

Group Project Report

IST 421: Advanced Enterprise Integration: Technologies and Applications

Amazon Alexa with Echo Classroom Integration Project

V5.0

Project Stage - Milestone 5: Project Hand-Off Plan

Date: July 22, 2018

Project Sponsor(s)

Undesignated at this time

Project Group: Team 1

Project Group Members:

Sravya Valiveti, Jonathan Weaver, Dylan Woodard, Gabriel Ynoa, Raquel Berrios

Preface

Document Version Control: It is the reader's responsibility to ensure they have the latest version of this document. Questions should be directed to the owner of this document, or the project manager.

This document was generated by the *Amazon Alexa with Echo Classroom Integration* project group.

Lifecycle Stage: *Amazon Alexa with Echo Classroom* is in the *Project Hand-Off Planning* stage of the lifecycle.

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Privacy Information

This document may contain information of a sensitive nature. This information should not be given to persons other than those who are involved in the *Amazon Alexa with Echo Classroom Integration* project or who will become involved during the lifecycle.

Update Control

Primary Updates in V2.0 – Requirements

1. Added Milestone Content
2. Added Preface
3. Added References

Primary Updates in V3.0 – Plan

4. Added Milestone Content
5. Updated Update Control
6. Updated Table of Contents

Primary Updates in V4.0 – System Design and Prototype

7. Added Milestone Content
8. Updated Update Control
9. Updated Table of Contents

Primary Updates in V5.0 – Project Hand-Off Plan

10. Added Milestone Content
11. Amended content in System Design and Prototype to more accurately reflect our end product
12. Updated Update Control
13. Updated Table of Contents

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I. Project Proposal

Organization Overview

Amazon Web Services (AWS) is the market leader in IaaS (Infrastructure-as-a-Service) and PaaS (Platform-as-a-Service) for cloud ecosystems, which can be combined to create a scalable cloud application. Amazon offers many services for application development and analytics. Alexa is one of the services in which we are going to apply and conduct system integration processes. Alexa is Amazon's cloud-based voice service available on Amazon devices such as Echo, as well as other third-party device manufactures. With Alexa, users are provided the tools and APIs to build natural voice experiences that offer them a more intuitive and productive way to interact with technology and systems.

Business Problem/Opportunity

For its proper function, Amazon Alexa utilizes a voice user interface (VUI) which allows people to use voice input to control computers and devices, including the Amazon Echo. Alexa provides capabilities, or skills, that enable customers to take advantage of these voice experiences and create a more personalized experience via the AWS marketplace and others. Many of today's advancing business such as Cisco and Uber have seamlessly integrated Alexa skills in their products to cater to the business functions and further simplify them. However, in a classroom environment where the Windows operating system is more frequently utilized, Alexa lacks the integration and compatibility with the applications and systems found in this academic setting. In this context, Alexa's competitors like Microsoft's Cortana and Google's Assistant shined where they were able to perform several tasks on the Windows OS. Despite these shortcomings, to Alexa's advantage, AWS offers the tools and APIs that make it easier to add these classroom-oriented skills to Alexa and allows users to leverage Amazon's knowledge in the field of voice design.

Business Strategy

The strategy of an educational business that could use this type of project would be to find a way to use an Amazon Alexa or other similar service to streamline and integrate voice commands into the existing computing environment. The best way to do this would be to create a way for Alexa to integrate with other common classroom computer systems, like Windows and Macintosh desktop machines. It would also be helpful if it could communicate with "smart devices" that are found in a classroom setting, like Smart Boards or tablets. The success of the integration would depend heavily on how many devices and platforms Alexa can interact with. The best way to insure a seamless integration between the users and the technology would be for Alexa to be able to integrate with all the technologies used in the classroom.

Business Goals and Objectives

Our business goals and objectives will be influenced and guided by education to facilitate the use of voice commands and increasing the use of technology in a classroom environment. Our target audience would be lower level education such as elementary or middle schools to include classrooms where there are behavior problems. By customizing voice triggers to make it do anything you say teacher would have the ability to control all computers and direct students to a webpage with just a voice command.

Project Overview

This project will utilize Amazon's Alexa, along with AWS integration, to bring better engagement to classrooms around the world. This project will be made in conjunction with a Corporate Sponsor that will be noted at a later date, utilizing and tailoring our system to the needs of that Sponsor.

Project Goals and Objectives

The goal of this project is to create a working integrated system in which a business is able to customize voice commands in a classroom environment. The objective is to engage students and inspire them to learn with the use of innovative emerging technology.

Project Deliverables

Throughout the course of this project, deliverables will be included to update interested parties on the progress of the project. Deliverables of note include Project Milestones for IST 421, and updates provided to any sponsors that this Team designates. Deliverables will be presented in a PDF format to all interested parties in a timely manner and will represent the full work of the Project Team up to that point. For inquiries into project deliverables, please contact the Team Leader or Assistant Team Leader at the contact information below.

Group Information

IST 421 Group

Name	Role	Email	Messaging name & platform	Phone numbers of members (optional)	Availability for meetings
Dylan Woodard	Team Leader	dfw5052@psu.edu	Google Hangout + Canvas	570-956-9417	Mon - Friday after 5pm Weekends Anytime
Gabriel Ynoa	Assistant Team Leader	goy5023@psu.edu	Google Hangouts + Canvas	(718) 578-1530	Mon - Friday after 4:30PM Weekends Anytime
Jonathan Weaver	Team Member	jfw5160@psu.edu	Google Hangouts + Canvas	(814) 470-2916	Tuesday and Thursday all day, after 8 PM every other day
Raquel Berrios	Team Member	rqb5314@psu.edu	Google Hangouts + Canvas	(201) 783-6995	Everyday, excluding military drill dates
Sravva Valiveti	Team Member	sov5135@psu.edu	Google Hangouts + Canvas	(814) 880 7695	Everyday, after 7 pm in the evenings

Group Contract

Project Management and Group Leadership

- ❖ The Team Leader will be Dylan Woodard and the Team Assistant Leader will be Gabriel Ynoa.
- ❖ Milestones will be submitted by the Team Leader and will be posted on the Team's Google Drive folder 6 hours before submission. The Team will have a chance to proofread and edit the final submission until the Team Leader submits the milestone.
- ❖ The Team's progress will be monitored by regular updates and a planned calendar of due dates and project milestones.
- ❖ Methods of communication will be open specifically to inform Team Members of the status of work-in-progress and open issues via the Team's Google Hangouts channel, as well as the Team's Asana Project Board.

Electronic communication within the group

- ❖ The Team will communicate with each other on a daily or bi-daily basis in order to stay coordinated with Team updates and requests.
- ❖ An appropriate response time for Team Member requests is between 12-24 hours, with exceptions being made for unexpected circumstances.
- ❖ A Google Hangout channel will be formed for the Team to effectively communicate. An Asana Project board will also be created in order to delegate, review, and monitor tasks.
- ❖ The Team will meet once-twice a week on a schedule to be determined each week.

Team Meetings

- ❖ Team Meetings will be held twice a week, in accordance with Team policy, every Team Member will make an extended effort to attend each meeting.
- ❖ The Team will have one meeting during the middle of the week (Tuesday/Wednesday) every week, with an additional meeting on Saturday if needed.
- ❖ Team Meetings will be held on the Team's Google Hangout channel.
- ❖ Meeting Minutes will be available for each meeting and will be recorded by the Assistant Team Leader.
- ❖ Delegation of Team tasks will occur during each meeting and will be translated into the Asana Project Board.

Conflict between members

- ❖ Team members are expected to treat each other with the utmost of respect and to handle differences in a cordial manner.
- ❖ Team members are expected to take responsibility for their work and to fulfill their expectations for each part of the project.
- ❖ Conflict will be dealt with accordingly with the attention of the group. A group meeting will be formed in order to discuss proceedings with an offending team member.
- ❖ If the conflict cannot be dealt with, and no resolution is made with the group, the Professor of the course will be added in to discuss actions to be taken.

Decision Making

- ❖ Decisions on Team business will be conducted in an organized and fair process.
- ❖ Each Team Member will be afforded the opportunity to suggest options for the Team to consider.
- ❖ The Team will then vote on the best course of action for that particular scenario, and the Team Leader and Assistant Team Leader will then decide which action to take.

Work Submissions

- ❖ Work Submissions will be organized and submitted by the Team Leader on behalf of the Team.
- ❖ Each submission's Final Draft will be uploaded to the Team's Google Drive folder 12 hours before the submission deadline.
- ❖ The Team Leader will submit the Final Draft 6 hours before the submission deadline.
- ❖ Each Team Member will have the opportunity to review and edit the Final Draft during the review hours and will make any changes they deem necessary. The Team Member will contact the Team Leader and Assistant Team Leader before making those changes.
- ❖ The Team Leader will inform the Team once the deliverable has been submitted.

II. Project Requirements

Goals

This project aims to bring an integrated Alexa solution into the classrooms of schools around the United States. The project will take existing Alexa skill architecture and tailor an experience usable for the classroom use case. This project will utilize Alexa voice recognition to launch in-classroom activities, present detailed information, and integrate into compatible ‘smart’ hardware that is installed in the classroom. The systems required for this project include full-stack back-end hosting and utilization architecture, Alexa skill expansion, hardware integration design, and a detailed redundant solution to minimize downtime. In the future, we hope to bring this expanded project to a corporate sponsor for full integration into a large-scale product. Below is a list of prospective project functionality which will be referenced in following sections:

Function Name	Function Descriptor	Function Classification¹
FUNC-01	Activation of in-classroom lesson via voice command	(1)
FUNC-02	Activation of in-classroom hardware via voice command	(2)
FUNC-03	Inform students of more detailed information about a queried topic via voice command	(2)
FUNC-04	Define specific queried words or items for students via voice command	(3)
FUNC-05	Select a student to answer a classroom questions via voice command	(3)

Input and Output Requirements

The definition for inputs into this project’s system include implementation of Alexa voice command recognition, which takes user voice commands and interprets them using a set functional application. Alexa activates upon the set trigger word and then listens for a voice command, which, once interpreted, triggers an action in the project’s Alexa skill. This project also requires that the classroom has a physical Alexa compatible device located on-site.

The desired outputs of the project are dependent on each of the user’s voice commands that are given to the system. The outputs intended include:

- ❖ Response to Activation of in-classroom lesson request- FUNC-01
- ❖ Response to Activation of in-classroom hardware request- FUNC-02

1

(1) *Mandatory: Absolutely essential feature; project will be canceled if not included*

(2) *Required: Individual features are not essential, but together they affect the viability of the project.*

(3) *Desired: Nice-to-have feature; one or more of these features could be omitted without affecting the project viability.*

- ❖ Response to Inform students of more detailed information about a queried topic request- FUNC-03
- ❖ Response to Define specific queried words or items for students request- FUNC-04
- ❖ Response to Call out a randomly selected student request- FUNC-05

Given outputs of this project are subject to change or be expanded upon before completion.

Data Requirements

The first data group that will be required from the system is the login information needed for the user to sign into the Amazon Echo device. The system will also have user-level access to the devices it is connected to for it to be able to access and use the installed programs on the devices. The Amazon Echo device and the one using it will therefore have access to any file or program stored on the user devices. Strict access control over who can use the Amazon Echo device and what kind of data is stored on the device. (All Functions)

Functional Requirements

The system shall allow an Amazon Echo running Alexa software to connect to various computer devices commonly found in a classroom. The system shall support a minimum of the Windows 10 desktop operating system, Android devices running version 7.0 or higher, and iOS devices running version 9.0 or higher. The system shall connect to the classroom devices using Bluetooth technology. The system shall take input in the form of a Voice Command and carry out the command on the specified connected device (All Functions). The system shall support, at a minimum level, voice commands including:

1. “Alexa, open application ‘X’ on device ‘Y’,” where “X” represents a currently installed program on a device, and “Y” represents a supported and currently connected device.
2. Basic navigation commands in Microsoft PowerPoint, including “Next slide,” “Go back,” and “Close presentation.”
3. Display a certain application over everyone’s device at the same time. For example, the command “Alexa, open file ‘x’ on each device,” would open a file called ‘x’ on each device connected to the Amazon system.

Performance Requirements

The developed system shall be able to receive one voice command at a time from one user. The voice command shall be registered and processed within the standard Alexa software response time; usually after several seconds of receiving a command. The corresponding Windows program or device that is being interfaced with shall respond to the voice command within three seconds of the command being registered. The system will be able to connect and have voice-command access to at least twenty devices simultaneously. The system shall be up ninety five percent of the time it is in operation allowing time for Amazon-required software updates to the Alexa software. (All Functions)

System and Communication Requirements

The Alexa setup process communicates the value of Alexa and helps customers connect your product to their Amazon account. Ideally, the Alexa setup flow should be incorporated into the setup or first run experience on your product. See the [AVS UX Design Guidelines](#) for more

branding and style information for the Alexa setup and authentication experience. The Amazon Echo product SHALL use Login With Amazon (LWA) to authenticate the customer. See the Authorization section in the [Alexa Voice Service API Overview](#) for additional information. The Amazon Echo product SHALL have an Alexa setup/sign in experience that follows the Setup and Authentication guidelines in the [AVS UX Design Guidelines](#).

The Amazon Echo product SHALL have a Splash Screen before the customer enters the Login With Amazon authentication flow. Your Splash Screen SHALL include the required elements as defined in the [AVS UX Setup and Authentication Guidelines](#). The Amazon Echo Your product SHALL have a Things to Try screen after the customer exits the Login With Amazon authentication flow. Your Things To Try screen SHALL include the required elements as defined in the [AVS UX Setup and Authentication Guidelines](#). The Amazon Echo product SHALL support logout by the customer. You SHOULD include information on Alexa setup and use in your product's instructional materials. (All Functions)

System Security Requirements

Use the following guidance to ensure that your product meets security best practices:

Use secure software update distribution, incorporating cryptographic signing, so that only authentic and authorized updates are applied to the device. Have a software maintenance update strategy that specifically defines how software updates will be created and distributed within a reasonable period of discovery when vulnerabilities are identified. Include information on your website on how security researchers can notify you of a security vulnerability. Develop and implement a security response plan that addresses a range of potential security incidents. Use a secure, authenticated set up. Never include the transmission of credentials over a non-TLS session during setup

Implement industry standard device hardening methods. For example, remove all unnecessary services and software from the device, validate input before processing it in services on the device, apply all relevant updates to open source software, and do not use default passwords. Hire an independent security expert to conduct a security review of your product before product launches and when major software or hardware changes occur. Notify Amazon immediately if you become aware of security vulnerabilities in your products that have the potential to affect the Alexa Service. (All Functions)

Backup and Recovery Requirements

In case of product failure, Github will be used by project members to access the source code that will help in re-building the system and the code will be version-controlled on Github. Github will provide the security and privacy of an in-house system. Amazon Echo has in-built system recovery software and has hidden developer options. The Fastboot and Recovery mode can be used to manipulate the operating system. (All Functions)

Support Considerations

For products that use Bluetooth, the product should support the Advanced Audio Distribution Profile (A2DP) Bluetooth profile. This Bluetooth profile can support audio streaming from Echo to speaker. However, hands-free voice control over Bluetooth is not supported for Mac OS X devices. Bluetooth devices that require pin codes are not supported at this time as well.

You can also send and receive Alexa messages and calls as well as place outbound calls to most phone numbers in the United States, Canada, and Mexico using Echo supported mobile phones and tablets. At this time, Alexa Calling and Messaging supports receiving calls from Alexa but does not support inbound calls from phone numbers. At this time, sending texts to 911, group messages, and MMS messages are not supported.

The product compatible with Alexa should provide a physical control to initiate an interaction with Alexa. The voice-initiated product also should only use approved Alexa wake words that include words like Alexa and should support cloud-based wake word verification.

The Alexa setup flow must be incorporated to run the product successfully. The product needs to use Login with Amazon (LWA) to provide customer authentication and should support customer logout. (All Functions)

Hardware Requirements

Hardware Functionality

The integration of Alexa with classroom engagement will require an internet-connected device with a microphone and a speaker. This crucial piece of hardware will receive voice commands that would convert these into skills. These skills would be utilized to access Alexa's ability to integrate with the classroom environment. In order to integrate Alexa within the classroom, the last piece of hardware required would be an internet-connected computer device.

Hardware Characteristics

The computer device's operating system that will be utilized in this integration project are licensed by Microsoft Windows, which is characterized as a commercial operating system. This are the most common kinds of operating systems applied in a classroom computer system. The operating system in this computer system will have software compatibility with applications designed to access the Internet, including, but not limited to, Google Chrome, Apple Safari, Microsoft Internet Explorer, and Mozilla Firefox. The device with a microphone and speaker that will be demonstrated in this project would be Amazon Echo. Echo's interaction with the operating system will be voice-initiated through the software agent Amazon Alexa throughout this integration effort. (All Functions)

Software Requirements

Software Functionality

The driving force behind this integration project will be a virtual assistant developed by Amazon. In extending the capabilities supported by this virtual assistant, cloud computing platforms on the Amazon Web Services will be utilized to build voice experiences that would assist in the engagement of systems in the classroom. A Microsoft operating system will be necessary in supporting these computer functions and software applications needed to integrate the Amazon assistant. Computer-programing languages that are compatible with the OS will be used for scripting the voice command inputs from the Amazon device into text, which ultimately would assist with commands in the OS.

Software Characteristics

In order to complete this integration, AWS offers the Alexa capabilities API which allows individual products to specify the interfaces and interface versions they support. In other words, this allows developers to voice-enable devices to have Alexa capabilities that are allowed by using the Alexa Voice Service (AVS). AVS would be hosted on the AWS Lambda computing platform. The Microsoft Windows OS will be utilized to allow the function of internet-based software applications, such as a multitude of web browsers that would be used in this classroom integration. In converting the Alexa skill APIs (e.g. audio input) into plaintext for its compatibility with the Windows OS, the Java programming language will be utilized. (All Functions)

Usability Requirements

Alexa will be initiated through the Amazon Echo speaker. In order to initiate the Alexa virtual assistant, we will only be experimenting with the voice-initiation wake word, “Alexa, do this.” To help with scripting for the code needed to make commands on the Windows OS, we used the website <https://www.ifttt.com> to help generate specific commands through applets provided. (All Functions)

III. Project Plan

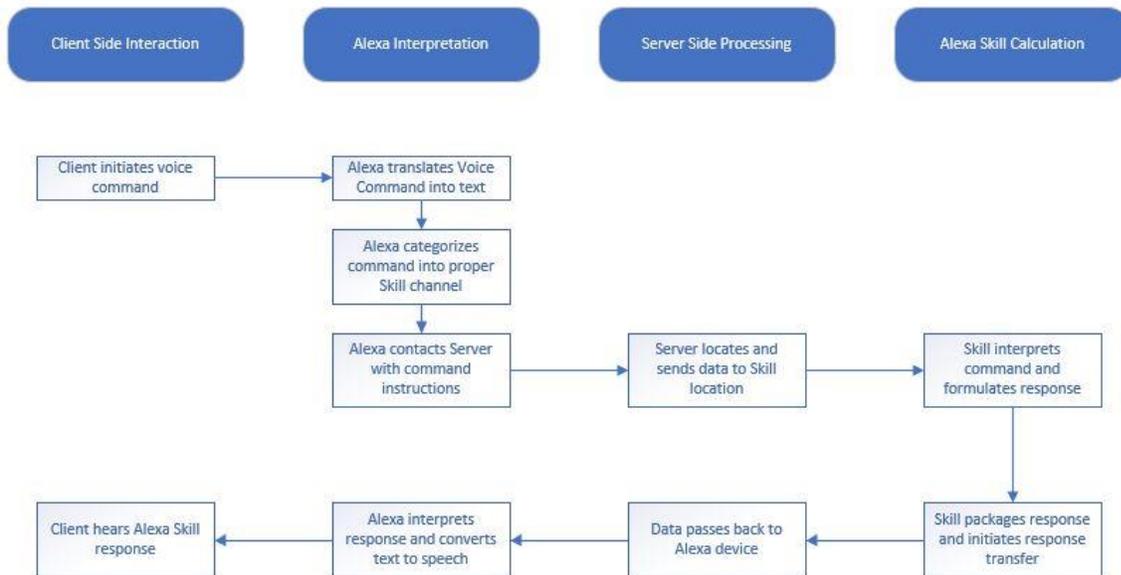
Project Scope

Scope Definition

The system defined in this plan will include functional hardware and software integration between physical systems located in the classroom, as well as capable software features for classroom utilization. Functional hardware system integration will include ‘smart’ device pairing. Software functionality will include a voice command search function, a random student selection tool, and the ability to launch functions on physical hardware. This system also aspires to achieve an ‘easy to use’ platform for expandability in the future.

This project’s scope is subject to sponsor corporate involvement at any step of the process. We hereby reserve the right to make changes at any time to the overall scope of the outcome of this project and any functionality that may arise from this project’s work.

System/Application Architecture



Development Environments

This project will require a number of existing, proprietary systems that will be utilized by our Alexa skill. These systems include a combination of the Alexa Smart Home Skill API, the Alexa Custom Skill set, an Alexa compatible Amazon Echo device, and a backend hosting environment provided through AWS Lambda. Development tools for the project include the Java SE Development Kit (JDE), Apache Maven, and AWS Elastic Beanstalk.

Budget & Cost/Benefit Analysis

Amazon Alexa with Echo Integration Project

Cost/Benefit Analysis

24 June 2018

Initial Investment in Alexa skill	YEAR 1	YEAR 2
Hardware (e.g., Amazon Echo Plus & 15 'smart' devices, etc.)	\$487.98	\$0.00
Software (e.g., Software environments to purchase)	\$0.00	\$0.00
Hosting (e.g., AWS Lambda & AWS Elastic Beanstalk Spot pricing for 1M requests for 1 year)	\$105.49	~\$100.00
Total Investments	\$593.47	~\$100.00

Benefits from Alexa skill
Time Savings in classroom
Providing additional support to Underprivileged schools
Supplementing lesson plans
Optimizing the efficiency of the classroom
Reduces teacher decision time
Accessing other Alexa skills from purchased devices
Controlling multiple Windows devices with one Echo Plus

Project Products/Deliverables List

The products and deliverables listed will be utilized for the purpose of running the Alexa integration with the Windows operating system that is developed to enhance teaching and learning in a classroom environment. Below is the complete list of the products and deliverables to be developed and/or used in this project.

- Amazon Echo
- Project report
- PC run by Windows 10 OS
- Java programming
- AWS Alexa Skills Kit custom skill script

Milestones

Milestone	Description	Deliverables	Time of completion
Milestone 1	This will clarify and outline the proposal, state the team contact terms and agreements, the scope of the project, deliverables to be produced, and our project risk management and communication plan.	Report <ul style="list-style-type: none"> - Project proposal - Team contract - Scope statement - Defining of requirements - Risk management plan - Communication plan 	June 10, 2018
Milestone 2	This will be entirely dedicated to designing the Alexa integration system. The milestone will tackle areas such as the system development, system design, and Alexa coding.	<ul style="list-style-type: none"> - Develop Java scripts used to retrieve audio Alexa received - Convert audio to text with AWS Alexa Skills Kit - Run script commands through the Windows OS 	July 18, 2018
Milestone 3	Performance testing will be conducted to ensure the system is available at all times, without any error in code or running of the code. Make any necessary adjustments to ensure the above stays true to the system performance.	<ul style="list-style-type: none"> - Test the integration to confirm the system is available at times of high and low usage - Ensure system performance is consistent - System delivers fast optimized content 	July 24, 2018
Milestone 4	Project will get handed over to sponsors and be reviewed for approval to proceed to the next phase.	<ul style="list-style-type: none"> - Sponsors will verify if project deliverables meet user expectations and satisfies their acceptance criteria 	July 27, 2018
Milestone 5	The project handoff plan will be defined. The report will describe how the project will be forwarded to clients	Report <ul style="list-style-type: none"> - Description of final solution - Hand-off plan - Lessons learned - Future potential work - User guide 	July 29, 2018

Impacted Business Areas

Business areas that are impacted during the duration of the project are aligned with Amazon's initiative of delivering innovative Echo devices and experiences that improve the lives of its customers. This project defines their efforts in presenting this to their consumers by taking advantage of Alexa and building and implementing the skills to be operated in a classroom environment. By developing custom skills that enable Alexa to be more helpful and relevant in the classroom, the impact of Amazon will greatly change the way students interact in the class and encourage students to engage in school activities through the innovation of voice recognition.

Project Dependencies

Assumptions

Project meetings will be held on a weekly basis and will be conducted every following 3 days (i.e. Wednesday and Saturday), where every project member is assumed to be available to attend and discuss/work on the progress of the project. Project milestone completion dates are assumed to be the time the team would finalize and conclude activity described in the description of the specific milestone. The AWS service needed to script custom skills to Alexa is assumed to be up and running at all times during the project duration. The scope of the project expected to not alter in any way and focus strictly on the integration of Alexa to make the classroom environment more engaging.

Constraints

Current constraints include the limited amount of time the project is to be developed and prototyped, tested, and handed off to sponsors for their approval. Team members are given exactly a month to ensure that the project product follows the scope and operates without any error to the system, which could also pose a constraint in the quality of the integration system if deadlines are not met or are rushed. The funding of this project is not influenced by our sponsors or any stakeholders and is relied on the budgets of key project members, and this could pose a constraint in the amount of resources available at the use of the project members. Due to the skill level of project members developing this project being held at a non-professional level, the technical approach may be limited to certain platforms or skills known to the developers.

Related Projects

Related projects for our system would be nearly the same technical setup with the Google's Home assistant instead of Amazon's Echo Alexa. This is relatable because the technical aspects of setting up the system would be nearly identical to setting up with the Echo. The Google Home and Amazon Echo are both Artificial Intelligence (AI) which have nearly the same capabilities and both are in competition.

Critical Dependencies

Dependencies are the relationships of the preceding tasks to the succeeding tasks. Tasks may have multiple preceding tasks and multiple succeeding tasks. For our project our critical dependencies would be determined upon the request of the organization we are building the system for. In order to create a system for an organization to their standards we would have to depend on their requests, In this case we would request the website links, applications and

windows system command they would like to have working through voice commands. In order for these commands to work the developers need a Dropbox account, an account with If This Then That (IFTTT) and programming experience.

Quality Management Approach

Activity Reviews/Walkthroughs

The quality techniques and standards to be applied, and the various responsibilities for achieving the required quality levels, during the project is to provide the best quality assurance for our process. By testing the product our customers can rely on our systems process to work effectively.

Tools and Techniques

For our system the tools and techniques will be shown by six sigma which is a disciplined, data-driven approach and methodology for eliminating defects (driving toward six standard deviations between the mean and the nearest specification limit) in any process:

- Defining a problem, improvement opportunity, or requirements
- Measuring process performance.
- Analyzing processes to determine root causes of variation, defects, or poor performance.
- Improving process performance by addressing root causes.
- Controlling the improved process and future performance.

Performance/Quality Standards

The performance of the system will be as defined in the requirements section of this document. Performance specifically relates to the response time of the Alexa system. The performance will be evaluated at the end of the system development. The response time of the system taking and processing a voice command will not exceed five seconds. Additionally, the project sponsor, if there is one, will specify additional performance criteria if applicable. The accompanying backend code must also be able to be modified freely by a potential client. Additionally, the final documentation must be extensive and fully describe the system and its components. If the project takes on a client, the client must agree that the documentation is sufficient.

Training

The project does not currently have a sponsor, and there is no guarantee that one will be added. Therefore, the best training that can be planned for at this time is general usage documentation that relates to the system in its end state. The documentation will include extensive instruction on how to setup and use the Amazon Alexa system. The documentation will also include instructions on how to troubleshoot and modify the back-end functionality, ensuring that maintenance can be performed. If a sponsor decides to come aboard our project, the project group will train the sponsor through video meeting on how to use the system, in addition to handing off the documentation. The training will consist of walking the client through the system code and demonstrating how to operate the system front end. Training will be evaluated through a series of predetermined questions to ensure a full understanding. Questions will include inquiries about his understanding of how to maintain the backend and how to utilize and apply the frontend. If the answers to the questions are insufficient, the team will clarify and re-demonstrate the deficient areas and ask them again.

Test approach

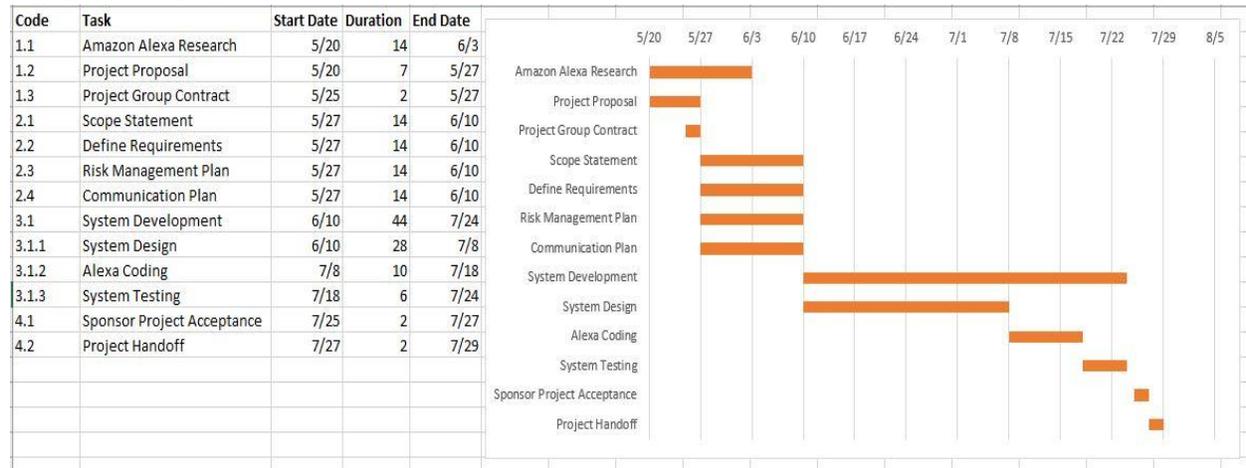
The test approach for our system will be performed proactively, an approach in which the test design process is initiated as early as possible in order to find and fix the defects before and during the build is being created. To avoid customer frustration and increase efficiency all commands will be tested to ensure functionality and quality.

Factors to be considered.

- Risks of product or risk of failure or the environment and the company.
- Experience of the people in the proposed tools and techniques.
- Regulatory and legal aspects, such as external and internal regulations of the development process.
- The nature of the product and the domain.

Project Management Approach

WBS/Gantt Chart



Basis of Estimates

The time frame estimates used in the Gantt chart are based off the standard deliverable due dates as outlined in the project grading rubric. The time durations are based off of the given model that each group member is able to work a 6.5-hour day. The bulk of the duration is spent on development, specifically design. The rationale for this is because our project is heavily focused on the application of Amazon Alexa in a classroom setting, so the most work will need to be put into designing the device’s behavior and interaction within the environment. Additionally, the Gantt Chart assumes we will obtain a sponsor and hand off the development. Small amounts of time were therefore allocated for a review and handoff process.

Project Standards

The project group will abide by several standards for document creation, status reporting, group meetings, and product review acceptance criteria. For document creation, the project group will first assign sections that need to be drafted to the individual group members. The draft sections will then be brought together to be reviewed and discussed to make sure they are of sufficient quality and consistency. Next, changes are made to the draft based on feedback and discussions by the group members. Google Docs will be utilized to facilitate the collaboration process. After

a final content review is done, the document is proofread and formatted. The formatting must be consistent the established document template produced in the first project deliverable. The document will be downloaded from Google Docs to a Microsoft Word Doc format to ease the process of formatting and ensure consistency. After being signed off by each group member, the final document is approved and submitted.

For status reporting, each project group member must be able to provide the status of their assigned tasks to the group through either email or through the established Google Hangouts Chat. Status Reports are expected to be given if a group member needs help completing his assigned tasks or if he expects to not be able to deliver his task by the assigned due date. The group member should be prepared to explain why he needs assistance and make suggestions designed to help solve the problem.

Group meetings will occur at least two times per week, depending on when the group decides that tasks are due. Meetings will generally occur on Wednesdays and Saturdays but may be called at any time if there is a consensus that one is necessary. During these meetings, the group will assign tasks and their respective due dates. The group meetings will start by discussing the overall state of the project and what needs to be done next. Members will ask questions about their assigned tasks as necessary.

Product reviews will occur during the development phase of the project after key development milestones are reached and a significant deliverable can be delivered. At the time of this document, our project does not have a sponsor. However, the general process of a product acceptance review will consist of the following:

- A review of deliverable scope.
- A review of product requirements.
- A review of user testing results and verification.
- A demo of the functioning product.

The product acceptance review is completed when the customer and project manager sign off on all agreed upon project requirements and testing results.

Executive Committee Status Report

Subject:	Executive Committee Status Report
Summary:	The Amazon Alexa Classroom Integration Project is finalizing the planning phase before moving into execution. The current trajectory is to proceed forward without a sponsor while still looking for a potential interested client. There are no significant changes to requirements or deliverables at this time.
Scope Updates:	The scope has been determined in the Section “Scope Definition.” The scope encapsulates the hardware and software development that is needed for the defined classroom integration.
Schedule Updates:	The group is on track to proceed with the execution phase within the coming weeks. If a sponsor were to join our project, there is the possibility of changing our schedule to accommodate the wishes of the sponsor. However, the scope of the project would be unable to be substantially changed. Therefore, the schedule is unlikely to change substantially.
Upcoming Plans:	The team will begin the design phase of the development and execution phases. This will include extensive research into the what will be required to achieve the specified system functionality.

Resource Plans

Resource planning is a key aspect of project management as the success of a project is directly dependent of how the resources are allocated and how optimally they are used.

Phase	Task/Deliverables	Resource Type	Source	Hours Required	Controller
Phase I Dates: 6/10- 6/24	Planning Organization’s Requirements	Informational Group, Amazon Echo	External	48 hrs	Group / External Party
Phase II Dates: 6/24-7/8	System Analyzing	Group Amazon Echo	Internal	50 hrs	Group / External
Phase III Dates: 7/8-7/22	System Designing	Designer Amazon Echo	External/Internal	60 hrs	Group / External
Phase IV Dates: 7/22-8/5	System Implementation	Programmer Amazon Echo	Internal	72 hrs	Group / External

Project Roles and Responsibilities

Project Leader: The project leader is responsible for overseeing the implementation of tasks and ensures the timely completion of the deliverables. He is ultimately responsible for the completion of the project as planned. He also communicates with the Executive Board and stakeholders and updates them on any projected delays, potential risks and is responsible for adhering to quality assurance standards. He acts as the bridge between the business/client team and the delivery team.

Program coordinator: He is responsible for facilitating the project operations and overlooks the work of consultants. He acts as the bridge between the project manager and the developer team. He also aids with troubleshooting any business-related issues.

Systems Analyst: The systems analyst will use design techniques using information technology to solve business problems. He is also responsible for providing the necessary training to new consultants and team members.

Software Engineer: The software engineer is responsible for development of code, troubleshooting technical/interface-related issues. He also collaborates with the systems analyst to ensure there's no issues associated with the business interface.

Consultants: They are responsible for completion of assigned project modules/tasks and need to provide updates to the project manager/coordinators and systems analysts. They also work on improving the service through any feedback offered at team meetings to improve the productivity.

Client/Customer: They are responsible for ensuring that the project meets the expectations & quality standards upon delivery of the service, need to provide feedback and need to check the system for any performance issues. They are responsible for paying for the service.

Table 1: RASCI table

Tasks	Project Leader	Project Coordinator	Systems Analyst	Software Engineer	Consultants	Client/Customer
Task 1: Project planning and troubleshooting	R, A, I	A, C, I	A, C	A	A, C, S	S, I
Task 2: Completion of deliverables & project operations	R, A, I	A, C	S, C, A	S, C	A, C	I
Task 3: Risk Management & Updates	R, A	A, S	I	I	I	S, I
Task 4: Strategy adjustments & new strategies	R, I	S	S, I	I	S, I	I
Task 5: Quality Assurance check	R, A, I	A, I	A, C	A, S, C	C, I	S and I
Task 6: Complete reports	R, A	A	I	S	A, C	I

R- Responsible for the project (owner)

A- Accountable, needs to sign off on work before it's effective.

S- Supportive, provide supporting resources and play a supporting role

C- Consulted, has information/skills necessary to complete the work

I- Informed, needs to be notified of results

Change and Issue Management Approach

Any changes to the project scope, timeline, budget or the resource plan will be communicated with the project leader and the project coordinator and the changes also need to be communicated with the Sponsor/client in a timely fashion. Any issues with technical failures, material shortages may impact the quality of the project and need to be resolved quickly to deliver the product on time.

The issue management approach is a planned process for dealing with unexpected issues that may arise during the project delivery stage. We would like to utilize an Issue Log to record any

gaps, inconsistencies, shortages and conflicts in the event of an issue in the form of a log. This will help us keep track of things that are going wrong and take the appropriate control measures to resolve these issues early on. Without this log, it would be difficult to not take these issues seriously and monitor the things that are going wrong.

We can have a safe and reliable method of recording and communicating these issues with team members and we could also potentially assign responsibility to specific people to take care of these issues according to their priority. This will allow us to monitor the health and quality of the overall project and if the project is on track for delivery/completion. We would like to use a spreadsheet/database to keep track of issues. We are planning to track variables such as issue type(category), description, timing, who can resolve the issue, skills required **to resolve the issue, etc.**

Communications and Control Approach

The responsibilities will primarily be communicated via frequent emails and team meetings with both the project group and client group to share updates, changes and feedback with each other. Each group member would share their updates during the weekly team meeting, following which the other team members would offer constructive criticism on the work done that week. There will be presentations on the work done as necessary. Since the time we have is limited, the Project Manager is expected to be open to communication at all times, needs to update the plan every week (more often if needed) and the Project Coordinator is responsible for sending weekly updates/changes/meeting minutes to all team members. Additionally, within the team, we expect to use Google Hangouts, Drive, Asana and Slack to communicate during other times in the week and to assign task responsibilities.

The team members are supposed to send a progress report at the end of each phase/deliverable to assess that team member's performance, skill set and to determine if that team member's role needs to be re-assigned at the end of each phase. The status reports will be distributed by the Project Manager to the Executive Board, Sponsor & the rest of the business team at the end of each phase.

The Project meetings need to be attended by everyone who's actively working on the project including the Project Leader and coordinator, consultants, business analyst and software engineer. The Executive sponsor/client are also welcome to attend the group meetings every week to stay updated about the project progress and if it's on track for delivery - any misunderstandings between the sponsor/client team and business team need to be resolved during these team meetings or during individual meetings with the project leader.

Implementation Approach

Process of the implementation approach

- Plan - The purpose of this phase is getting the project started, identifying the project team members, and developing a detailed project plan.
- Design - The purpose of this phase is to create the detailed design containing the results gathered during requirements collection, confirmation workshops and prototyping efforts.
- Build - The purpose of this phase is to configure and test the business and technical requirements that have been established in the Design Phase.

- Deliver - The purpose of this phase is to prepare for the live system with the implementation and will include final system testing, user training, cutover activities, and formation/enhancement of an internal help desk for support after we go-live.
- Operate - The purpose of this phase is to transition from a pre-production environment to business operations.

Application Release Strategy

A formal release strategy would potentially make the process of distributing applications/software easier. We would like to implement the following tasks:

- Software Testing: Develop strategies on how the product will be tested and assess factors such as quality, performance, user feedback, quality improvements. This would also include alpha and beta testing approaches.
- Documentation: We will provide documentation in the form of product guides, training material and other notes.
- Packaging and distribution: These activities will highlight how the product will be packaged, distributed and installed. This will include box package distribution, electronic distribution and copyright authorities.
- Hosting the software: We would provide information surrounding requirements for security, software and hardware for internal and external systems.
- Production: define the functionality, the operating systems required & supported, programming languages required, information surrounding application security.
- Deployment Plans: Provide a platform for rapid deployment on the side of the client. This would include easy to utilize instructions that the client would interact with.
- Transition to Support Strategy: Provide training and documentation to end users and clients and check if the quality of the product meets expectations and standards. Have a support team available after the product is ready to be deployed to provide help to the customer in regards to troubleshooting any technical issues.

Risk Management

In enterprise integration projects, risk management is defined as the integration of the necessary tools that aim to resolve the risks that may potentially arise. Minimization of risks will improve the quality and performance of the enterprise system. For this project, the Project Management Body of Knowledge (PMBOK®) risk management model will be used to identify, carry out qualitative risk analysis to rank the risk, risk response planning and risk monitoring & control to treat the risk.



The goals of implementing this risk management model include:

- Avoid or eliminate risks through efficient planning
- Optimize the processes and mitigate the risks
- Reach out to necessary resources to cut down risks.
- Keep the risk level to a minimum and allocate budget for risk prevention.

Quality metrics for this project include the time and cost attributes of deliverables to be completed.

- Projects are time-sensitive, and deliverables are scheduled to have deadlines and need to be completed in a sequence. Any issues in planning or execution is going to affect the above constraints and thereby, affects the quality of the project. During the planning stage, the team must also consider any unexpected events that may occur that could potentially delay the completion of the deliverables. Also, any risks that the project may encounter need to be identified and mitigated beforehand to save time and money.
- It is also essential to adhere to the budget constraint of the project. Once the project is approved, stakeholders and sponsors need to be able to see constant progress of the project and supervise to see if the project is not having any cost overruns. The goal is to achieve a high-quality project completed in a cost-effective manner in the least amount of time possible.
- A third quality metric is to measure the quality of the product delivered. This is a quantitative measure of the satisfaction from quality and is a customer-focused metric. Defects that may affect the quality can be prevented by consistent supervision/monitoring and prevents the project from failing or not achieving progress. Quality audits can be used to keep track if the user achieved satisfaction from the product.

Risk type	Likelihood of risk occurring	How to solve the risk?
<p>Unable to protect sensitive information securely Data security experts are concerned about the Amazon Alexa's capacity to listen to any commands as well as other voices/conversations. Can it detect other voices or conversations that may potentially violate privacy of an individual?</p>	<p>Quite likely - It has been found that Amazon stores voice recordings from the Echo on its servers to improve its services. So technically Amazon has ownership of the customer's personal information. In the future, it could be possible that Amazon may potentially share the customer's data with other agencies which is considered exploitation of data.</p>	<p>Customers should not expect 100% privacy when purchasing a personal assistant IOT device since the companies have the customer's personal data on their servers. However, users can mute the device instead of leaving it on the always listening mode. A user can also erase old recording through their Amazon account.</p>
<p>Anyone has the capacity to control your device. Even though Amazon Echo has a smart voice recognition software, it cannot differentiate between one voice or another and responds to anyone who says commands followed by Alexa,....</p>	<p>Very likely - A burglar or a criminal could use Amazon Alexa against the user to potentially inflict harm. For example, if you have your Amazon Alexa linked to your home security system, this could present a danger. Similarly, it could cause a lot of harm to store passwords and credit card data.</p>	<p>IOT devices like Alexa are quite convenient to use but they could bring risks. It is important for users to not store any personal information even if it is more convenient to prevent potential malware attacks. There needs to be end-to-end encryption of communication between Echo, the Alexa App and Amazon servers. It is important for the users to create strong passwords on your account and enable two-factor authentication (2FA).</p>

Some initial strategies to initiate the risk management process and to mitigate risks:

- Involvement of the executive board, stakeholders and senior project managers.
- Risk management needs to be a priority and needs to be assessed at the end of each project deliverable.
- In the event of a risk, engineering and project management departments need to communicate risk information and gather the necessary resources to mitigate the risks.
- Risk management could also be integrated into the program's business processes and systems engineering plans. Some steps include identification of cost estimates and risk management tracked along with the project progress.

IV. System Design and Prototype

Architecture

The architecture of our Alexa Classroom Skill is comprised of three different functional parts. The code for the skill itself is hosted on an IFTTT account with triggers configured to catch updates from the client facing Alexa Skill. The Alexa Skill itself is located on the Alexa Developer network where it is configured to take certain inputs from the Alexa Echo unit via voice commands, utterances, and intent schema. We then link the skill to the IFTTT third party back end service via the built in linking system. Once linked and the skill is published, the Skill can be accessed via voice commands. The figure below outlines the connectivity between the three functional parts of the system.

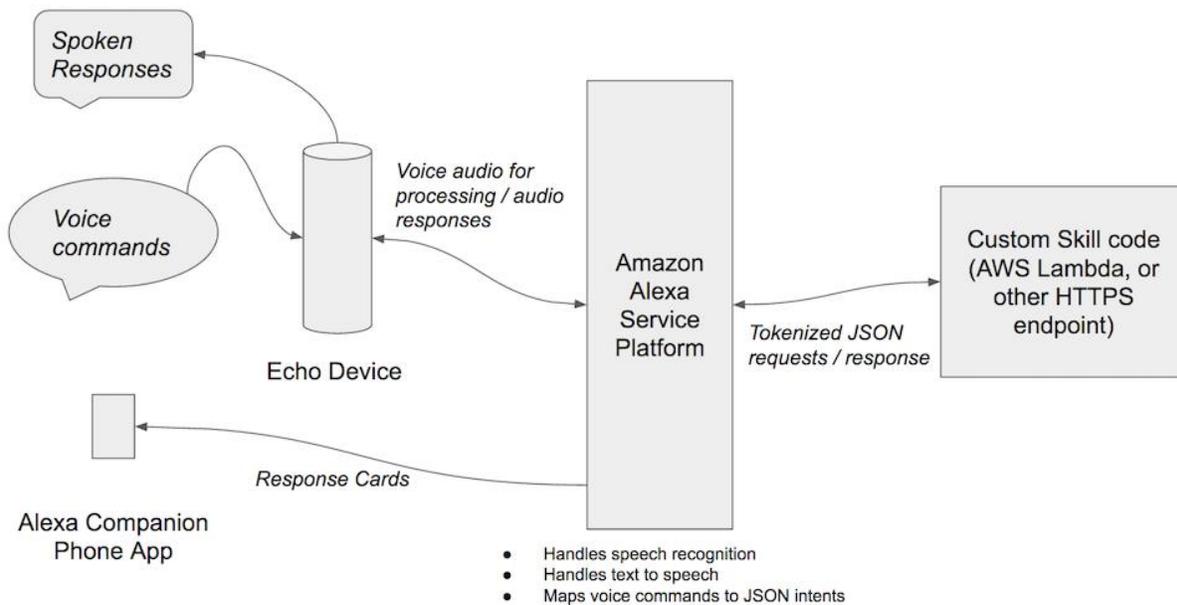


Figure: Build an Alexa Skill, MODUS

Resource Information

The resource requirements in this project include the amount of memory, data file sizes, and disk space needed to fulfill system standards and ensure that no storage capacity issues arise during the development and prototyping of the project. The disk space of physical systems operated must be large enough to support all of the software applications and tools utilized in this integration project and should allow the applications and tools to run without any sort of lag or delay in its performance. The amount of data file space used in the development of this project should not exceed the disk space of the physical systems they are saved on. For this project, we are executing the development of the project on a PC with a maximum hard disk space of 10T, with 8.9T available in its current state.

Network Discussion

The system will consist of multiple devices connected over a local area network. The devices must be a part of the same local network for the system to work properly. The system will make external calls to the Amazon servers whenever commands are issued. Additionally, the connected devices may also access the internet if an issued command requires it. The given use case of this system mostly focuses on classroom engagement and usability; therefore we do not foresee a situation where bandwidth usage is a concern. Some delays are possible if Amazon's servers are experiencing high traffic, but local bandwidth should not be impacted.

Security Architecture

The system is primarily accessible through Amazon's interface, so only authorized users have access to the Amazon Alexa skill. This works to ensure that only authorized users are able to access the device and use it to control the connect devices. The devices that will be used in the system must be connected manually to the Alexa device with an app. Something that will need to be addressed is an unauthorized person using the Alexa with their voice. However, because of Alexa's ability to recognize voices, the system can be configured to only allow previously authorized users to issue commands.

Standards Compliance

The system being created will abide by several standards dictated by the underlying technologies used for the project. The first standard that is being used is the standard Alexa Skills API. This is easily managed through Amazon's development environment. Additionally, we will be using available APIs that allow Alexa to interact with Windows computers, Android devices, and Apple devices. The system as a whole will support standard Amazon Alexa commands.

External Software Requirements

The following list highlights software needed for the Alexa integration as well as describes their functions in the development of the system:

- **Amazon Web Services:** AWS is an Amazon-provided application software platform that offers cloud computing services to its users. In this project, AWS will offer the Alexa capabilities API needed to run the integration system, which allows individual products to specify the interfaces and interface versions they support. The Alexa Voice Service would be hosted on the AWS Lambda computing platform.
- **Microsoft Windows 10 OS:** The Microsoft Windows operating system software will be utilized to allow the function of internet-based software applications, such as a combination of web browsers that will be incorporated into the Alexa skill that is being integrated.
- **Java SE Development Kit:** The JDK includes a complete Java Runtime Environment and tools for developing, debugging, and monitoring the software application. In converting the Alexa skill APIs into plaintext for its compatibility with the Windows OS, the JDK will be utilized.
- **Windows PowerShell:** The shell scripting language responsible for running command line level queries on the host computer.

System Dependencies

For the Alexa integration project to be developed, the system requires a variety of applications, interfaces, and platforms to function between physical systems and software features in the classroom in order for the Alexa skill to be recognized and executed. These dependencies associated with the development of the integration of Alexa in a classroom environment include the utilization of the Alexa Smart Home Skill API, the Alexa Custom Skill Set, the Java SE Development Kit, Apache Maven, and a variety of Amazon Web Services for deploying infrastructure which orchestrates the Alexa services (e.g. AWS Elastic Beanstalk) as well as providing a backend hosting environment (e.g. AWS Lambda). Physical dependencies for this system to function include a combination of classroom-based hardware systems including a PC running the Windows 10 operating system and an Alexa compatible Amazon Echo Device.

User Interface

The Amazon Echo - Alexa integration project's user interface would be very simplistic, as the only physical piece of hardware would include just one Amazon Echo. Now, the user interface is actually Voice User Interface (VUI), which allows people to use voice input to control computers and devices. VUI is what enables voice experiences like Alexa, Amazon's voice service and the brain behind millions of devices including the Amazon Echo. Voice experiences are great when they offer a faster, easier, or more delightful way of doing things.

People are now awakening to the vast potential of VUI. They are engaging in voice experiences beyond customer service and search. They're talking to Alexa to control their lights, play games, and even plan entertainment. For our project purposes we are utilizing this technology to create a simpler VUI in the classroom. Web services and the Internet of Things provide ready-made opportunities for voice. Sensors and readouts, for example, make for natural smart-education integrations.

Testing Requirements

- We would like to develop strategies on how the product will be tested and assess factors such as quality, performance, user feedback, quality improvements. This would also include alpha and beta testing approaches.
- We will provide documentation to end users and clients in the form of product guides, training material and other notes. We would provide information surrounding requirements for security, software and hardware for internal and external systems.
- We will provide a platform for rapid deployment on the side of the client. This would include easy to utilize instructions that the client would interact with.
- We will then check if the quality of the product meets expectations and standards. After which, we will have a support team available after the product is ready to be deployed to provide help to the customer in regard to troubleshooting any technical issues.

Functional testing

We will ensure that the basic functionality matches the information listed on the Amazon Alexa website. We will use our formal release strategy to ensure the process of distribution and product delivery is simple and efficient. We plan to define our application and security functionality

needs beforehand and we will categorize functional requirements into different milestones so that with each milestone, the application meets certain functional standards.

As part of testing, we plan to use the following at the end of each milestone:

Quality measurements, which include bug counts, user/sponsor feedback, key performance indicators, etc.

Quality requirement checks to ensure the product is meeting quality standards and to ensure there are no defects or missing functions in the application being developed

As part of the testing approach, we plan to go through the following stages of testing:

- Pre-alpha: At this stage, the product does not contain all of the required functionality or tools. It can be thought of as a pre-testing stage where the product is still being developed. It provides validation that the product does not have major performance issues and is able to execute at least some functions.
- Alpha: At this stage, the product does not contain all of the required functionality or tools, however, it satisfies some of the basic release requirements. It serves as a preliminary build that can be shared with the project group at a team meeting. However, it may contain mostly software code and partial functionality.
- Beta: At this stage, the product is ready to be shared with the organization as a first version. There may still be bugs and issues present in the system at this stage but it satisfies the release, quality and most of the functional requirements. There is a lot of opportunity to get and apply feedback even if the interface does not look appealing.
- Release candidate: This version of the product meets all of the release, quality, performance & functional requirements that are defined by the scope of the project. This product can then be tested by the executive sponsor/the client team or the executive board. The coding process needs to be completed and integrated into this product version after everyone agrees that no new source code needs to be added. Functional defects may still come up and they need to be fixed before the final version of the product is released.
- General availability release: This is the version of the product that is bound for release and meets all the functional, quality and release requirements. At this stage, there's no known issues or bugs in regard to the functionality or quality of the product. It is a stable version of the product and it is expected that the quality exceeds the client's requirements.

Following these testing stages, the client team will troubleshoot for any issues. The sponsor will specify additional performance criteria if applicable. The accompanying backend code must also be able to be modified freely by a potential client. Additionally, the final documentation must be extensive and fully describe the system and its components. The training will consist of walking the client through the system code and demonstrating how to operate the system front end.

The developer/project team will perform maintenance checks and will modify back-end functionality if needed. The test approach for our system will be performed proactively. The test design process is initiated as early as possible in order to find and fix the defects before and during the build. To avoid customer frustration and increase efficiency, all commands will be tested to ensure functionality and quality.

Risks

For this project, the Project Management Body of Knowledge (PMBOK®) risk management model will be used to identify, carry out qualitative risk analysis to rank the risk, risk response planning and risk monitoring & control to treat the risk.



Figure: Risk Management Approach, PMI

The goals of implementing this model include:

- Avoid or eliminate risks through efficient planning
- Optimize the processes and mitigate the risks
- Reach out to necessary resources to cut down risks.
- Keep the risk level to a minimum and allocate budget for risk prevention.

Quality metrics for this project include the time and cost attributes of deliverables to be completed.

- This project is time-sensitive, and deliverables are scheduled to have deadlines and need to be completed in a sequence. Any issues in planning or execution is going to affect the above constraints and thereby, affects the quality of the project. During the planning stage, the team must also consider any unexpected events that may occur that could potentially delay the completion of the deliverables. Also, any risks that the project may encounter need to be identified and mitigated beforehand to save time and money.
- It is also essential to adhere to the budget constraint of the project. Once the project is approved, stakeholders and sponsors need to be able to see constant progress of the project and supervise to see if the project is not having any cost overruns. The goal is to achieve a high-quality project completed in a cost-effective manner in the least amount of time possible.
- A third quality metric is to measure the quality of the product delivered. This is a quantitative measure of the satisfaction from quality and is a customer-focused metric. Defects that may affect the quality can be prevented by consistent supervision/monitoring and prevents the project from failing or not achieving progress. Quality audits can be used to keep track if the user achieved satisfaction from the product.

Risk type	Likelihood of risk occurring	How to solve the risk?
Unable to protect sensitive information securely Data security experts are concerned about the Amazon Alexa’s capacity to listen to any commands as well as other	Quite likely - It has been found that Amazon stores voice recordings from the Echo on its servers to improve its services. So technically Amazon has	Customers should not expect 100% privacy when purchasing a personal assistant IOT device since the companies have the customer’s personal data on

<p>voices/conversations. Can it detect other voices or conversations that may potentially violate privacy of an individual?</p>	<p>ownership of the customer's personal information. In the future, it could be possible that Amazon may potentially share the customer's data with other agencies which is considered exploitation of data.</p>	<p>their servers. However, users can mute the device instead of leaving it on the always listening mode. A user can also erase old recording through their Amazon account.</p>
<p>Anyone has the capacity to control your device. Even though Amazon Echo has a smart voice recognition software, it cannot differentiate between one voice or another and responds to anyone who says commands followed by Alexa,....</p>	<p>Very likely - A burglar or a criminal could use Amazon Alexa against the user to potentially inflict harm. For example, if you have your Amazon Alexa linked to your home security system, this could present a danger. Similarly, it could cause a lot of harm to store passwords and credit card data.</p>	<p>IOT devices like Alexa are quite convenient to use but they could bring risks. It is important for users to not store any personal information even if it is more convenient to prevent potential malware attacks. There needs to be end-to-end encryption of communication between Echo, the Alexa App and Amazon servers. It is important for the users to create strong passwords on your account and enable two-factor authentication (2FA).</p>
<p>We have a limited amount of time where the project needs to be developed, tested and handed off to sponsors for approval. Given the time constraint, one employee may be unable to spot all errors in regard to functionality and performance aspects before the testing stages.</p>	<p>Very likely - It is risky to leave the execution and performance checks just before the project handoff stage. This could cause huge performance issues in the testing stage.</p>	<p>It is important for the consultants, project coordinator and other team members to check for performance issues in the applications through Key Performance Indicators (KPI) at the end of each week to ensure the product is following the scope. This needs to be done by all team members and not just one team member to ensure any bugs are identified beforehand and to avoid quality compromise due to the fast-paced timeline.</p>

During the development stage, Amazon Alexa should not include malicious hacking links that allow other people to spy or track the user. It should also not contain any skills/tools that would potentially misuse the user's personal information.

Some initial strategies to initiate the risk management process and to mitigate risks:

- Involvement of the executive board, stakeholders and senior project managers.
- Risk management needs to be a priority and needs to be assessed at the end of each project deliverable.
- In the event of a risk, engineering and project management departments need to communicate risk information and gather the necessary resources to mitigate the risks.
- Risk management could also be integrated into the program's business processes and systems engineering plans. Some steps include identification of cost estimates and risk management tracked along with the project progress.
- We would potentially create a Risk/Impact Probability Chart to determine the risk level and the effect it would have on the product and to prioritize our risks during the Project Planning stage.

Prototype Status

The Alexa Classroom Skill Prototype has entered development and is currently being built on the AWS Lambda instance. Once the Skill has been published, it can be found at the skill location below. A functional prototype will be available for testing in the coming weeks, as the publication of the skill can take from a day to over a week.

Amzn1.ask.skill.405ee46c-5456-4e41-9a70-cd07c440ca47

V. Project Hand-Off Plan

Description of Final Solution

The Alexa integration system our team has created is an efficient way to easily access educational websites, lock workstations by a simple voice commands through Amazon Echo's assistant Alexa. In simple terms it works through java programming, PowerShell scripting, Dropbox, If This Then That (IFTTT) and Amazon Echo. All these assets are integrated together and work conjunctively to the customers desired task. In this case our team will use "Pennsylvania State University" as an example. The current triggers we have for the system are listed below:

Triggers:

Google Chrome
Canvas.psu.edu
LionPath.psu.edu
Amazon.com
Linkedin.com

Desired Ideal Solution

The ideal solution to the system our team has created would be to fully integrate these commands and triggers to work solely with Amazon's AWS cloud instead of IFTTT and Dropbox.

Currently IFTTT appends a text file to Dropbox which is scanned by a java program and which is then executed by PowerShell to perform the command the user wants.

This differs from the ideal solution because it uses multiple things at one time instead of just processing everything through the AWS cloud. By getting this on the AWS only is would cut down on a few seconds of delay to process everything

Hand-Off Plan

We would hand off this project to a potential client by providing them with instructions of how to connect their Amazon Echo Device with our Alexa skill. This process is slightly more complicated because it is not an officially recognized Skill in the Amazon store, but the functionality remains the same. The first step is to provide the client with access to the Dropbox folder that contains the code that runs the Alexa Skill. Next, the client will create an account on the IFTTT (If This then That) website, which allows the Alexa to execute code based on a voice command. Details in the User Guide will provide exact instructions on what to enter on the IFTTT page, but the client will enter the voice commands that are supported by the system into the IFTTT interface that corresponds to our Alexa Skill. Finally, the client will install Windows PowerShell, which needs to be open on the host computer. After that, the initial handoff is complete. The ongoing building upon the deliverables can occur in several ways. First, by directly modifying the provided code and updating the IFTTT page, the client can add whatever additional functionality they want. Second, the client can make the system and official Alexa skill to allow for a more seamless deployment in the future.

Lessons Learned

Throughout the course of this project, there have been many experiences in the design of systems like these that have taught our team valuable organizational lessons. We have learned that communication and organizational alignment is vital when tackling a vast and detailed project like this. We also took away a vastly bigger understanding of the details needed to produce a compelling integration, implementation, and prototype such as the one detailed in this project. Utilizing the Project Management techniques that we learned throughout the course, we were able to identify target areas of the project, delegate tasks efficiently and effortlessly, and complete any action that was needed in order to fulfill our goal. Our end prototype was slightly different than what we envisioned in the start of this project, but we believe that our hard work and dedication to the project helped us build something that we are proud to utilize.

Future Potential Work

In the future, we would like to add more interactive commands on the IFTTT interface and make it more personalized to the user. We would like to export it on the AWS website and make it more efficient. Currently, the commands are executed in a step-by step fashion where Alexa executes the code based on voice commands on IFTTT website and then passes it on to Windows PowerShell on the host computer for execution, but we would like to optimize this process to make it much more quicker and avoid any interruptions/discrepancies during this process. We would also like the client to have the ability to modify the code, the official Alexa skill set and add any additional specialized functionality according to their personal preferences. If possible, we would also like to make the process of connecting the Amazon Echo device with Alexa skill more efficient with improved functionality, reduced processing time and make the process more user-friendly. We would also like to provide more troubleshooting support for users using Alexa on the Amazon Echo device (both online and offline support).

User Guide

The essential user guide for use of our solution starts with these steps:

- Create a Dropbox account
- Download our Dropbox Folder locally (INSERT LINK)
- Create an IFTTT.com account
- Create an Amazon account with Amazon Prime
- Purchase an Amazon Echo (or another Alexa compatible device)
- Link the user's IFTTT account to their Dropbox and Amazon accounts

Once those steps have been completed, the user will have an IFTTT account that is linked to both their Dropbox and Amazon accounts. This is a vital step, as in order for our prototype to function, the user must have these connections established. The next steps in utilizing our prototype is setting up the IFTTT functionality. The user must:

- Log into the user's IFTTT account
- Select the Amazon Alexa trigger and name it 'google' (or whatever the user would like to name it)
- Select the THAT trigger and select to append to a text file
- Enter 'start chrome google.com' in the command prompt line

Once these steps have been completed, the user will have established all endpoints for our prototype. To utilize, all the user has left to do is open the PowerShell file in our Dropbox folder and speak the command to their connected Alexa-compatible device. An example of this syntax is as follows:

- “Alexa trigger google”

After this set up, users will be able to trigger any command that they require to accomplish in-the-classroom tasks, such as searching for more content on a topic, or opening new instances of webpages on their machine.

IV. References

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