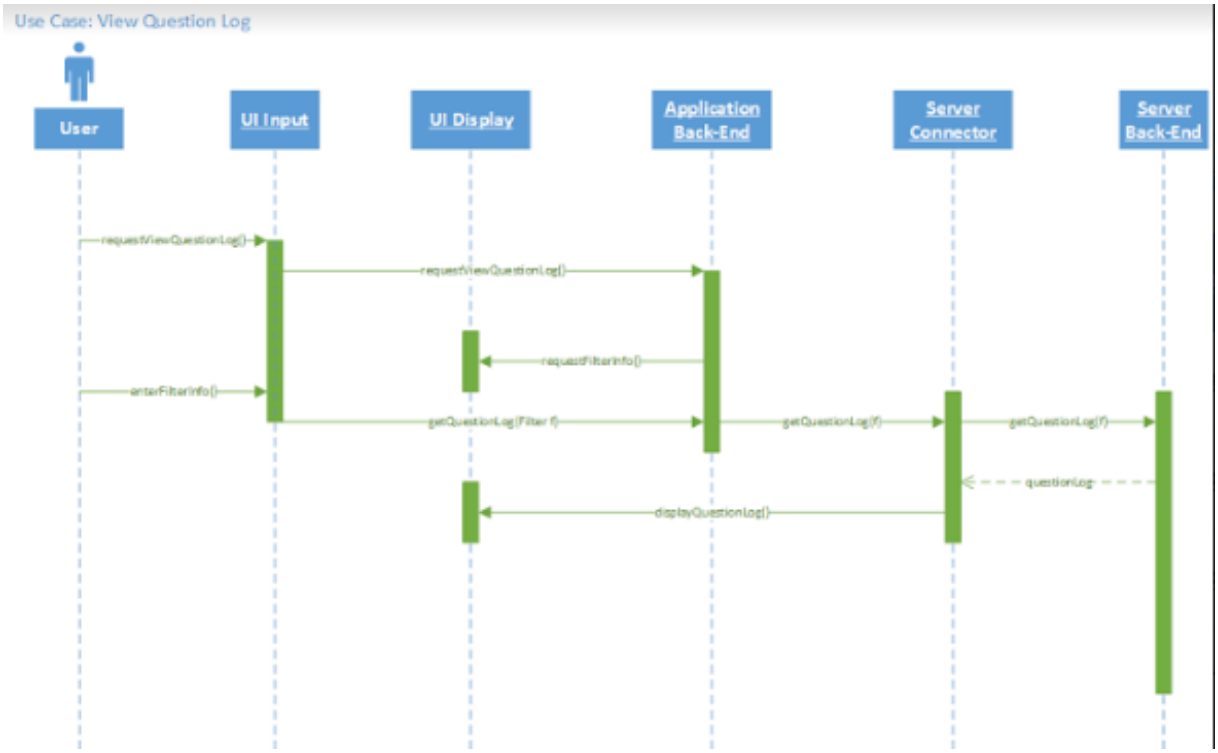

Figure 45: Sequence diagram for "Voice to Question", related to UC-008

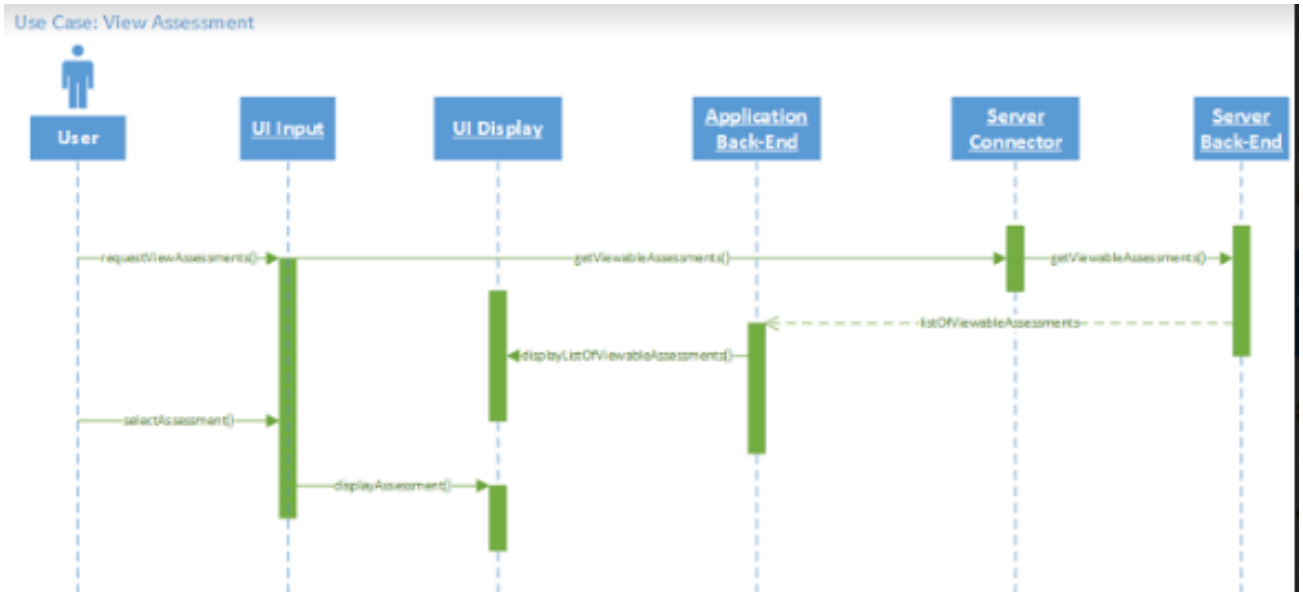

Figure 47: Sequence diagram for "View Assessment", related to UC-005

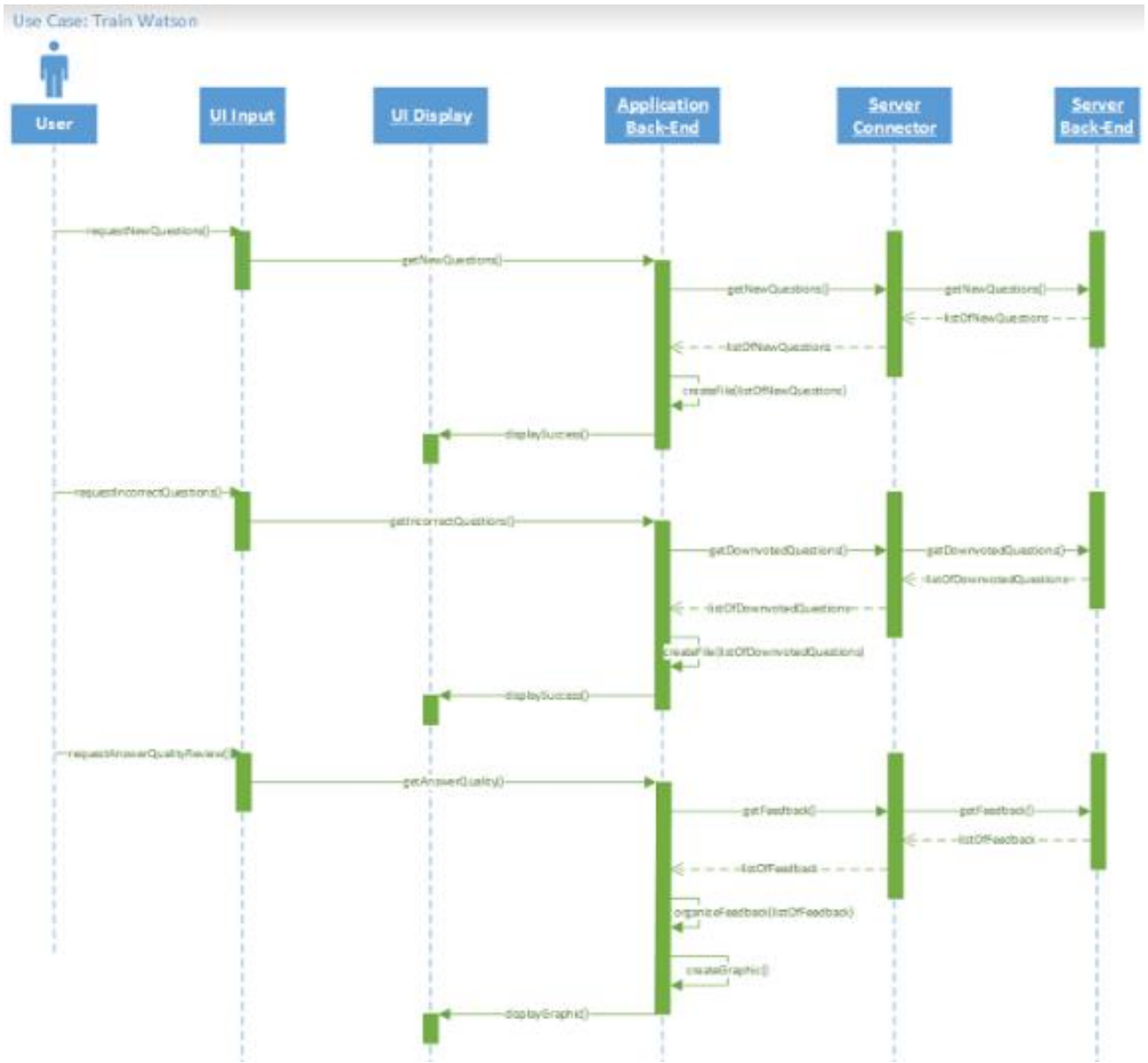

Figure 48: Sequence diagram for "Train Watson", related to UC-007

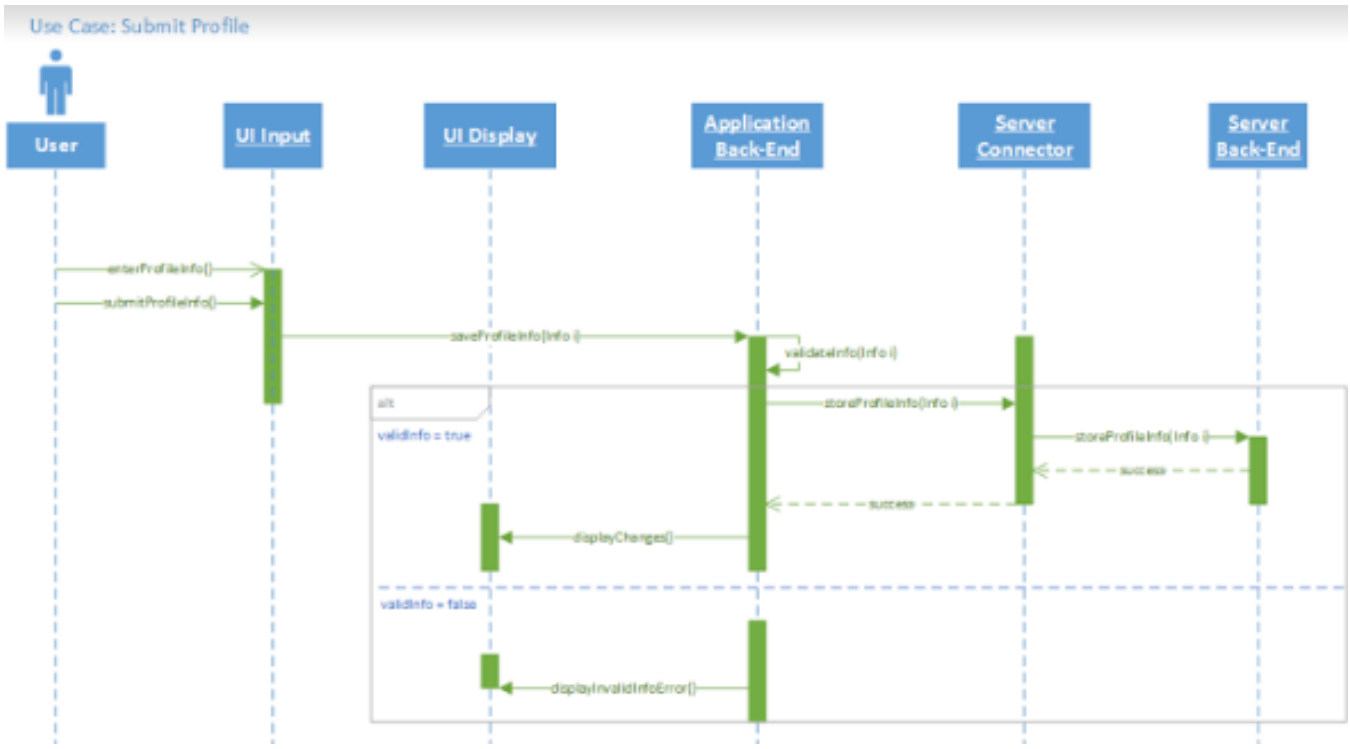

Figure 50: Sequence diagram for "Submit Profile", related to UC-013

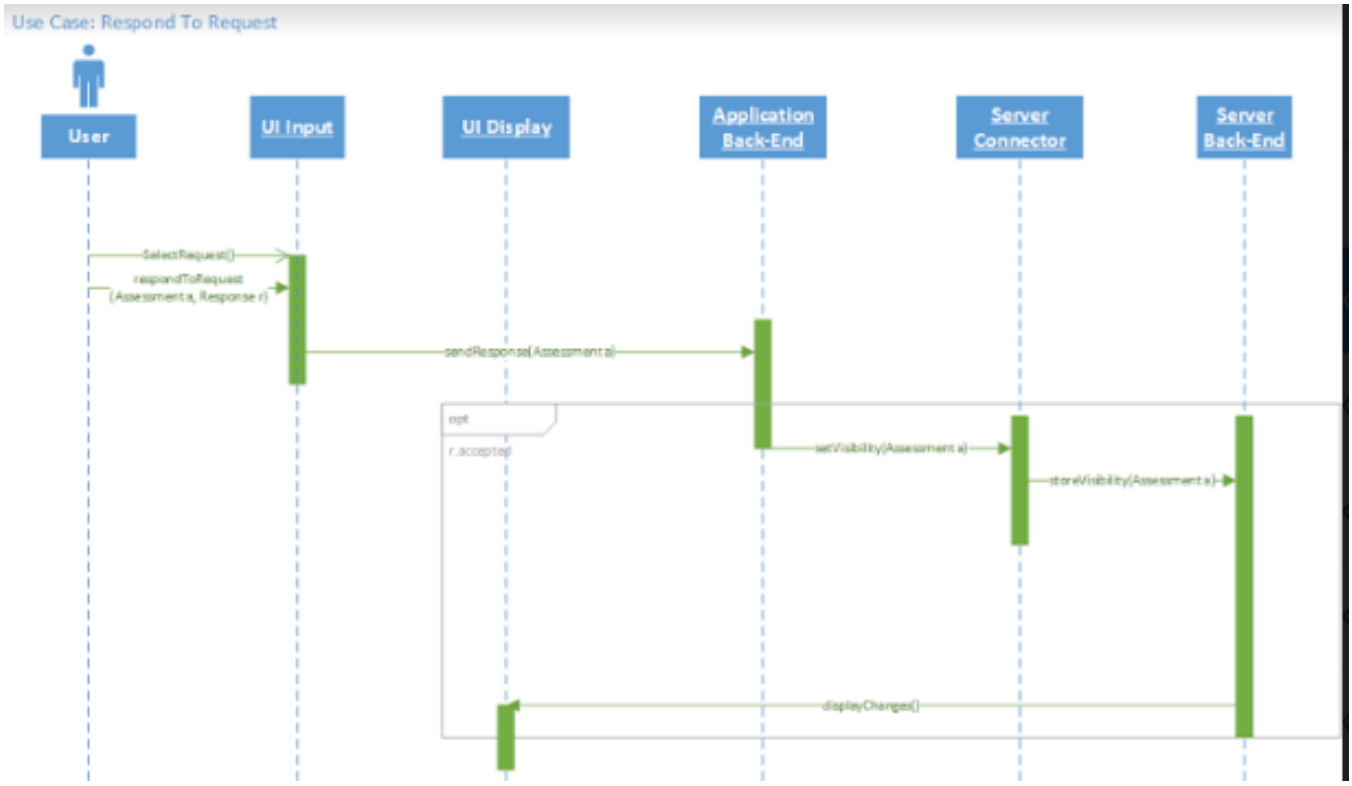

Figure 49: Sequence diagram for "Respond to Request", related to UC-001

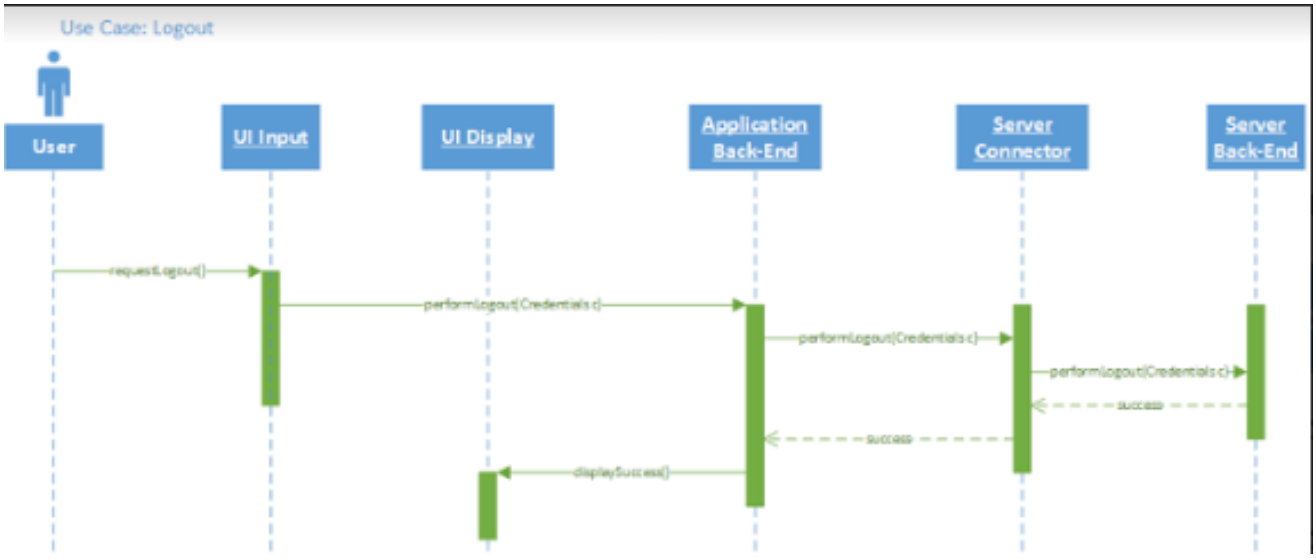

Figure 51: Sequence diagram for "Logout", related to UC-018

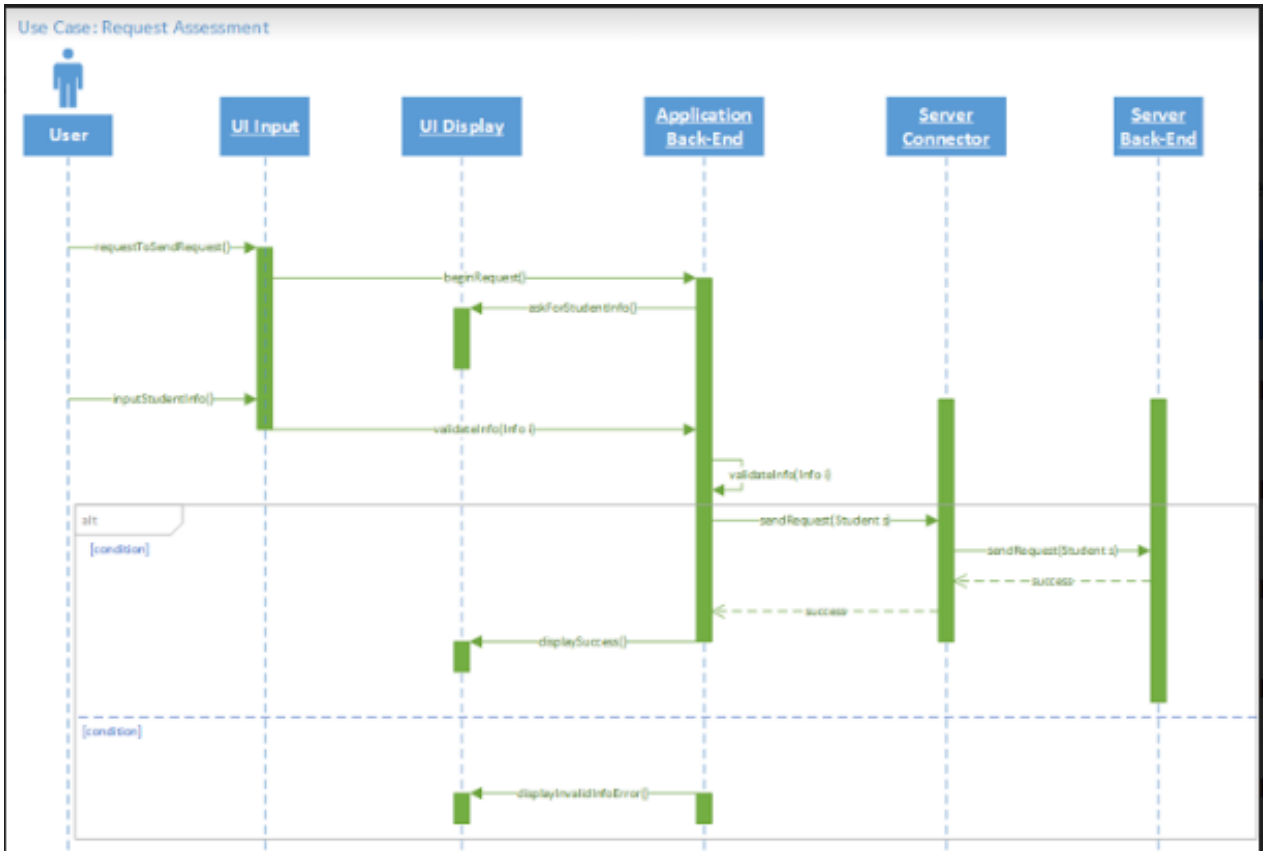

Figure 52: Sequence Diagram for "Request Assessment", related to UC-019

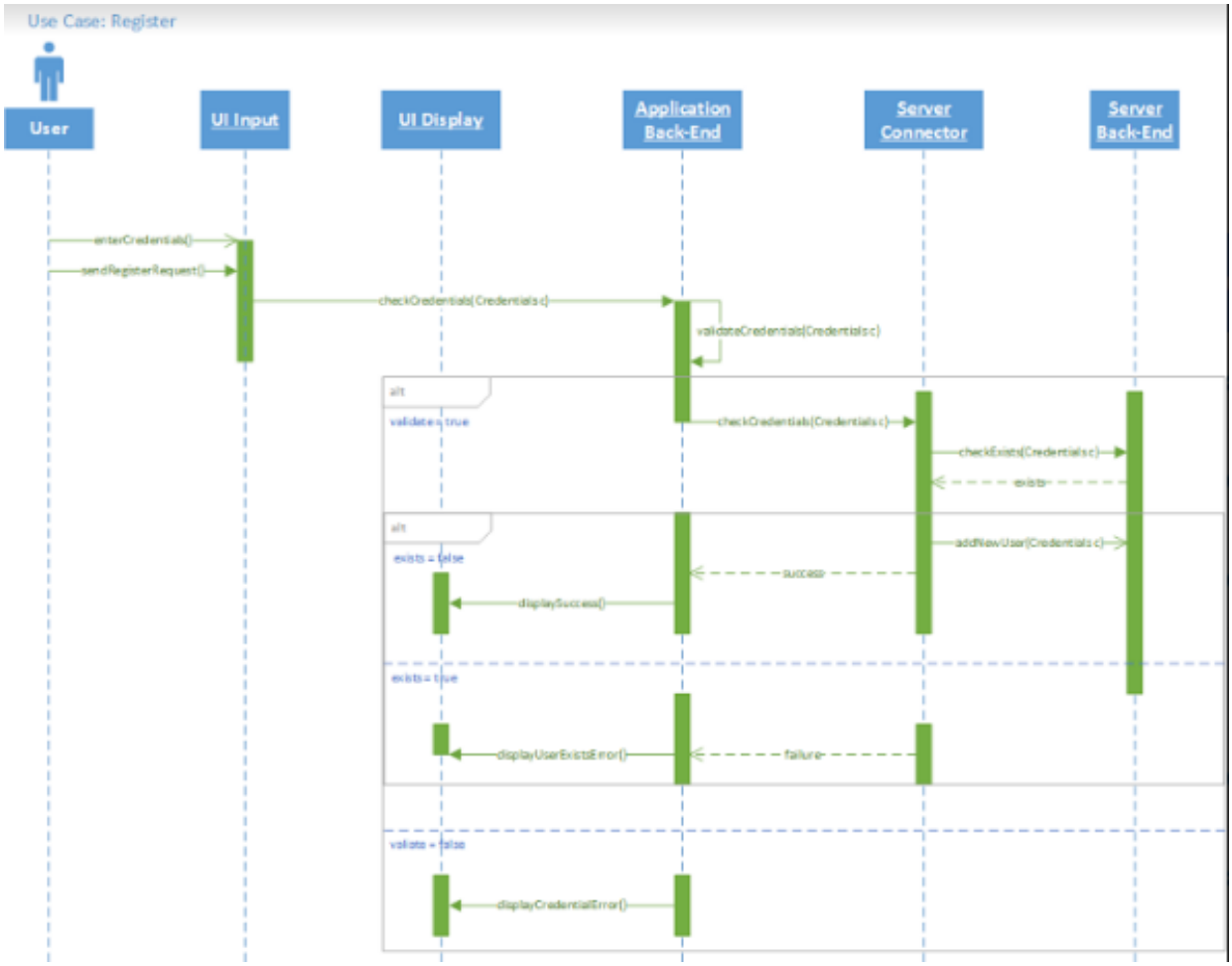

Figure 53: Sequence diagram for "Register", related to UC-004

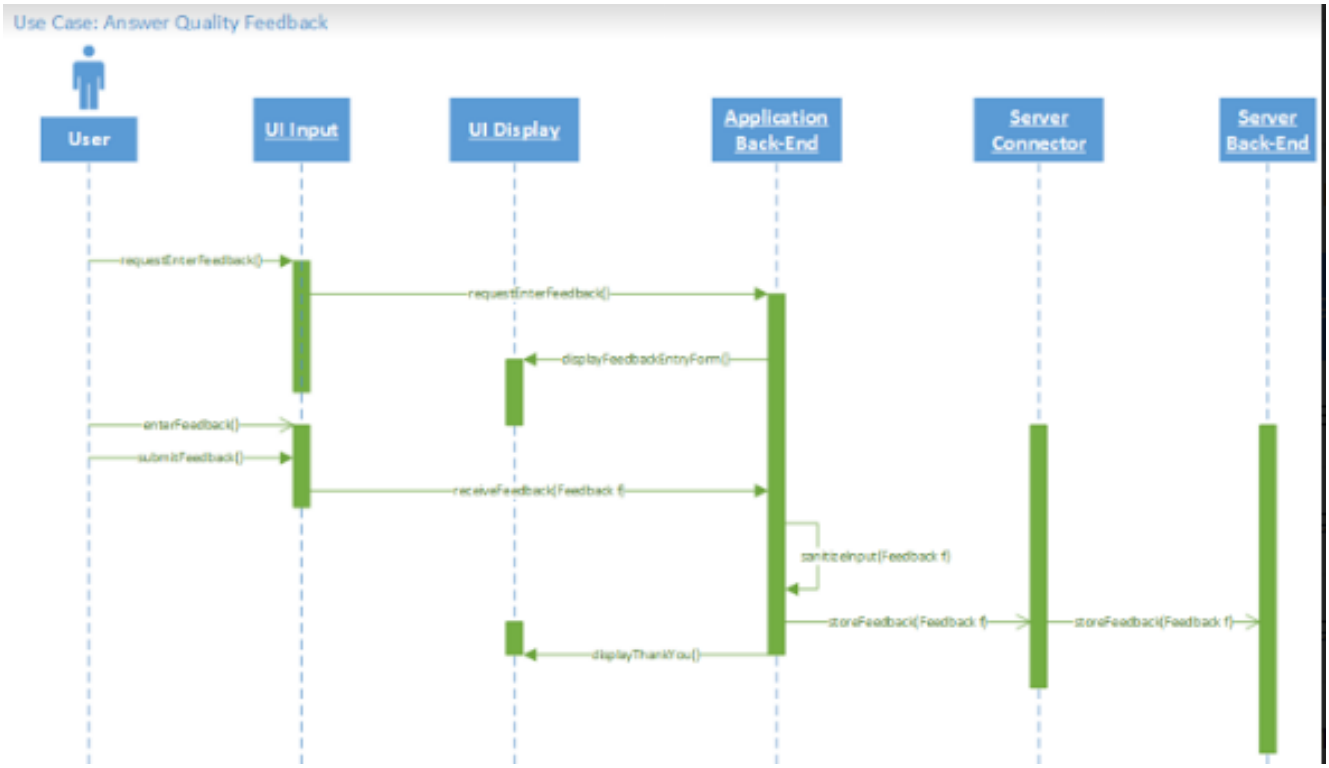

Figure 54: Sequence diagram for "Answer Quality Feedback", related to UC-010

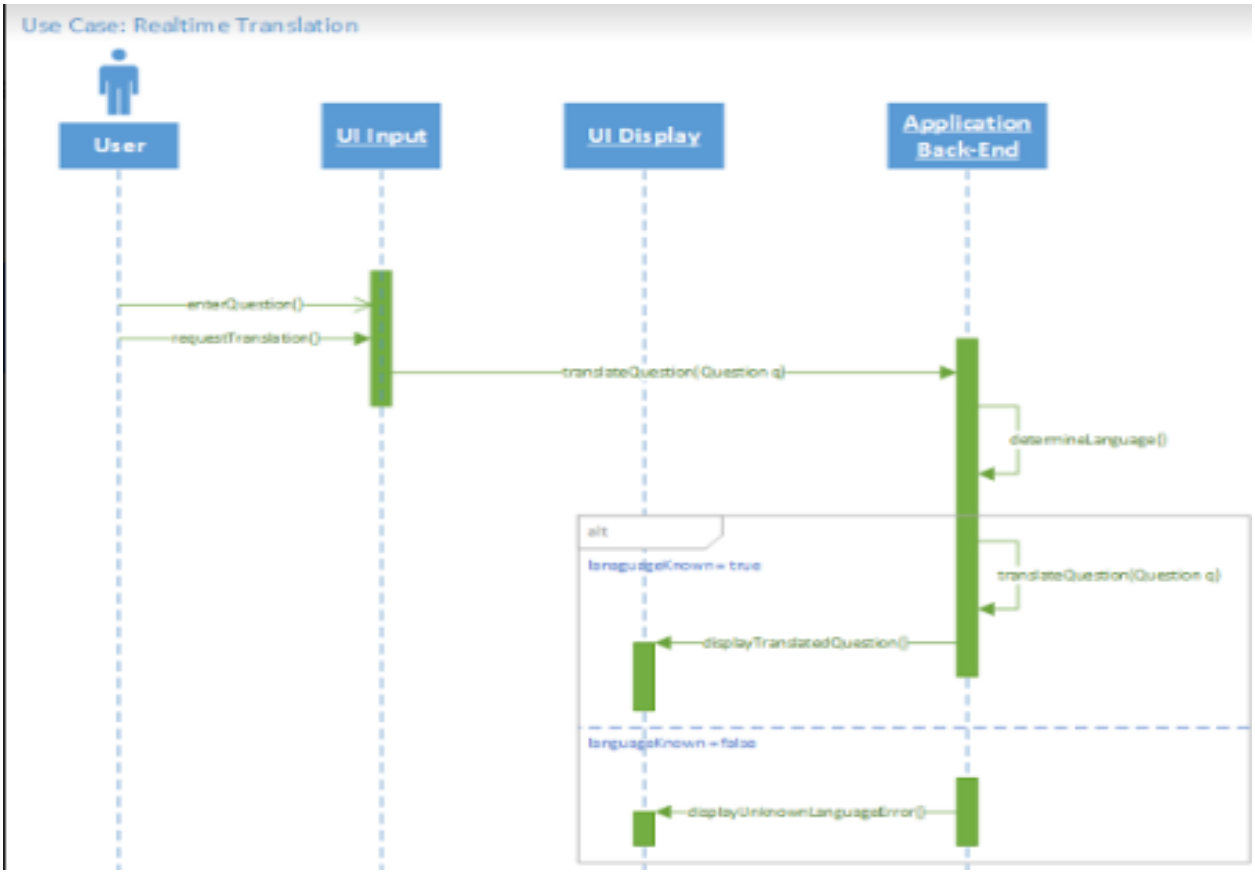

Figure 55: Sequence diagram for "Real-time Translation", related to UC-009

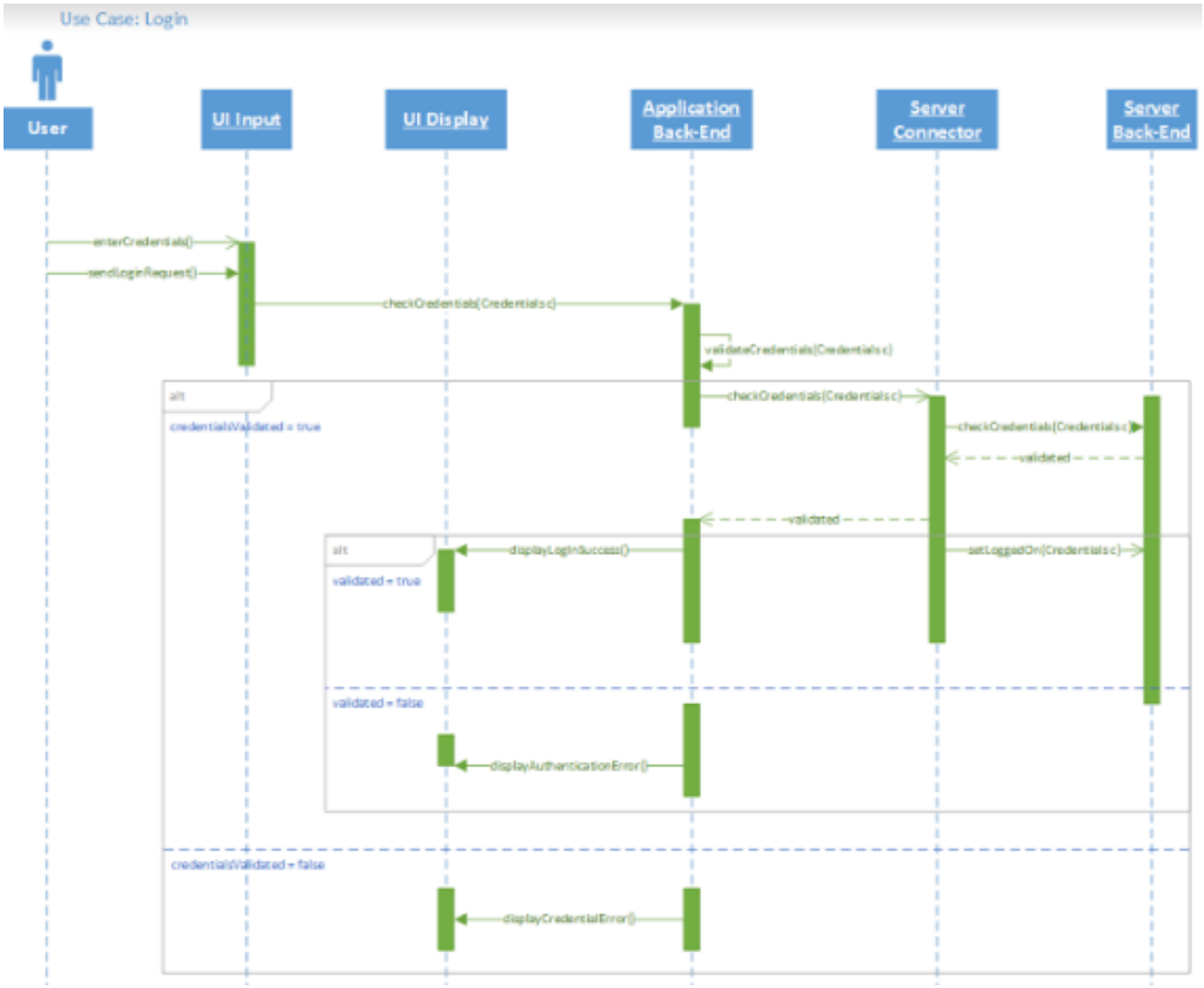

Figure 56: Sequence diagram for "Login", related to UC-016

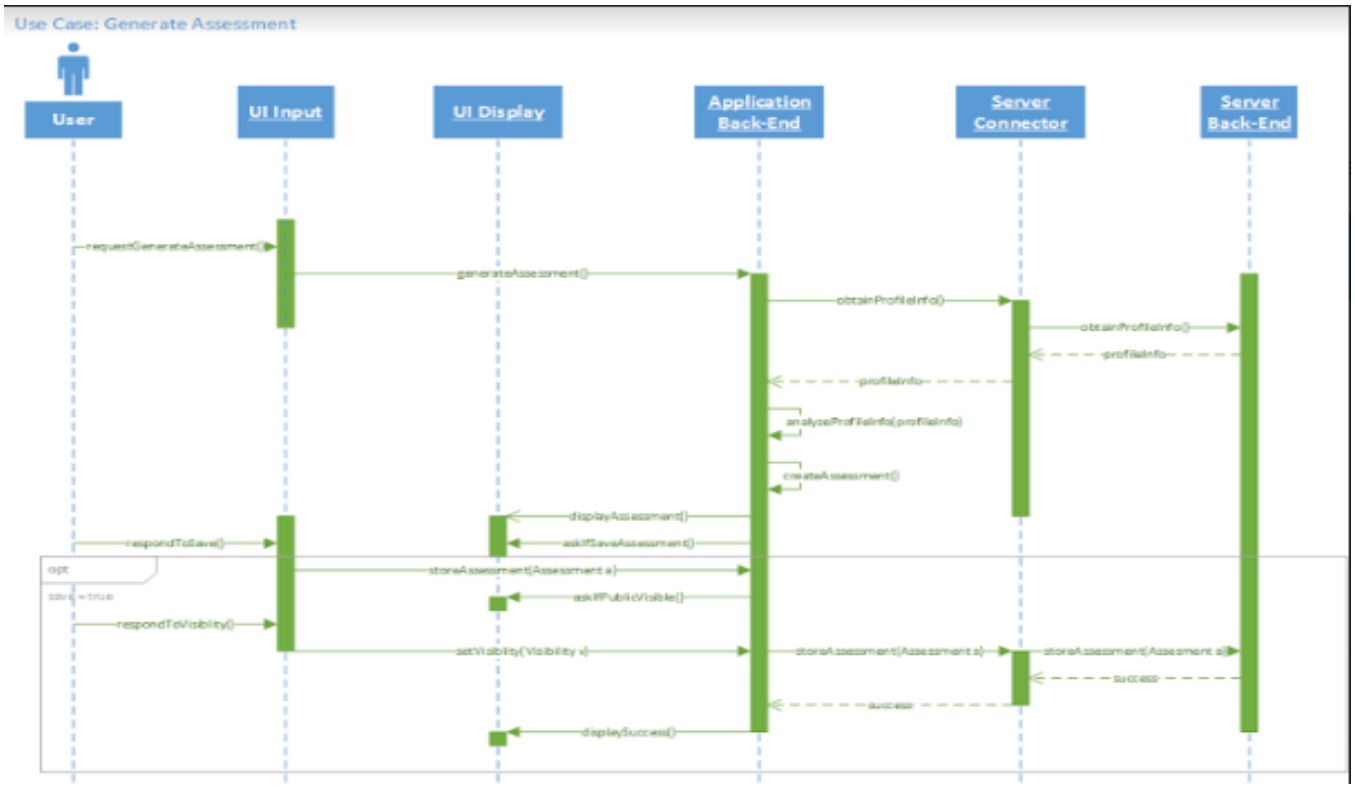

Figure 58: Sequence diagram for "Generate Assessment", related to UC-015

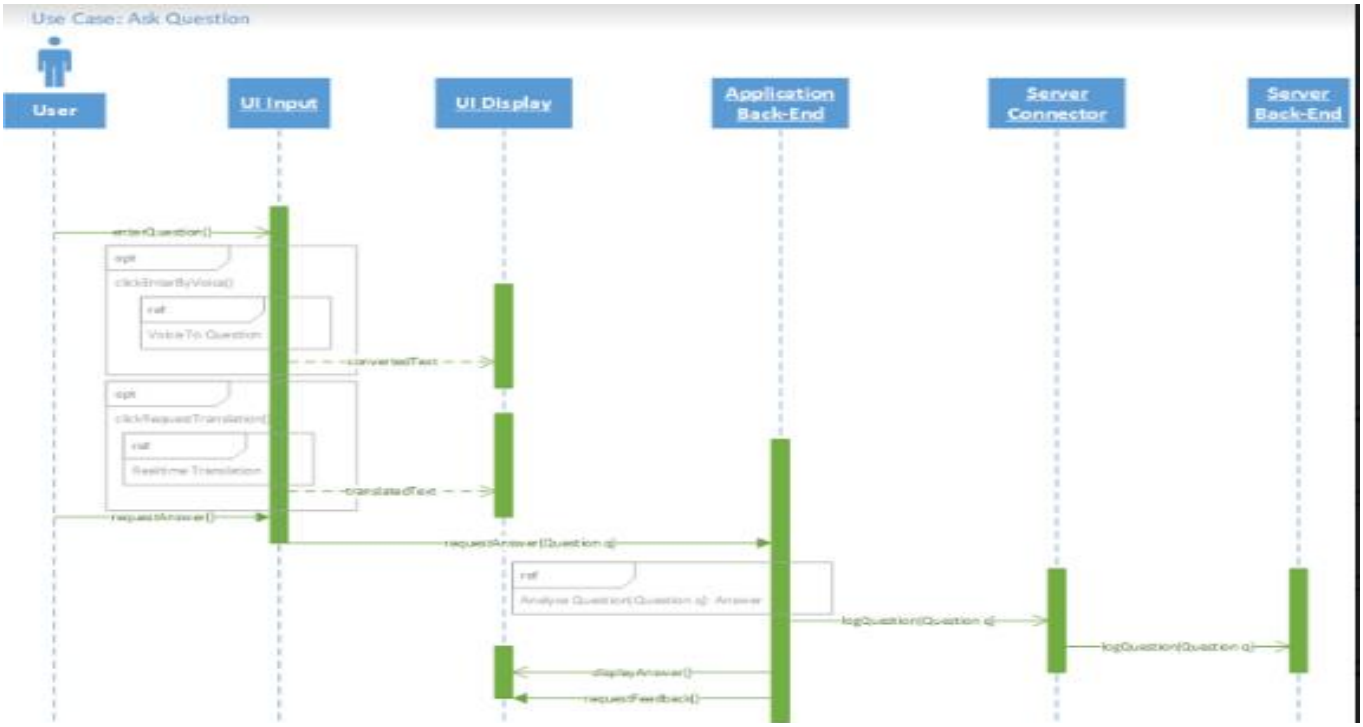

Figure 57: Sequence diagram for "Ask Question", related to UC-011

Figure 59: Sequence diagram for "Analyze Question", related to UC-012

4.2.1.3. Data Requirements

UC001 - Input: User whose assessment is being requested.

UC004 - Input: User email address and real name for registration and login.

UC004 - Input: User password for registration and login.

UC006 - Input: Filter information for useful question log (eg. major, minor, courses).

UC007 - Output: List of newly generated questions exported to a text file.

UC007 - Output: List of unanswered frequently asked questions.

UC008 - Input: Questions submitted in the form of voice recordings.
UC008 - Output: The voice recording is converted to text and displayed to the user.
UC009 - Input: Untranslated text.
UC009 - Output: Translated text.
UC010 - Input: User feedback pertaining to the relevance of the responses to their questions.
UC011 - Input: User questions.
UC011 - Output: Responses to user questions.
UC013 - Input: User profile.
UC015 - Output: User assessment based on their profile and search history.
UC019 - Input: The advisor who is requesting the student's assessment.

4.2.2. Non-functional Requirements

4.2.2.1. Product: Performance Requirements

Project Name:	**Intelligent Academic Planner**				
Requirement ID:	SP-03-01			**Type** / **Functional** / **Non-Functional**	
Creation:	Oct 05 2016 01:36 AM			**User** ☐	☐
Modification:	Oct 05 2016 01:49 AM			**System** ☐	☒
Description:	The system's voice-to-text service should process within 5 seconds of voice submission.			Product (sub-type below)	
				Performance Requirements	
Priority:	Highest	High	Medium	✓ Low	Lowest
This Req. is Engineered From:	UP-03				
Justify why meeting SP-03-01 can contribute to the fulfilment of UP-03	Ensures an answer is given quickly by adding a performance requirement.				
Traceability:	**Use cases cf.**	N/A			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	***Generated from the CapStone Process Management System ©2015***				

Figure 60: Description of system non-functional performance requirement SP-03-01, related to requirement UP-03

4.2.2.2. Product: Dependability/Reliability/Security

Project Name:	Intelligent Academic Planner				
Requirement ID:	SP-01-01			Type / Functional / Non-Functional	
Creation:	Oct 05 2016 12:12 AM			User ☐ / ☐	
Modification:	Oct 05 2016 12:14 AM			System ☐ / ☒	
Description:	The system should only display information that the user knows is being displayed.			Product (sub-type below)	
				Dependability/Reliability/Security	
Priority:	Highest	✓ High	Medium	Low	Lowest
This Req. is Engineered From:	UP-01				
Justify why meeting SP-01-01 can contribute to the fulfilment of UP-01	Makes the user's profile more secure by allowing the user to specify which information is visible.				
Traceability:	Use cases cf.	N/A			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	*Generated from the CapStone Process Management System ©2015*				

Figure 61: Description of system non-functional security requirement SP-01-01, which is related to requirement UP-01

4.2.2.3. Organizational: Development Requirements

Project Name:	Intelligent Academic Planner				
Requirement ID:	SO-01-01			Type / Functional / Non-Functional	
Creation:	Sep 23 2016 12:42 PM			User ☐ / ☐	
Modification:	Oct 05 2016 01:49 AM			System ☐ / ☒	
Description:	The system should log the user out after 1 hour of inactivity.			Organizational (sub-type below)	
				Development Requirements	
Priority:	✓ Highest	High	Medium	Low	Lowest
This Req. is Engineered From:	UO-01				
Justify why meeting SO-01-01 can contribute to the fulfilment of UO-01	Ensures a user is not logged on for too long, managing their session.				
Traceability:	Use cases cf.	N/A			
	Test cases cf.	Yet to be completed in test case worksheet!			

Figure 62: Description of system non-functional development requirement SO-01-01, which is related to requirement UO-01

4.3. Requirements Trace Table

Project Name: Intelligent Academic Planner			
User Requirements		System Requirements	
Req ID	Description	Req ID	Description
UF-A	A user can log in.	SF-A-01	The system should log-in a user within 5 seconds.
UF-B	A user can log out.	SF-B-01	The system should log-out a user within 5 seconds.
UF-C	A user can ask the system questions.	SF-C-01	The system should conduct textual analyses.
		SF-C-02	The system should be able to handle input from multiple well-known languages.
		SF-C-03	The system should recommend majors suitable for the user based on the personality assessment.
		SF-C-04	The system should gather data unique to each user.
		SF-C-05	The system should recommend courses based on the recommended majors.
		SF-C-07	The system should be able to handle both text and voice input.
UF-D	A user should receive multiple responses to a question.	SF-D-01	The system should show a minimum of 1 related search/question.
UF-E	A user can create a profile	SF-E-01	The system should allow between 100 and 600 words to describe a user's academic and professional interests.
		SF-E-02	The system should allow a user to submit 100 words of self-description about their personality.
		SF-E-03	The system should allow a user to view their personality assessments.
		SF-E-04	The system should create a personality assessment unique to each user based on the data gathered.
		SF-E-05	The system should summarize this data to be used by an advisor directing the student.
UF-F	A user can register	SF-F-01	The system should register the user within 5 seconds.
UF-G	A user can view a log of asked questions.	SF-G-01	The system should only allow Advisors and System Developers to view the question log.
UF-H	A user can provide information to improve accuracy of the system.	SF-H-01	A user can provide answer quality feedback after asking a question.
UO-01	A user's session should be managed.	SO-01-01	The system should log the user out after 1 hour of inactivity.
UP-01	A user's profile should be secure.	SP-01-01	The system should only display information that the user knows is being displayed.
UP-03	A user should receive a quick response after asking a question	SP-03-01	The system's voice-to-text service should process within 5 seconds of voice submission.
Acknowledgment: Generated from the CapStone process management system ©2015			

Figure 63: Overall view of all user and system requirements

5. Exploratory Studies

5.1. Relevant Techniques

Surveys

5.2. Relevant Packages/Products

N/A

5.3. Broader Impacts

This project can be expanded to include other majors within Behrend or branches of Penn State University. On a grand scale, this type of tool would be a beneficial tool for high school juniors and seniors, as well as college freshman.

6. System Design

6.1. Architectural Design

Layered Architecture

7. System Implementation

7.1. Programming Languages & Tools

Bluemix (conversation, retrieve and rank, alchemyAPI,…)
MongoDB
Node.js

7.2. Coding Conventions

N/A

7.3. Code Version Control

GitHub

9. Challenges & Open Issues

9.1. Challenges Faced in Requirements Engineering

9.1.1. **Initially, we struggled to determine the scope of the project. Watson has many features, therefore we had to be very specific about which of these features would make the most sense for our project's initial development.**

9.1.2. **Understanding the domain, or what sort of questions we wanted Watson to answer.**

9.1.3. **Be able to benchmark the accuracy of answering system.**

9.1.4. **Be able to automate the training/learning system.**

10. System Manuals

10.1. Instructions for System Development

10.1.1. How to setup the development environment

10.1.1.1. **The Intelligent Academic Planner project is a web application, that will be accessible publicly on Heroku, a Node.JS environment host platform. The source code will be stored by GitHub, for version control purposes. And the master version will always be automatically deployed and run on Heroku. There is no restriction on what IDE will be used by each group member.**

10.1.2. Notes on system further extension

10.1.2.1. **Automate question and feedback log DB**

10.1.2.2. **Natural language extension**

10.1.2.3. **Analytical library**

10.1.2.4. **Visual recognition on building**

10.1.2.5. **Attitude analysis on question**

10.1.2.6. **Campus direction utility**

10.1.2.7. **Course info helper (location, material, etc…)**

10.1.2.8. **News/feeds utility**

12. References

- I. B. M. What is IBM Watson? http://www.ibm.com/watson/what-is-watson.html (accessed Oct 5, 2016).
- MonkeyLearn http://docs.monkeylearn.com/ (accessed Oct 5, 2016).
- AlchemyAPI http://www.alchemyapi.com/ (accessed Oct 5, 2016).
- Watson Developer Cloud https://www.ibm.com/watson/developercloud/retrieve-rank.html (accessed Oct 5, 2016).
- Watson Developer Cloud https://www.ibm.com/watson/developercloud/conversation.html (accessed Oct 5, 2016).
- Watson Developer Cloud https://www.ibm.com/watson/developercloud/speech-to-text.html (accessed Oct 5, 2016).
- Watson Developer Cloud https://www.ibm.com/watson/developercloud/visual-recognition.html (accessed Oct 5, 2016).