HEALTH CARE BOT

Project plan

Project: Project Integration

Company: Saxion University Of Applied Science

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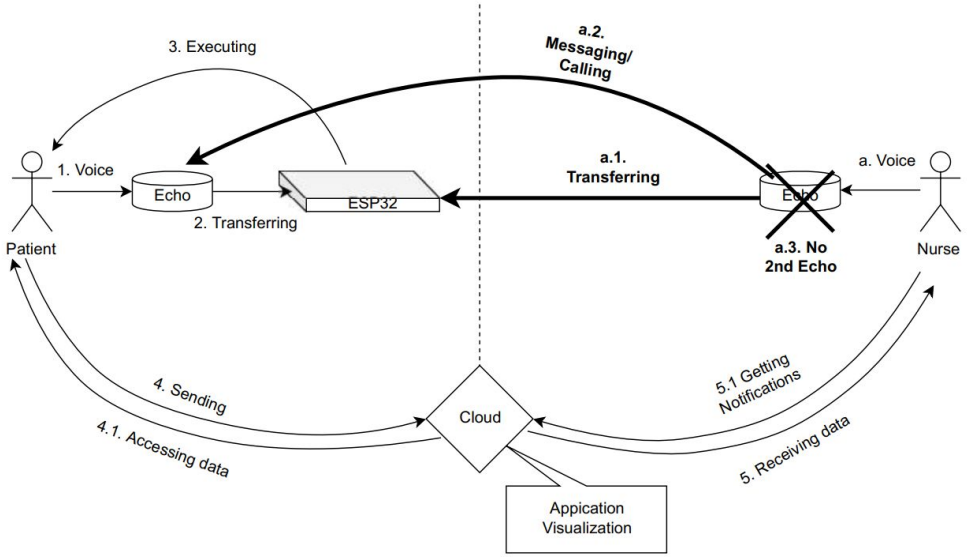
1. Background

The project is provided by Saxion university of applied science and by Johan Stokkink (project owner), Ramazan Kirmali (software instructor), Umit Guler (hardware instructor). There are six members in the team. Including three students from applied computer science (ACS) and three students from (EIE). ACS students perform in software part and EIE students perform in hardware part. The purpose of this project is building a smart healthcare bot. The team has to decide the concept of the device. The product has to has the special help hardware. This project will utilize the ESP32 community with Echo Dot (Alexa) to control the device. Echo Dot is a device which recognize the voice and transmit requirement to another device. The project carries out at university and working home. Each week, the team has to spend at least one hour for meeting to follow the process between hardware and software and one-time meeting with project owner. The project carries out following the v-model and testing each phase.

2. Project Result

The final result of this project is creating the mobility device, which assist of power supply, relating to healthcare and communication by ESP32 and Echo Dot. The team decide building a heartbeat measurement, notice and alarm to nurse when emergency case – too high or too low heartbeat rate - the data display in the graph in application on PC.



(1) Patient use voice to control Alexa to do something.

(2) Alexa receive voice from user then transfer to ESP32 to perform heartbeat measuring.

(3) ESP32 control the sensor to execute measuring process.

(4) The result will be visible through application.

(5) Nurse can receive the result and notification from application.

(4.1) (5.1) Patient and nurse can access to application to follow the data.

Basically, this is the ideal concept for a healthcare BOT will work with the Alexa. However, there are three main scenarios for Nurse to perform the next action:

a. The 2nd Echo Dot will directly transfer the voice command to the ESP32 which as the same principle as the 1st Echo Dot. However, for this time, nurse will be the one who give command.

b. The 2nd Echo Dot will be used to make the contact to the patient by using the sending message/ making call of Echo Dot. By that way, instead of using phone, patient can be reminded to do the measurement themselve.

c. There will be no 2nd Echo Dot. In this case, the nurse will come directly to the patient's room to do the measurement.

S - Specific

What: The main hardware device is ESP32, Echo Dot and heartbeat sensor

The programing language is micro python to upload to ESP32 and communicate with Echo Dot. Data is stored in table by MySQL and push to the local server. The data display into a graph with the timeline. The data is secured by log in.

Why: Learning how to use Alexa

Learning how to use ESP32 and how to connect ESP32 and Alexa

Realizing data acquisition by sensors and display in graph to user

Learning how to implement and use wireless or Bluetooth system

Improve calculation, measuring, design circuit and testing

Who: All members of the team

Where: Saxion University of applied Science

M - Measurable

Hardware part

EIE team design PCB and hardware instructor will check the design.

The PCB is checked the connection and calculated.

The software is tested each phase and explain clearly

A – Acceptable

The team need to have the skill with design PCB, research, calculate and test component to build the main board for product. The team also need experience with programming especially C language or micro python to create the communicate with ESP32.

R - Realistic

Both ACS and EIE team have basic background. The ACS team has to wait EIE finish their part.

T - Time

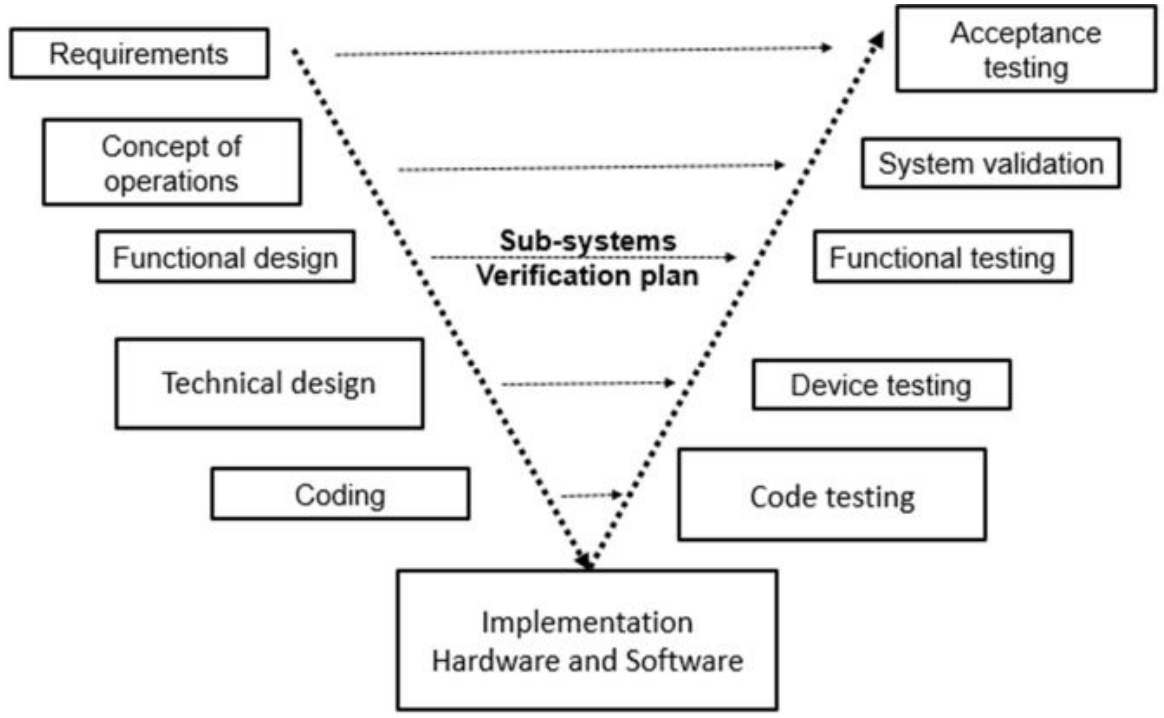
All the documentation will be finished first and within 5 weeks. Beside that, the hardware and software part ignite by drawing demo and testing connection between ESP32 and Echo Dot by making a small test with LEDs. After finishing all documentation, the hardware team start to build the PCB and testing. The software team also start up with ESP32, Echo Dot, sensor and database. The time of each phase is stored in Gantt chart.

3. Project Activities

Planning Activities

The V-model methodology have been used to indicate the process development of our group project - Healthcare bot. The V-model is a graphical representation of the systems development process and it facilitates the understanding of the complicated developing systems.

The V-model also demonstrates the progression of activities to be process during the project life cycle and focuses mainly on the execution phase. It also describes how the outcome product has been produced during the execution of the project.




Research
• What is ESP32?
• What is it used for ?
• What is Alexa? Can it be connect to ESP32?
• What kind of Database should be used ?
• How to connect ESP32 to wifi or bluetooth ? How to make the communication between ESP32 with Alexa?
• How to use voice control from Alexato perform actions withESP32 (heartbeat measuring)
• Which type of monitor can be used for the mobility devices ?
• What is the funtion of heat-beat sensor ? How can we use it to measure patient heat-beat ?
Analysis
• Researching documents, collecting resource
• Making methodological overview
• Inspect the components specification.
• Highlight the important statics information for software and hardware part
• Confirm the flaw of the process would have and provide the solution
Planning
• Give anouncement for any important ocassional (group meeting, implement phases, etc...)
• Make schedules for each stage of the project and handouts works for each member
Executing And Testing
• Design development board/ warm up programming test
• Sketch analogical diagram and design PCB layout
• Calculate and check the components value in details
• Making report for every steps/phases
• testing prototype for errors and hand over to project owner and instructors fro review and get feedbacks
• Finalizing the final product + final report of the product
Finishing
• Demonstrate the product
• Complete the report after check content of the project
• Give the explantion and application of the product

Methodological Overview

Research:

- Give details information of your project and discover knowledge to reach the demand of project.
- Searching information, instruction of ESP32.

Analysis:

- Detailed examination for the project in other to understand more about the project and also to reduce the error that would make in the.

Planning:

- Make the timeline about the activities required to the project.

Calculation:

- Calculating the power supply, components for the PCB.

Executing and Testing:

- Performing and testing the project before the final stage of the process.
- Each hardware part and software part would be tested each phase.

Finishing:

- Complete the whole process of the project.

Categories	Option 1	Option 2
Microcontroller	ESP32	ESP8266
Heartbeat Sensor	Pulse sensor (https://www.sparkfun.com/products/11574)	MAX30100 (https://www.robotistan.com/max30100-heart-rate-sensor)
Voice Assistant	Amazon Echo Dot	Google Home
Battery	Pin Li-Ion (Lithium-ion)	Pin Li-Po (Polymer- ion)
Development coding language (Microcontroller)	C programming	MicroPython
Development coding language (Database)	MySQL	Microsoft SQL server
Development coding language (Server + GUI)	Java/JavaFX	C++
Display Monitor	OLED Display SPI connection	LCD
Mechanical system	Motor	Sevor

Microcontroller for Stationary	Arduino Uno R3	ESP 32
Power supply for Stationary	AC voltage (using cable connect with DC transformer)	DC voltage (using battery)

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Development coding language (Microcontroller)	C programming	MiroPython
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4. Project Boundaries

The project has a 16 week duration period starting from 13 February 2019, excluding the vacation weeks of the school. During these period the project team is assigned to work on the project activities and make the final product which is the health care bot .

During these period time the project team is responsible :

Must have	Should have	Could have	Not have
● Build a healthcare bot that can connect with Alexa and ESP32. ● Make a mobility device for user with the OLED screen. ● Programing language for ESP32 are C++ or micro python. ● To design a PCB for the final product which include the electrical design.	● For the final product to use a wireless radio system. ● Realizing data acquisition by a computer and graphical presentation of this data to the user. ● To make the total price of the final product within the budget.	● Conduct the housing of the final product. ● Having a clearly GUI with timeline. ● The security for application.	● Too many things in mobility device ● The product is not illegal

5. Intermediate Result

The result for each activity in section 3 (project activities) of this project plan would be specify in this section. Some of the activities have a sub-activity to achieving that specific phase intermediate result. The following would show what the intermediate result are for each project activities:

Preliminary design phase:

- The project team is ready to proceed to the other phase.
- The project plan documentation is completed.

System requirement phase:

- A enthusiasm client for the final product.
- A finishing system requirement documentation.

Functional design phase:

- The functional design documentation is completed.
- The PCB is for an ESP32 with an analogue circuit, a digital sensor and an OLED display is made and program it by using Arduino IDE ESP32.
- The research for the ACS of the group is completed : build a health care bot that can connect with Alexa and mobility device.

Technical design phase:

- The technical design documentation would be completed.
- Every detail in electronic, mechanical and software is completed.

Realization:

- The prototype is made in separated modules.
- The realization of the prototype is being made.

Module Test:

- The result for each part in electrical module and mechanical module are correct.

Sub-system Test:

- The result for the whole electrical module and mechanical module is achieved.

Factory Acceptance Test:

- The prototype is achieved.

Site Acceptance Test:

- The heartbeat sensor is develop and fully-functionality (the optional function can be ignored.)
- The final report of the whole project is completed.
- The presentation of the project would be conduct which means the project is completed.
- The presentation of the project would be conduct which means the project is completed.

6. Quality

As the mention of the project results and project activities, the final product should be fitted with the minimum requirements. All the necessary tests should be performed to check the functionalities and quality of the final product. The task is a healthcare Bot by using voice control (Amazon Echo Dot - Alexa) to perform healthcare actions. In this case, the Bot will measure the heart beat of patients and send the data back to Alexa in order to save it to the storage. To do those functions, both hardware and software part should be tested carefully by all team members with the following requirements :

- Hardware:
    - Be able to uploading code and PCB should be 100% working well
    - The final product made by a good material and high-quality component that will be meet a safety for medical standard.
    - Testing and measurement is calculated carefully to make sure that it won't cause any damage to the user.
- Software:
    - The code should be contained all function basing on the ESP32, heartbeat sensor and Alexa to built up a system for a perfect BOT.
    - Debugging the code with the prototype by using the ESP32 development board from manufacturer before uploading to the self-build ESP32 development board for errors.
    - Demonstrating the prototype to get feedbacks and improving later.

Those test will be executed in every stage of the project to make sure everything will go well and reduce problems as much as possible.

Beside checking and testing procedure by all team members, it should be also tested and reviewed by project owner and instructors before official releasing. After reviewing and everything working fine, a final report will be delivered to project owner and for customers to see a very detail information of the product.

7. Project Organization

This project will be carried out by 6 people of group 10. So the designing, documentation, quality control will be divided into some parts and each and every members will do their parts and at last we will combine them. Whereas Johan Stokkink,U. Guler and R. Kirmali will be supervisor for the project.Once a week or in 2 weeks there will be a meeting with the supervisor of the project.Members can access the supervisor through mail or by going to his office at school if necessary.

As mentioned in the above table, all members has different task in the project. Whereas Johan Stokkink (Supervisor) will be monitoring the project.

Name	Role	Email address
Shyam Shiwakoti	Member	426021@student.saxion.nl
Hong Trinh	Member	438443@student.saxion.nl
Phuc Le	Member	456061@student.saxion.nl
Minh Thanh Nguyen	Member	444856@student.saxion.nl
Minh Le	Member	467475@student.saxion.nl
Van Nguyen	Member	444878@student.saxion.nl
Johan Stokkink	Project Owner	j.s.d.stokkink@saxion.nl
U. Guler	Supervisor	u.guler@saxion.nl
R. Kirmali	Supervisor	r.kirmali@saxion.nl

8. Planning

All the planning and week assigned for certain documentation or task are mentioned. The project is for two quarters (about 6 months) and it is shown per week what the tasks are. Members work on this project for 2 days a week around 5 hours a day.

The schedule for deliverable can be seen below,

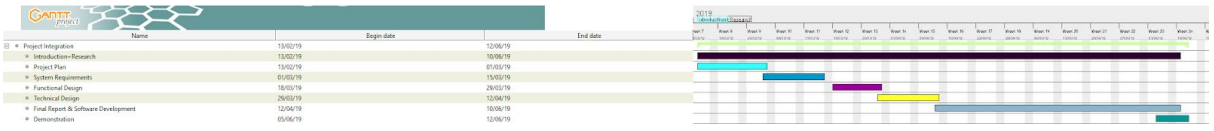
Week	Deliverable	Date	Grading
3.2	Project Plan	Feb 29	Pass/No Pass
3.4	System Requirements	March 16	Pass/No Pass
3.6	Functional Design	March 29	Pass/No Pass
3.8	Technical Design	April 13	Pass/No Pass
4.6	Final Report	June 12	0-10
4.6	Final Demonstration	June 13	0-10

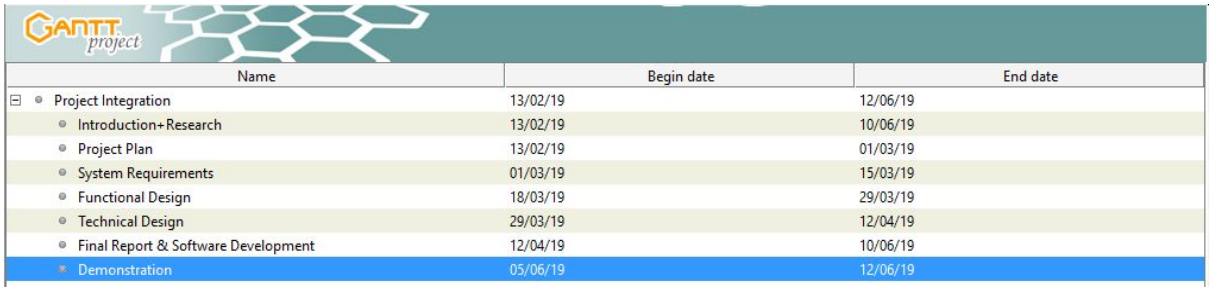
Milestones during the projects : Each Week Supervisor Meeting

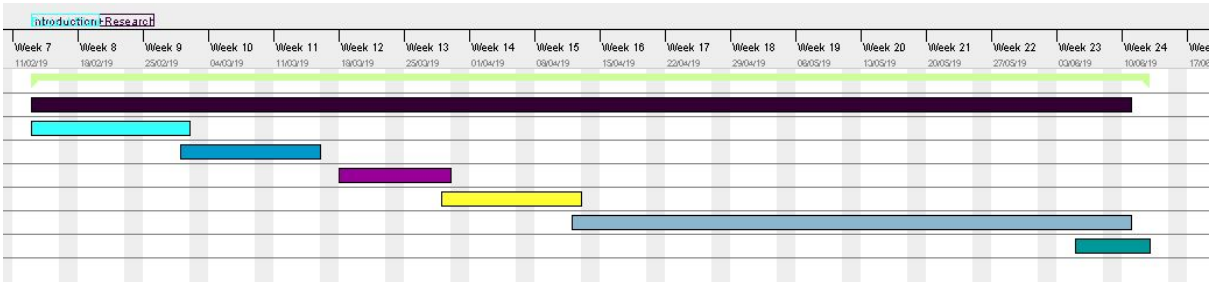
Work Space

➔ The work place for this project will be Saxion W2.42,W2.43 and W2.44

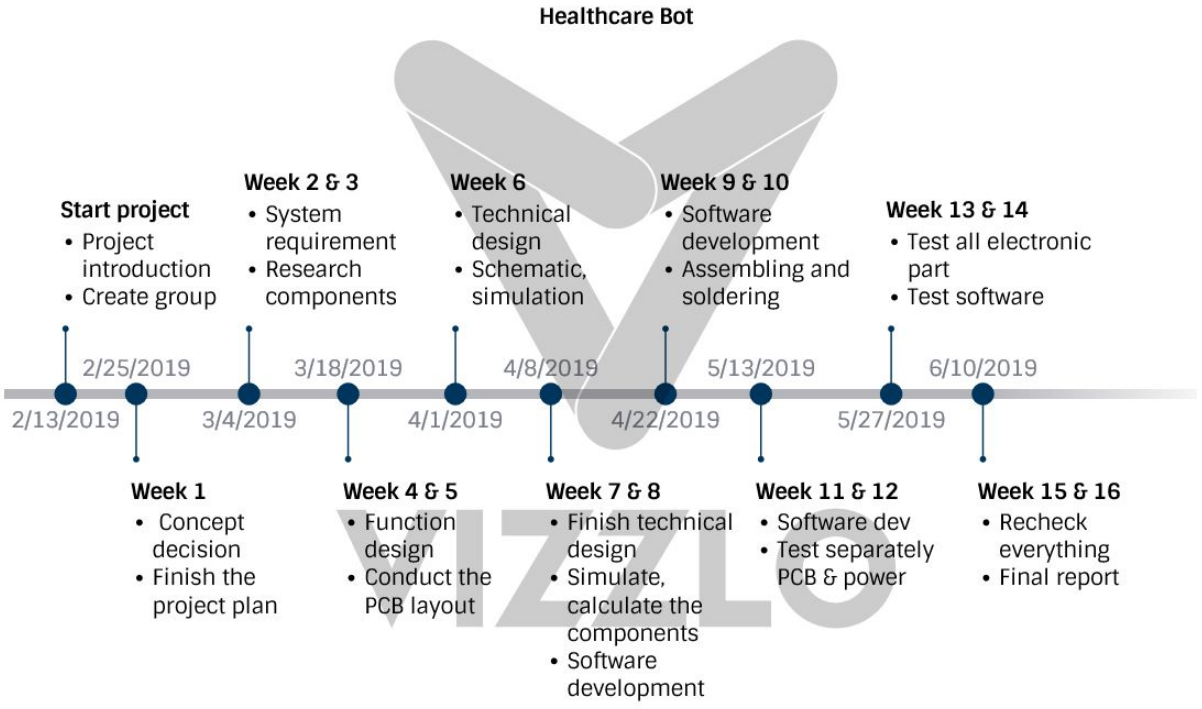
Gantt Chart







The initial plan of whole project in milestone:



9. Cost and Benefits

Costs

The fund of the project is supported by Saxion University, the group do not have to pay for the costs of the components that are needed for the system. Beside the main components for the system, the group is also supported some small components such as capacitors, resistors which are needed for the research and the system

The system need:

- Mobility device (Smart Wristband)

Name	Costs(Min-Max)(€)
Heartbeat Sensor	15-25
Display	5-11
Micro-Controller	15-30
Wifi(Bluetooth) module	10-15
Charging battery	20-25

- Stationary device (Alexa)

The group receive 1 Alexa bot from Mr.Stokkink to do the research and apply into the system with the SD card in order to save the data

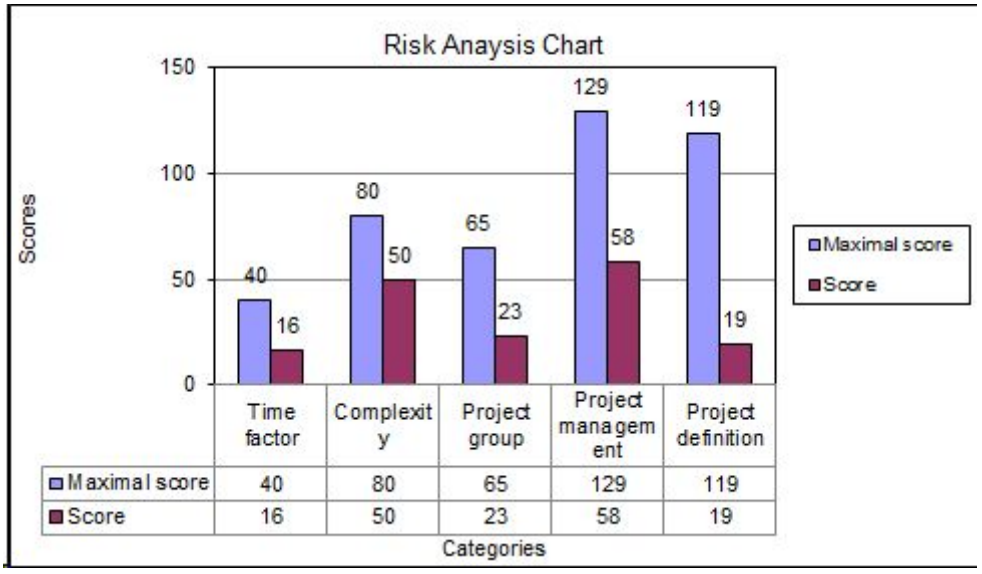
Benefits

For EIE students: This project give the students a practice for their subjects on class. The students can gain experience about PCB design, research skills, group work

For ACS students: This project give the students a practice for their subjects on class. The students can have more experience about Microcontroller, C language, programming, research skills, group work.

10. Risk Analysis

Internal risk:
PCB broken - with less experiences about designing and printing new PCB, soldering components that might broke the PCB.
Components connection - Soldering is the most hardest process that can corrupt the PCB making process if the PCB is burned while soldering.
Time for new programing language - This project require new programming language which is MicroPython that require ACS student has to study, practice and programming it to the ESP32 as the requirements of the project owner. It will cost much time for learning, practicing to be really understanding.
External risk:
Time for receiving components from manufacture.
The connection between software and hardware can have problem.



The given graph illustrates the potential risks that might be occured during this project. As it can be seen, each categories has two columns which the blue is stand for the maximum risk that can be happened while the other one is presented for the calculated risk. Except the complexity and the project management have the calculated risk that mostly half of the maximum risk, the rest has small impact on the project. Therefore, the team should be focused on the management of the project and the complexity of the project to reduce as much as risk possible to make all phases will be gone well and face with less issues.