9/28/2017

Advanced Software Process |CPSC 544 INSTRUCTOR- PROF. CHANG-HYUN JO

Homework 1

Team 1

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Revision Table

Name	Work Description	Date
Saranya Arunachalam	Read and understand the Homework 1 Outline	8/30/2017
	Distribute the work to the team	8/31/2017
	Discuss the process of Scrum and XP programming with the team	9/1/2017
	Work on the Iteration 1 process and create the App accordingly	9/6/2017
	Work on the Iteration 2 process and create the App accordingly	9/12/2017
	Work on the Iteration 3 process and create the App accordingly	9/18/2017
	Acceptance testing of BubbleSort App	9/18/2017
	Demo Presentation of Bubble Sort App	9/23/2017
	Create Revision Table, Table of Contents, Figure list, Team Charter, Evaluation Sheet	9/24/2017
	Final changes to the report	9/24/2017
	Consolidate the Final report and send for team review	9/24/2017
Charushila Awhad	Read and understand the Homework 1 Outline	8/30/2017
	Discuss the process of Scrum and XP programming with the team	9/1/2017
	Work on the process for the project	9/2/2017
	Work on the initial stage of Pre-gaming	9/4/2017
	Work on the initial stage of Planning	9/5/2017
	Work on the initial stage of Staging	9/6/2017
	Review the report and presentation	9/25/2017
Ketaki Shikarpur	Read and understand the Homework 1 Outline	8/30/2017
	Discuss the process of Scrum and XP programming with the team	9/1/2017
	Work on the Iteration 1 process and create the App accordingly	9/6/2017
	Work on the Iteration 2 process and create the App accordingly	9/12/2017
	Work on the Iteration 3 process and create the App accordingly	9/18/2017
	Unit, Functional Testing the BubbleSort App	9/18/2017

	Final inputs and changes to the report	9/24/2017
	Review the report and presentation	9/25/2017
Sonal Patil	Read and understand the Homework 1 Outline	8/30/2017
	Discuss the process of Scrum and XP programming with the team	9/1/2017
	Define the work products, roles and practices	9/8/2017
	Work on the Pre-gaming, Planning and Staging	9/9/2017
	Work on the Vision, Requirements	9/10/2017
	Work on the Product Backlog, Architecture Spike	9/11/2017
	Work on the Release Planning, Technology Preparation	9/12/2017
	Review the report and presentation	9/25/2017

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1. Process Defined for Project

1.2 Process in terms of Scrum and XP:

For our project, we decided to have a blend two well know software development methodology which are Scrum and XP (Extreme programming). The mixing of Scrum and XP gives various is by far the most common mix and is advantageous to our project. The scrum which uses all important tasks such as Sprints, daily Scrums, retrospectives, burn down charts, and so on, and on the other hand XP's handles TDD, refactoring, pair-programming and JIT design via User Stories.

The scrum is a software development methodology which is mainly used for improving the software quality and the responsiveness to the changing customer requirements and the Extreme programming (XP) takes its name for the idea that the beneficial elements of tradition software engineering practice by taking it to an "extreme" level.

1.3 Pre-Game (Planning and Staging in Scrum- Exploration and Planning in XP):

1.3.1 Planning

In this phase, the stakeholders come together to understand the customers' requirements. After the requirements are understood the Product Owner creates the Product Backlog. Based on the Product backlog the scrum team will build the Sprint Backlog. To build the software product the scrum team needs to collect ample of information regarding the project. The planning will help development team to create a high-quality product to meet the customer's expectations. Planning will also help to estimate the budget from customers and to allocate the resources that will be used while developing a software product. A plan will help to meet the deadlines and customers' requirements.

Activities:

Vision:

The vision is the conditions that must exist when the project is complete and articulates the goals of the product.

Allocate Resources:

Resources can be anything that will need to complete the project such as money, supplies, stock, and staff. Allocation of resources will help in timely completion of the project with effective functionalities.

Allocation of financial resources is very important. Proper allocation of the fund will result in the project's success.

Product and Sprint backlog:

The Poduct Backlog is a document that consists of a list of user stories, user stories based on the priority, number of task that is required to complete the project successfully. Product Owner owns the Product Backlog. The Product Owner will prioritize the product backlog based on customer's feedback and business values.

The Sprint Backlog is a product backlog subset. In every sprint, the scrum team will pick the prioritized user stories from the product backlog in the time box frame. The product owner will set the sprint goal for the team.

Most commonly the sprint backlog consists of:

- Features and tasks
- Technical work
- Training
- Quality plan
- Bugs

Risk Plan:

It is important to have a risk log and an action plan to handle the unplanned things in the project. It will help to handle the risk impact and suitable action need to resolve unexpected events. It will help to progress of the project as per plan.

Evolution Plan:

Evolution plan is important to know the missing requirements.

1.3.2 Staging

Staging will help to recognize more requirement compared to the planning phase. After collecting all requirements, we will prioritize these for the first iteration. The staging phase will be used to simulate the product development environment.

Activities:

Planning:

Planning in staging phase will check for overlooked requirements.

Prototyping:

Prototype involves the preliminary model of the product that we will build.

Design:

Before development phase, it is important to focus on the design phase. It will allow building the Class-Responsibility-Collaborator (CRC) card and prototype for development. Some of the main activities of this process are to build prototype, mockups and creating CRC cards. The design phase will help the development team to provide high-level and skeleton of the final product.

One important thing is that this design or prototype will not be a final product. It will just provide an idea or guideline to understand the some of the product's functionalities. The design may change or modified as per changing requirements from customers and to adapt the changing technologies.

Now with the help of story cards, requirement and design, Developers can start the development.

Development

Development Process flow:

- A product owner will create the prioritized client's requirement list known as a product backlog.
- In sprint planning, the team will select prioritized requirements in the form of user stories known as sprint backlog and decide how to implement these requirements.
- The team will have some amount of time mostly two to four weeks to complete this work.
- The team meets each day to assess the progress (Daily Scrum meeting) and Scrum Master keeps the team focus.
- At the end of each sprint, the work must be shippable to the customer.
- The sprint will end with sprint review and retrospective.
- Next sprint will begin: The team will choose the next chunk of requirement from the product backlog and begin working team again.
- The cycle repeats until the product is complete.

In this way, the programmers will start making the iteration plan and sprint backlog from the customer's prioritized **Story Cards**. Customer or client will always identify which part should be implemented in which sprint.

After setting up the first **Sprint Backlog,** developers will start the coding. At the same time, the client's (with the help of tester) and coders will write the test scripts for the part they need to build in the first sprint.

Now apply the test on the code to see the system part is working properly or not. And if it is working properly then see its functionalities.

After completing each sprint everyone must attend the **Sprint Review** meeting to go through the tasks that have been completed and if possible perform acceptance testing with the client to validate and verify the required work done. Also, start planning for next sprint or Iteration.

It is still possible to modify or change the product backlog. As the client or customer is onsite, any changing requirements will be welcomed by developers. Some requirements may be added or modified.

After adding and modifying some requirements. It may possible to modify the work already done. So, some rework may be needed as per client's changing requirements.

After completion of every parts code and tests, bring all these parts together and test as a whole. Apply integration, validation and verification test of the product and make the system ready for next phase.

Release (Release in Scrum and Productionizing in XP):

It is one of the important phases of the agile process. It again makes sure that team has given continuous delivery of the product to the customer, also QA and testing team again make sure that they delivered a high-quality product that has no bugs and errors.

There are many activities involved in a release such as:

1. Product documentation
2. Training and implementation
3. Marketing

When the product is ready, it is important to document and to include vital details for future reference and easy understanding of the client. This documentation is also important to make sure that the developed software is clearly understandable for future references.

Training and implementation are also one of the important phases of the release. The developed product when ready for release, setup and implement this in the client's environment and teach or train the client's side employees. In this training, the consultants will teach the client's sides team members some basic steps that need to perform while working with the software system. Many forms can follow to train the client-side employees such as practical training, videos and information sessions.

Marketing is one of the main aspects, especially in product based organizations. Whenever the organization delivers a system to the market. The marketing team and the consultant will make sure that the client has complete awareness of the product delivery to the market.

At this stage, the first version of the system will be released and is ready to install and use.

Maintenance:

Maintenance fixes the error or bug in the software product after release to improve the performance of the product and to add the new features as per the changing demands of stakeholder or customers.

There are various scenarios to enhance the system performance and fixing the system:

1. During the development phase, engineers may find the better time and budget estimation. They may realize that the system will not complete with all these requirements. They will make an agreement with the customer that they will omit this unnecessary requirement in this cycle and will release it in next version.

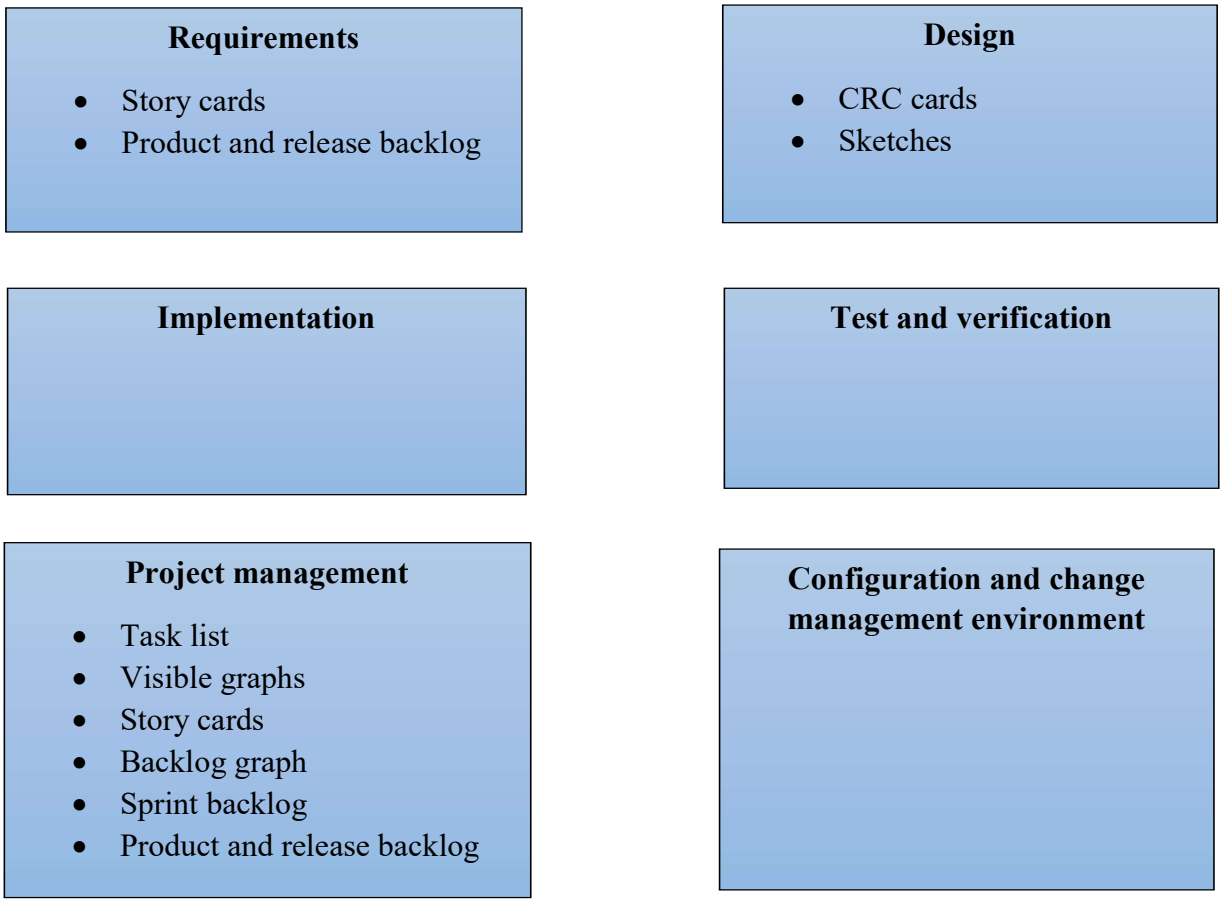
2. After Acceptance Test, if some problem occurs that the client and team agree to fix them in the first release. The engineers will fix the bugs and customer will agree that everything is acceptable in the first release, then the first version of the software product will be released.

Software maintenance of Agile model:

- Projects with the Agile model will provide the bug reports or story cards.
- Developer estimation.
- The client prioritizes the bugs.
- Common bug tracking Database.
- Quality Assurance team prioritize test and write functional acceptance tests.
- Programmers write failing unit tests.
- Developer fixes the bug and runs the unit test and functional tests.
- Perform Regression test.
- New system release.

2. Work Products, Roles, and Practices

2.1 Work Products



2.2 Roles:

Product Owner: The product owner is the sole person to manage the product backlog. Responsible for project outcome and setting up project priorities. Choose the sprint goal and review the product at the end of each sprint. Also, responsible for the business value of the project.

Scrum Master: The Scrum Master is responsible to make sure that the Scrum team lives by the scrum values and practices. Scrum master mainly considered as a team coach who mediates a daily scrum meeting and conducts the sprint reviews.

Scrum Team: Collection of individuals mainly developers and testers working together to deliver the working software.

	Iteration 1	Iteration 2	Iteration 3
Product Owner	**Saranya**	**Ketaki**	**Sonal**
Scrum Master	**Ketaki**	**Sonal**	**Saranya**
Scrum Team	**Charu**	**Sonal**	**Saranya**
Scrum Team	**Saranya**	**Ketaki**	**Sonal**
Scrum Team	**Sonal**	**Ketaki**	**Charu**
Scrum Team	**Ketaki**	**Saranya**	**Sonal**

Chicken: The other members who can observe but not interfere or speak during an iteration such as Stakeholders, managers etc.

2.3 Practices:

Requirement Phase

- Pre-Game Planning
- Planning Game
- Onsite Customer
- Acceptance Testing
- Sprint Planning
- Sprint Review

Design Phase

- High-level design
- Simple Design
- Frequent Refactoring

Implementation Phase

- Pair Programming

- Coding Standards

Test and Verification

- Unit testing
- Acceptance testing
- Sprint Review

Project Management

- Project Game
- Stand-up Meeting
- Sustainable Game
- Chicken and Pigs
- Self-organized and self-directed Team
- Daily Scrum
- Sprint Planning
- Scrum team

Configuration and Change Management Environment

- Common Room(Preferred)
- Planning Game
- Continuous Integration
- Daily Build (Scrum)

3. Pre-Game Planning and Staging

This is the first stage of the project. The initial purpose is to discuss the requirements with stakeholders.

In this project, Saranya, Ketaki and Sonal are the project owners in Iteration 1, Iteration 2 and Iteration 3 respectively. Their responsibilities are to communicate with stakeholders and knowing the product vision as well as finalizing the user stories from product backlog for sprints.

4. Vision

The vision of this project is to create the "Bubble Sort" android application by following the process in an Agile environment through the combination of Scrum and XP programming practices.

4.1 A Brief Description of the Application

The Application's main aim is to perform the BubbleSort algorithm. It is also known as a comparison-based algorithm. In this, each element is compared with the adjacent element and repeatedly swapped if they are not in proper order. The application will be executable on Android emulator. The inputs to the application will be ranging from [0 to 9]. If the input does not match

the minimum and maximum range as specified, an error message is issued and the user is given another chance to rectify the inputs.

4.2 Project Goals

The primary goal of the project is to perform BubbleSort algorithm using the Android studio. We are following the following goal for the smooth development of the application:

a. Build BubbleSort application
b. Deliver it with all specified requirements
c. Delivering it before deadline Sep 19, 2017
d. Enhance the user interface
e. Delivering 99% fault-free application

4.3 Organization/Business Goal

To achieve the project goal that is developing a BubbleSort application in android application considering all processes the organization has set the following organizational and business goals:

a. Customer Satisfaction
b. Excellent product quality
c. To make optimum use of resources to achieve high-level of efficiency and ensure the smooth development of the application

4.4 System Features

The following are major features of the bubble sort application.

1. The application shall use the BubbleSort algorithm for sorting the numbers
2. The application shall display the input digits
3. The application shall display an error message if the input is out of the range i.e. [0 to 9]
4. The application shall display appropriate error messages
5. The application shall display execution steps on the screen
6. The application shall accept a minimum of 2 inputs
7. The application shall accept a maximum of 8 inputs
8. The application shall display the output digits

4.5 System Context Diagram

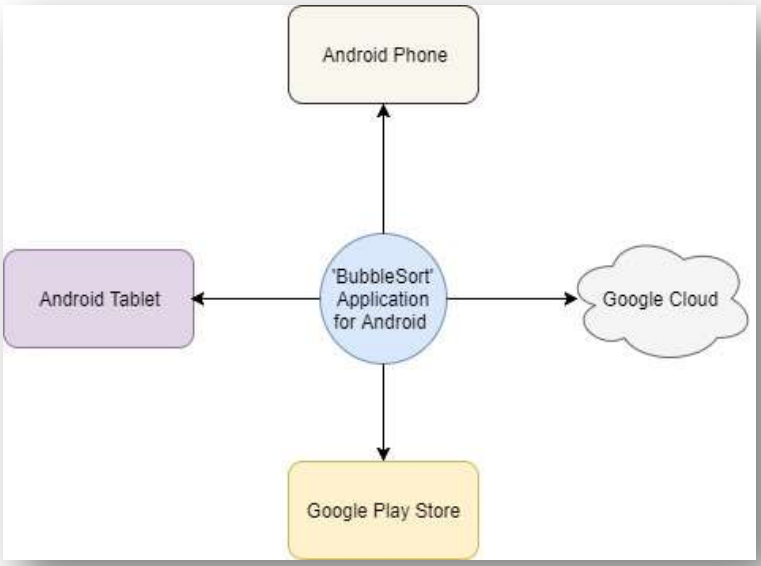


Figure 1 BubbleSort System Context diagram

The application should be work on other android devices such as Android Tablet and Android phones. Google Play to update new versions for users to download and the Google cloud for backups.

4.6 Stakeholders

The Stakeholders for this project are:

Customer: A person who needs the system and pays for it.

Product owner: A person who works with the customer and get the requirements for the project

Scrum Master: Person who manages everything in the team.

Developers: People who develop the software.

Tester: People who test the system.

5. Requirements

5.1 Simple Description of Target System:

The Application's main aim is to perform the BubbleSort algorithm. It is also known as a comparison-based algorithm. In this, each element is compared with the adjacent element and repeatedly swapped if they are not in proper order. The application will be executable on Android emulator. The inputs to the application will be ranging from [0 to 9]. If the input does not match the minimum and maximum range i.e. 2 and 8 respectively, an error message is issued and the user

is given another chance to rectify the inputs. The output would be displayed on the screen along with the execution steps. There are additional features like “Reset” to reset the input field and “Quit” to come out of the App to the homepage.

5.2 Functional Requirements

FR 1: The application shall use the BubbleSort algorithm
FR 2: The application shall display the array of user input
FR 3: The application shall show how bubble sort works
FR 4: The application shall output the execution steps on the screen
FR 5: The application shall display an error message for invalid inputs
FR 6: The application shall display the output array of digits
FR 7: The application shall reset the input field

5.3 Non-Functional Requirements

NFR 1: Availability: The application will available to the user almost all time with no downtime

NFR 2: Interoperability: The application can communicate with itself or some other systems

NFR 3: Performance: The application should perform all tasks given by the user with an average latency of 2 seconds

NFR 4: Modifiability: As per customer’s requirement, the developers can modify or change some code to enhance the application features

NFR 5: Portability: The application can work on multiple Android devices

5.4 Architecturally Influential Factors:

Following are the architecturally influential factors for our product:

- Usability: The application should be easy and simple to use
- The application does not support any web browsers
- The application does not support any iOS devices

6. User Stories for Planning:

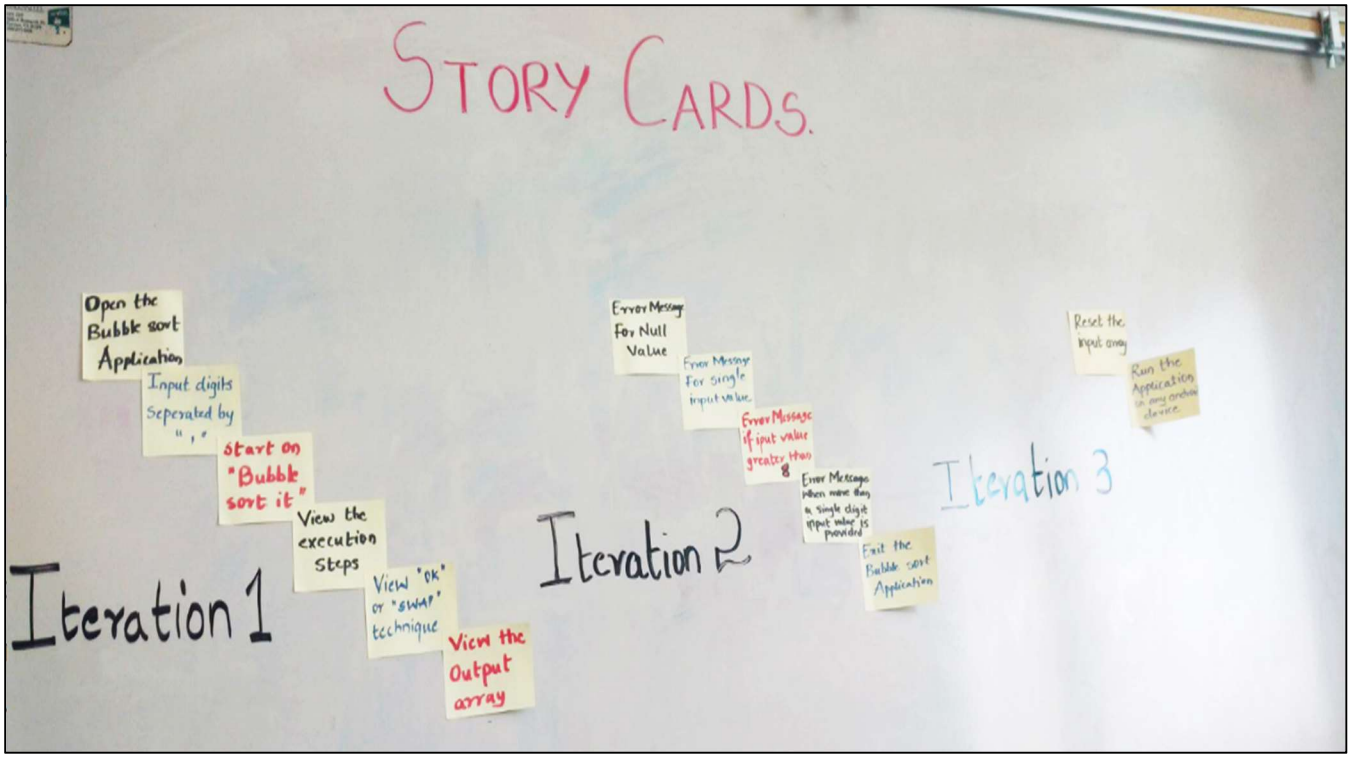


Figure 2. BubbleSort User stories

User Story 1: As a user, I should be able to successfully open the Bubble sort application

User Story 2: As a user, I should be able to provide an input array of digits, each separated by a ",".

User Story 3: As a user, I should be able to start the bubble sort application upon clicking the "Bubble sort it!!" button.

User Story 4: As a user, I should be able to view the steps of execution of the soring algorithm

User Story 5: As a user, I should be able to view the "ok" or "Swap" technique used for the sorting

User Story 6: As a user, I should be able to view the output array

User Story 7: As a user, I should be able to view an error message "Please enter some values to sort before proceeding!" when a null value is given

User Story 8: As a user, I should be able to view an error message "Total minimum number of integers to sort should be 2" when a single input value is provided

User Story 9: As a user, I should be able to view an error message "Total number of integers to sort should not cross 8" when more than eight input values are provided.

User Story 10: As a user, I should be able to view an error message "Numbers to sort should only contain integers from 0 to 9" when a more than a single digit input value is provided.

User Story 11: As a user, I should be able to successfully exit from the bubble sort app when an Quit button is clicked.

User Story 12: As a user, I should be able to reset the input array such that a new input can be taken.

User Story 13: As a user, I should be able to run the application on any android device.

7. Product Backlog and Estimates

The Product Backlog is an ordered list of all the things that may be needed in the product and is the source of requirements for any changes to be made to the product. The product owner (PO) is responsible for the Product Backlog, including its content, availability etc.

The Product Backlog progresses as the product and the environment in which it will be used evolves. The Product Backlog is dynamic; it constantly changes to identify what the product needs to be appropriate, competitive, and useful. If a product exists, its Product Backlog also exists.

Product Backlog refinement is the act of adding detail, estimates, and order to items in the Product Backlog. This is an ongoing process in which the PO and the development team work together on the details of Product Backlog items.

SPRINTS	USER STORIES	TASK	TEAM MEMBER	ESTIMATION
SPRINT 1	Launch bubble sort app	4	Charushila	5
	Provide inputs separated by ","	3	Sonal	1
	Bubble sort the input	5	Ketaki	4
	Display each execution step	2	Sonal	4
	Execute "OK" and "SWAP" technique	2	Charushila	2
	Display the output according to the bubble sort algorithm	3	Ketaki	4
SPRINT 2	Error message on the input of null value	4	Saranya	3
	Error message when less than 2 input values are provided	2	Sonal	3

	Error message if input value exceeds 8 integers	3	Charushila	4
	Error message if the input number is less than 0 and greater than 9	2	Sonal	4
	Successfully exit the bubble sort app	2	Charushila	4
SPRINT 3	Reset the input array	2	Saranya	2
	Run the application on any android device	1	Ketaki	3

Note:
Estimation: The user stories are prioritized and displayed in the table and the estimates are in the range of 1-5 wherein 1 has the lowest priority while 5 has the highest.
Task: It provides the number of tasks that are required for completed the user story which will be explained in the Sprint Backlog

8. Architectural spikes

Spike is a term that comes from the Extreme Programming (XP) practice. The goal is reducing the risk of a technical problem or increase the reliability of a user story's estimate. The duration and objective(s) of a spike should be agreed between the Product Owner (PO) and development team before the start.

There were some of the risks that we encountered before getting into the iterations. One of which is that not all the group members had the knowledge or past experiences regarding android programming and app development. However, two of our team members had some idea regarding android programming. For smooth functioning of the team, it was very much essential that all the team members be at the same level of knowledge regarding this matter as we were supposed to choose pair programming in order to develop the app.

Also, communicating and working collaboratively was essential. Meeting regularly and tutoring each was important because the time allotted for the total project was to be judicially divided into training ourselves and then programming and developing the application. Managing the time was a crucial thing. However, it was decided to use Java Programming language which all the team members were comfortable with and had previous experience working with it. All the activities were equally distributed amongst the team members so that each member would get the experience of working in an agile team and enacting all the roles.

Another major problem we encountered is that the android emulator we were supposed to use would restrict the use of the application to the android devices only. As a solution, we thought of using Xamarin studio to make it compatible with the iOS devices too. But as the time was limited we thought of sticking to the Android devices only.

Another problem was to code the range of the input array, this problem was solved by conduction regular peer review sessions whereon the code was reviewed by each team member and suggestions were considered and changes were made accordingly.

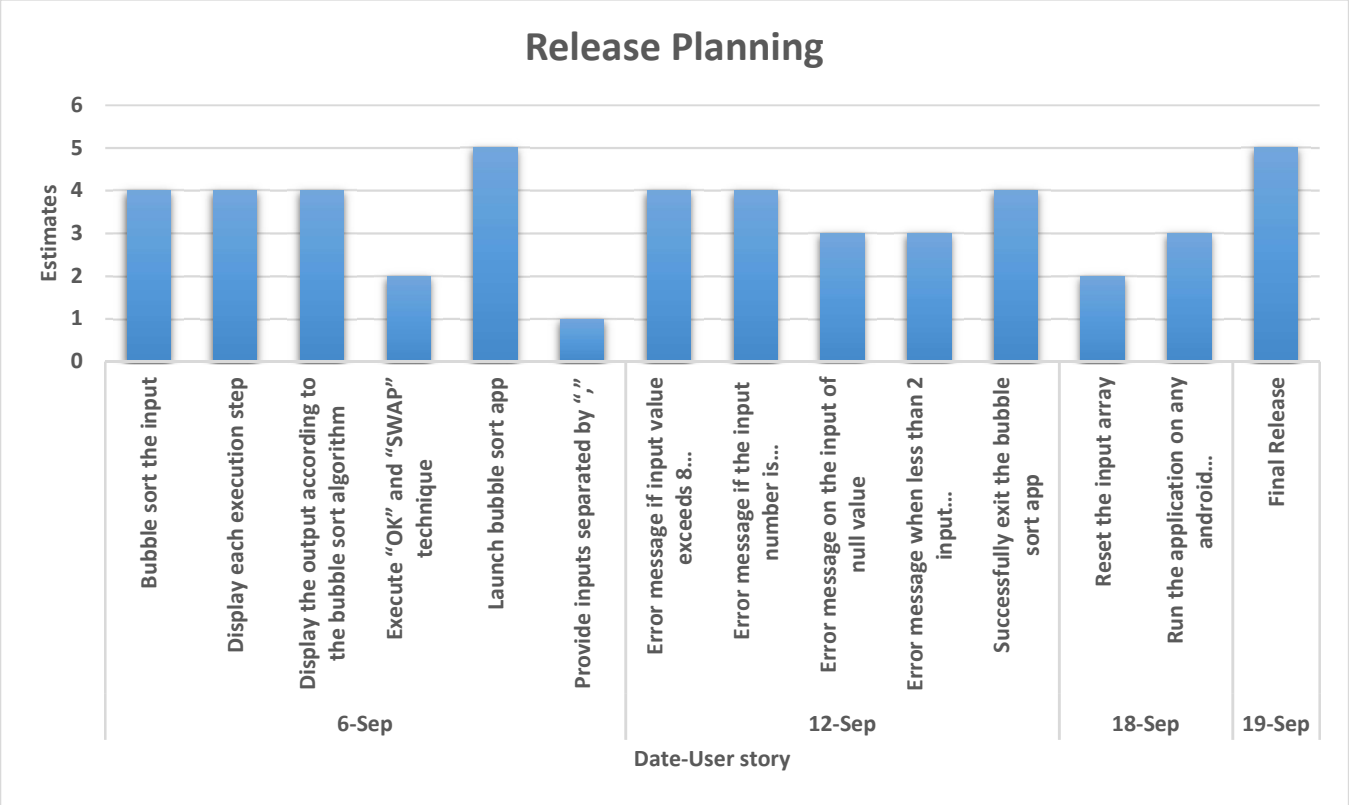
The peer reviews helped the team members rectify each other's mistakes as well as helped us to learn more from the way of coding of the other team members. All the difficulties faced while coding the application were solved through peer reviews. Receiving constant technical feedback was an enriching experience altogether.

9. Release planning

Our aim was to release the product by 09/19/2017 which we were successful in achieving. It was a considerably small project and was divided into three iterations. The deliverables after the final release were the bubble sort application and a video recording which demonstrates the working of the application.

Date-User Story	Estimate
6-Sep	
Bubble sort the input	4
Display each execution step	4
Display the output according to the bubble sort algorithm	4
Execute "OK" and "SWAP" technique	2
Launch bubble sort app	5
Provide inputs separated by ","	1
12-Sep	
Error message if input value exceeds 8 integers	4
Error message if the input number is less than 0 and greater than 9	4
Error message on the input of null value	3
Error message when less than 2 input values are provided	3
Successfully exit the bubble sort app	4

18-Sep	
Reset the input array	2
Run the application on any android device	3
19-Sep	
Final Release	5



10.Technology preparation

The teams had different views regarding which technology to be used as each one had expertise in different technology and languages. However, two members of the team had the previous encounter with android programming and then later it was decided to go with Java programming language and to use an android emulator to display the results of the bubble sort app.

All the members took two weeks to polish the skills related to android programming. These included taking online classes and tutorials on YouTube which helped all of us enhance our skills. The other two members who had basic knowledge about android programming helped the others. Regular meetings were arranged to tutor each other and to speed up the development process. Once the basics

were cleared we were good to start the whole software development process of the bubble sort application.

The internet proved to be very useful during this course of time in providing abundant resources regarding Android Programming. Learning through the videos and online materials helped the team to grasp the concepts faster and to implement the ideas very well. Another suggestion about learning the android programming and concepts for newbies is that learning through the internet and watching videos etc. available on YouTube etc.

Few study material used by the team to learn android programming,

1. http://www.vogella.com/tutorials/Android/article.html
2. https://www.youtube.com/playlist?list=PLB03EA9545DD188C3

Another efficient aspect of working in a scrum environment is the ability to work with one another. For those without much experience, along with agile pushing for continual communication and collaboration, if a team member was stuck or had any questions with JavaScript then it was easy to ask another team member who knew more about it. This allowed the team members to feel free to ask one another to learn faster without the fear of making a mistake as each team member understood the other's position.

For the application, we will be needing the following things:

- Android studio

The android app will require a platform and it is the main basic component to develop an Android application and for this project, we will be using android studio to code the application

- Mobile device(Android)

Next is the mobile device which needs to be an Android mobile device which will help to test the final android application on it

- Emulator (to test)

The emulator is also another important component this will help me check the code at any instance of time and to correct the mistakes

11. Development

11.1 Iteration I

11.1.1 User stories

The Product owner will discuss with the Customer, users and decides on the above stated user stories. For our project Saranya is the product owner who is responsible to discuss with the

customers and get appropriate inputs. Based on the complexity and the estimation hours the priority list of user stories was created.

Following are the User stories that are focused in the Iterantion 1:

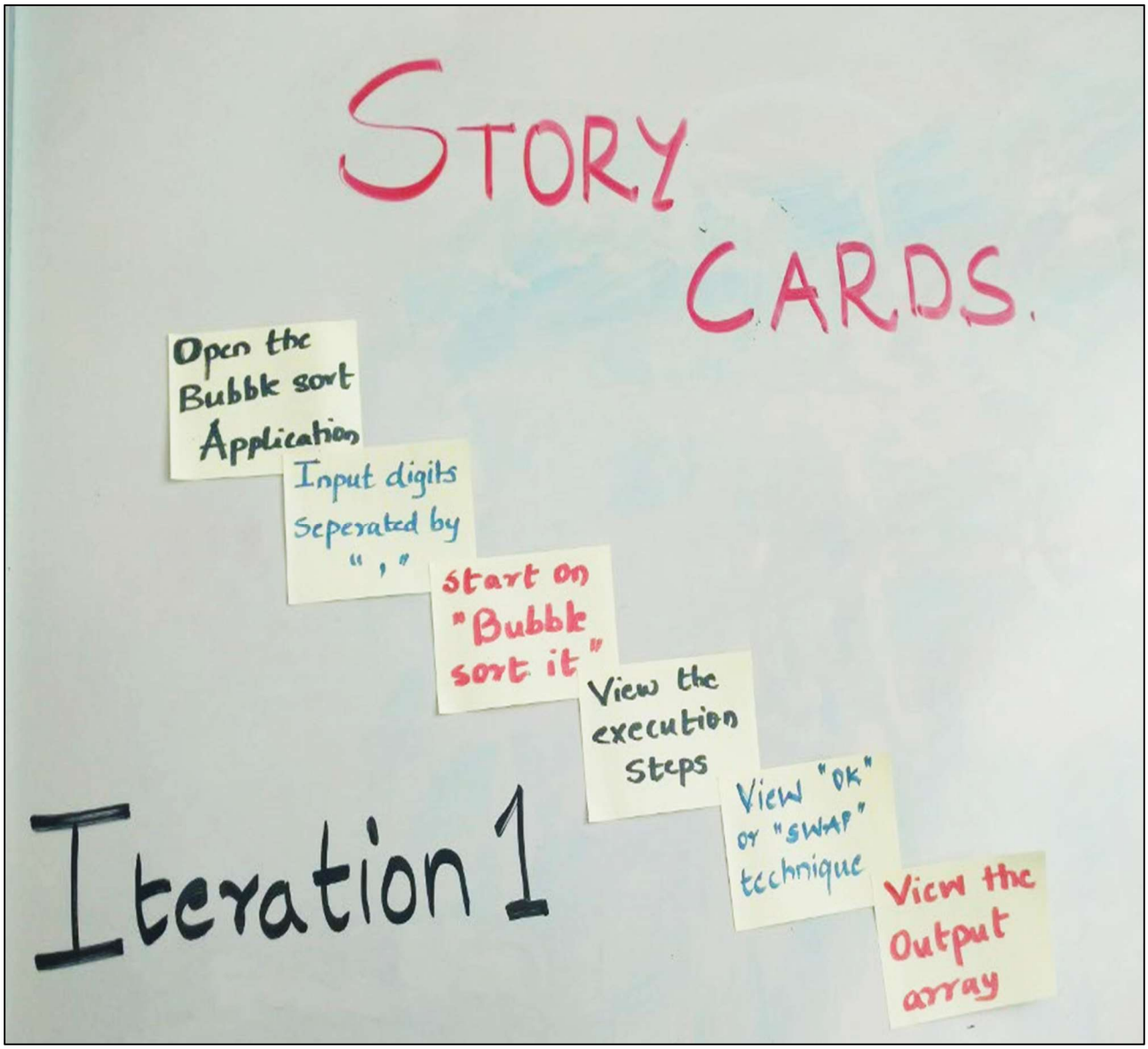


Figure 3. User stories- Iteration 1

User Story 1: As a user, I should be able to successfully open the Bubble sort application

User Story 2: As a user, I should be able to provide an input array of digits, each separated by a ",".

User Story 3: As a user, I should be able to start the bubble sort application upon clicking the "Bubble sort it!!" button.

User Story 4: As a user, I should be able to view the steps of execution of the soring algorithm

User Story 5: As a user, I should be able to view the "ok" or "Swap" technique used for the sorting

User Story 6: As a user, I should be able to view the output array

11.1.2 Iteration Planning

Sprint Backlog:

User story	Task Description	Originator	Responsible	Status	Hours of work Remaining					
					Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
User story 1	Meet and discuss the goals of the project	SP	KS	Complete	2	7	8	2	5	2
	Discuss with the development team about the feasibility of the App	SA	KS	Complete	2	2	3	2	3	1
	Understand and outline the app design (GUI)	CA	SP	Complete	3	2	1	2	3	1
	Evaluate the team of the Android studio programming skills	SA	SP	Complete	1	3	2	4	2	4
User story 2	Discuss the app features	KS	SA	Complete	5	4	5	4	4	4
	Discuss the methods to provide input (space or comma etc.)	CA	SP	Complete	2	1	3	2	5	2
	Brainstorm on the design for input screen	KS	SA	Complete	8	2	2	1	3	5
User story 3	Provide technical training for each module	SP	KS	In-Progress	3	2	2	3	3	1

	Based on the skill evaluation allocate work to the team	KS	SA	In-Progress	1	1	1	2	8	1
	Discuss the bubble sort algorithm	SP	KS	Complete	3	2	2	1	3	1
	Code through pair programming	CA		In-Progress	5	8	2	1	1	3
	Peer review the code	KS	CA	In-Progress	7	8	2	1	2	1
User story 4	Understand the execution steps of the Bubble sort algorithm	KS	CA	In-Progress	2	1	1	1	3	1
	Discuss efficiency of the algorithm	KS	SP	In-Progress	3	3	3	3	1	1
User story 5	Incorporate "ok" and "Swap" techniques to the execution steps	CA	KS	In-Progress	1	2	7	2	8	9
	Discuss and try to reduce the number of lines of code.	KS	SP	In-Progress	3	2	1	2	3	1
User story 6	Discuss the format of the output	SP	CA	In-Progress	5	4	5	4	4	4
	Validate the output	KS	SP	In-Progress	7	8	2	1	2	1
	Validate the algorithm	CA	KS	In-Progress	3	2	1	2	3	1

11.1.3 Managing

Our team chose college classroom as our workspace, as open environment allowed us to work more collaborative and maintain effective interaction with the team members. The workspace is situated at California State University, Fullerton UH204. This open workspace helped us to work together with different teams and allowed us to ease the level of difficulties faced by the teams.

Figure 4. Open environment workspace for team[UH204]

Sustainable Pace

During the iteration, one of our focus was to complete the task in the given time span. Each task was estimated precisely and allocated the number of hours and distributed to the team. With commitment, the team worked towards completion of the tasks within the given time.

Daily stand up meeting

We scheduled daily stand up meetings at 8:00 AM every morning from Monday to Friday for discussing various important topics which are going as per the schedule and about the future targeted topics. The Scrum master Ketaki would take the initiative and make sure all the important topics are discussed. We made sure that each of us had done homework about the further topics which were to be discussed so that they can give inputs on those topics. We had chosen one team member to record the minutes of meeting which can be used for future releases.

Project Velocity

For iteration 1, we have total of six story lines and based on the team's prior experience we estimated that it would approximately be around 25 lines of code which would involve the core logic of the bubble sort app. Hence for this iteration we have estimated 60 hours for completion of the code.

Move people around

The team was involved in cross training during the initial planning stage were the people from one module was getting trained on other which they haven't been working on. The development team

was also getting trained on testing of the app and same with the testing team. This way we could utilize the time and resource efficiently.

11.1.7 Designing

Basic Design

1. **Design for Screen 1**

Figure 5. Basic designs for Screen 1

2. **Design for the BubbleSort**

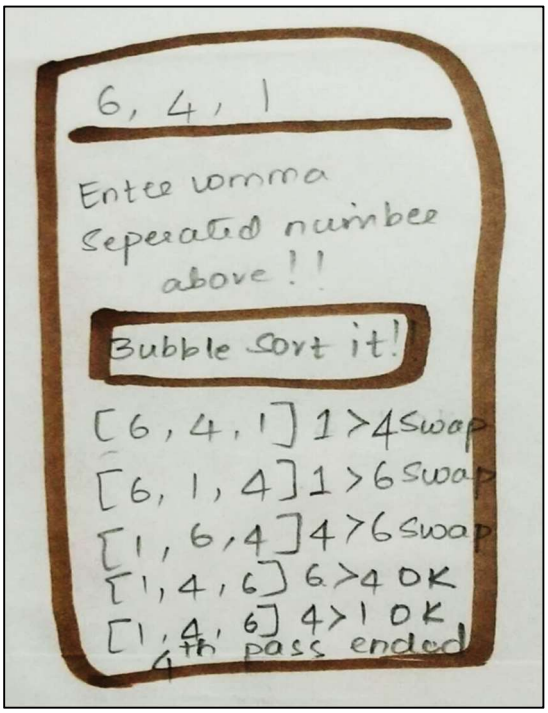


Figure 6. Basic design for Sorting execution steps

Spike answer

The main technical hurdle which the team faced was to understand the algorithm and to integrate the algorithm with the appropriate inputs. At this stage, two developers worked together as pair programmers to ease the difficulty level.

11.1.5 Coding

The customer was always available to provide information to the developers regarding any queries and clarifications with respect to the code. The developers generated the code following the coding stands provided by the customers. During technical difficulties, the developers followed the method of pair programming.

At initial phase, the developers did unit testing using Junit using the Android studio for the validating the algorithm against the customer requirements. Following is the code which was developed during the first iteration.

```
boolean noSwap;

  for(int i = 0; i < arrayToSort.length; i++) {
    noSwap = true;
    for(int j = arrayToSort.length-1; j > i; j--){
      if(arrayToSort[j] < arrayToSort[j-1]){
```

```
            outputView.append(Arrays.toString(arrayToSort) + " " + arrayToSort[j] + " < " +  arrayToSort[j-1] +  "
swap"+'\n');
            arrayToSort[j] ^= arrayToSort[j-1];
            arrayToSort[j-1] ^= arrayToSort[j];
            arrayToSort[j] ^= arrayToSort[j-1];
            noSwap = false;
          } else {
            outputView.append(Arrays.toString(arrayToSort) + " " + arrayToSort[j] + " > " +  arrayToSort[j-1] +  "
ok"+'\n');
          }
          //outputView.append(Arrays.toString(arrayToSort) + '\n');
      }
      if(noSwap){
        break;
      }
      outputView.append("Input Array after " + (i + 1) + getSuffix(i+1) + " pass: " + Arrays.toString(arrayToSort) +
'\n');
      outputView.append((i + 1) + getSuffix(i+1) + " pass for sorting has ended" +  '\n' + '\n');

    }
    outputView.append('\n' + "Output Array : "+ Arrays.toString(arrayToSort) + '\n');
    outputView.append('\n' + "Sorting completed !!!"+ '\n');
}
```

11.1.6 Testing

Junit Automation testing

For iteration 1, the testing team decided to go with the unit testing of each small modules where in the user stories where the business requirements were given to the testing team as per the Iteration 1 and the team took all the user stories and created the unit testing for the project.

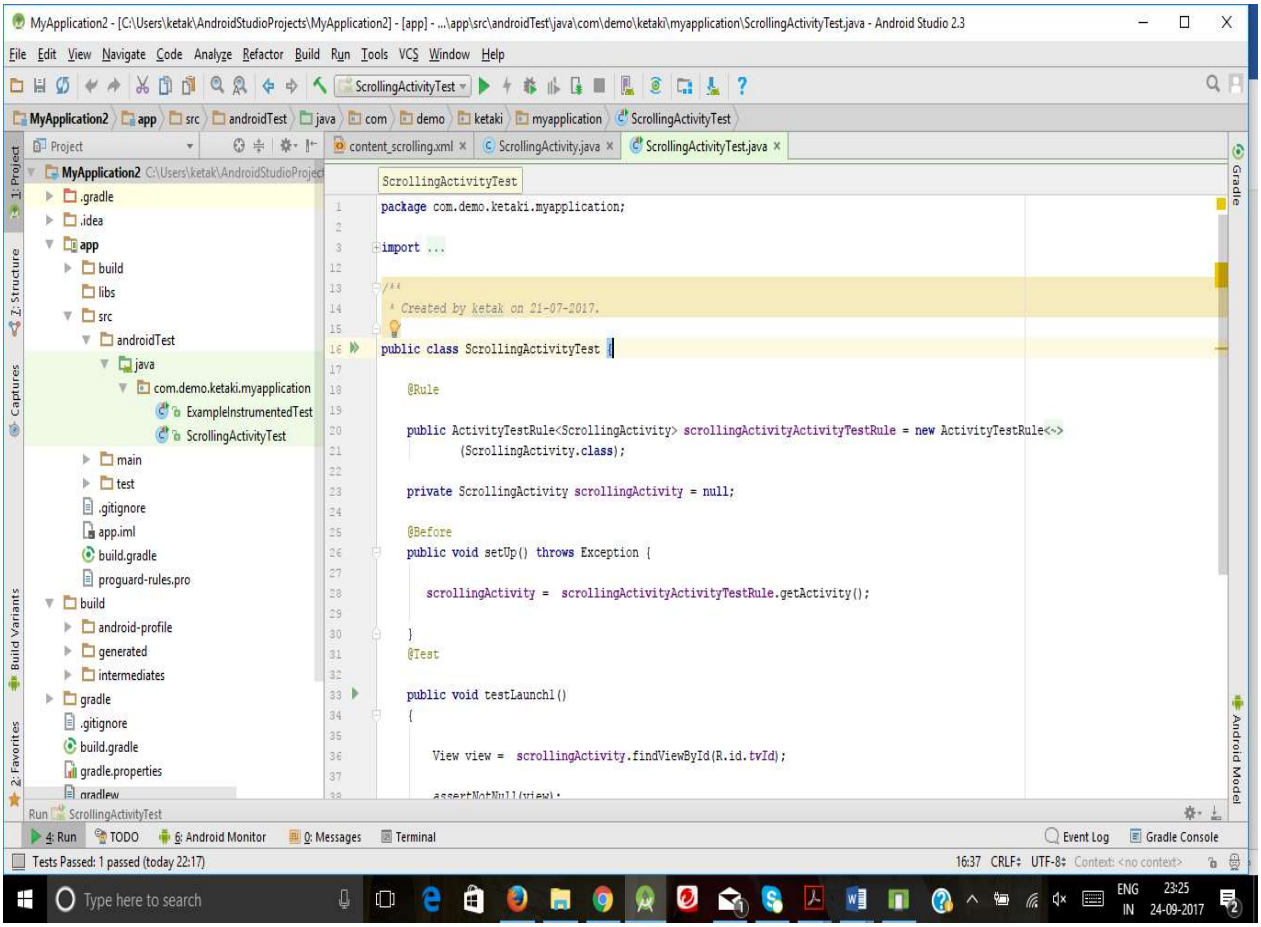
The unit testing was don using Junit in the android studio. For the first iteration, the main testing focus was on the interface of the app. As the app had one main basic screen, hence all the test cases were focused on that screen.

The main testing was focused on the following:

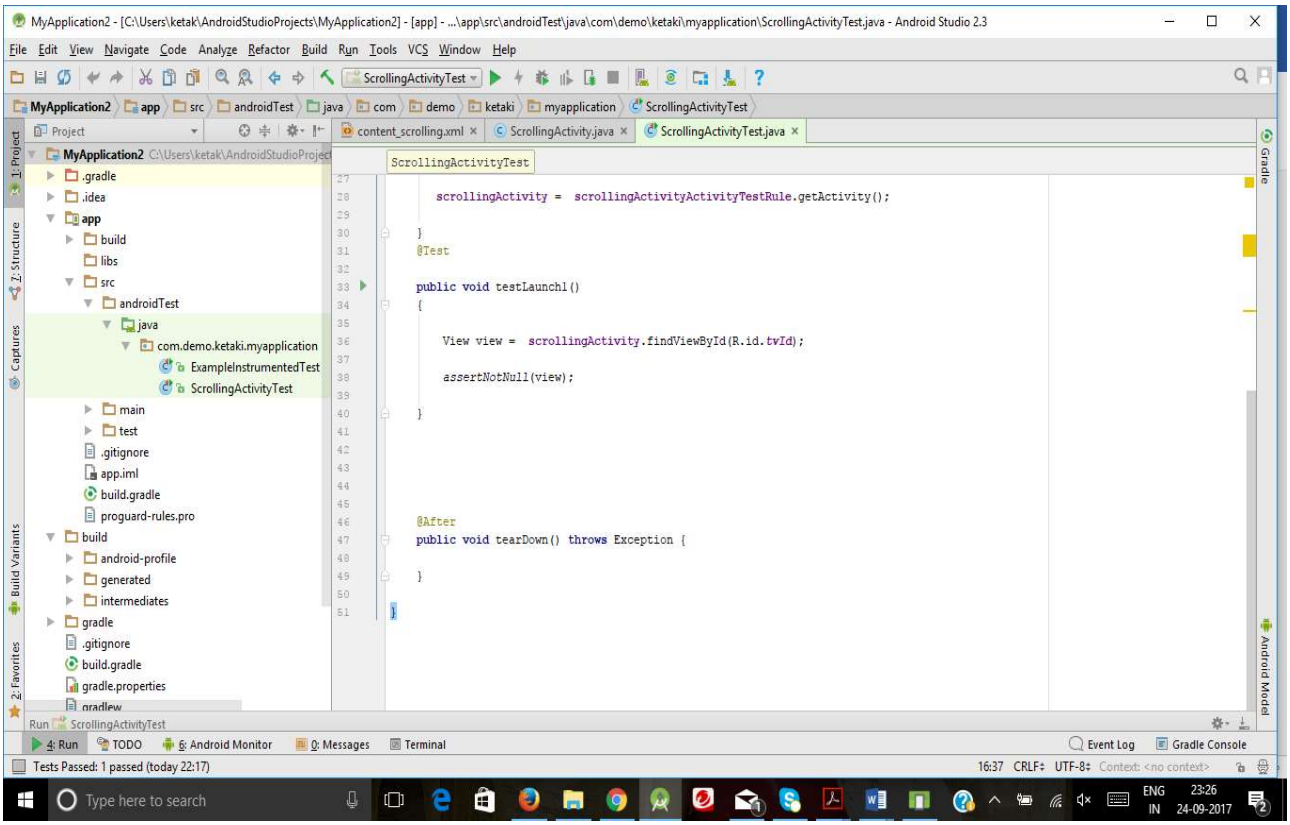
1. Checking for the opening of the launch screen
2. Checking if the ok and swap techniques were displayed
3. Checking if the font size
4. Checking of the font color
5. Checking if there is “Bubble sort it!!” button
6. Checking the functionality of the button
7. Checking for the output array

The team carefully tested the whole app using automation testing for each unit and logged all the defect and notified the developers and developers sent the rectified code and the retesting for same feature was carried out again.

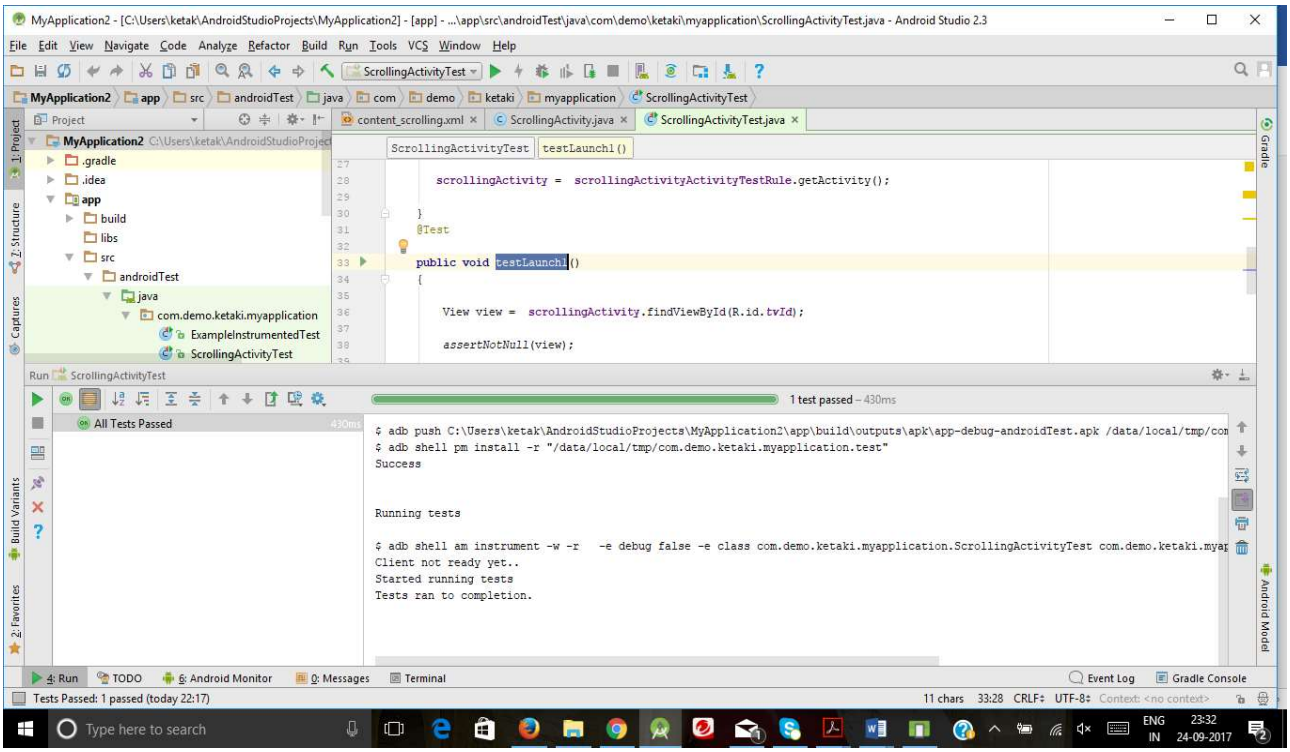
Below screen represents the testing carried out in Android studio using Junit



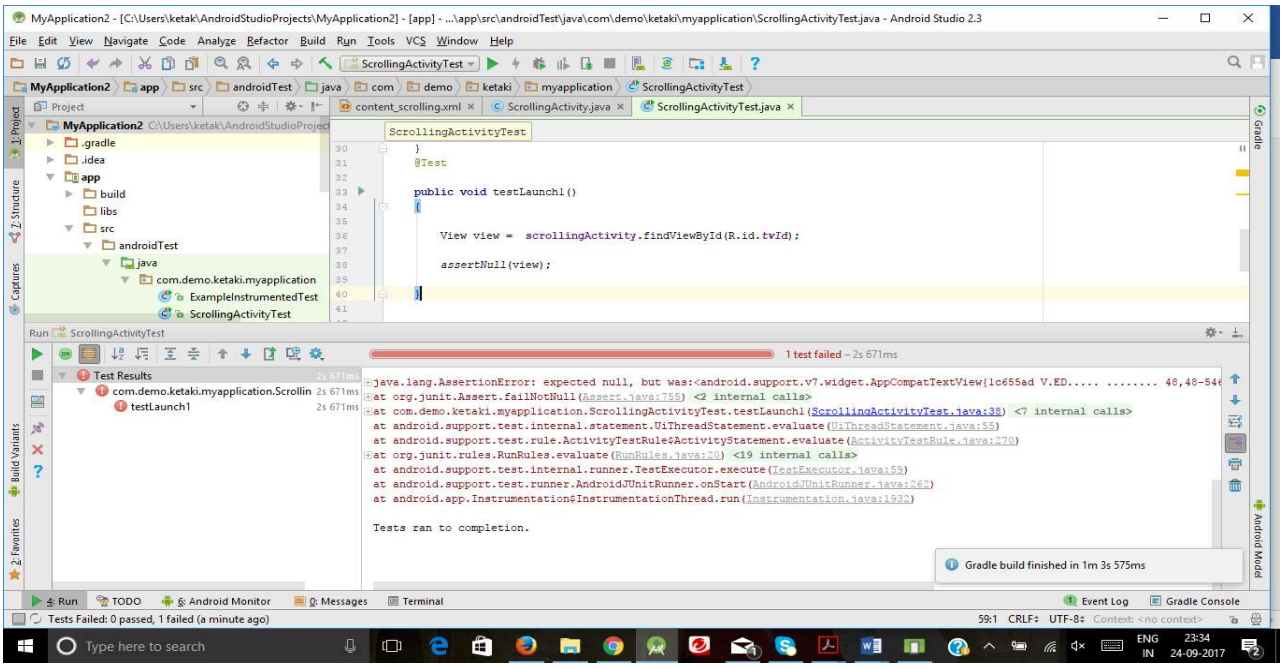
The below diagram shows a small glimpse of testing of the launch screen of out bubble sort app in Android studio.



Once we run this code if the screen successfully launches then the bar goes green and the output is displayed on the bottom of the screen



If there is any error made by the developer or some exceptional error which are not handled, then the output bar will be red in color and that indicates the error.



Once we run all the test cases in the Pass1 and we further log these defects in excel and later pass the Pass 1 results to the developers. The developers make changes in the code and gave back the same code back for retesting. The testing team retest the bugs and change the status from fail to pass in the Pass 2.

Once all the bugs in the iteration 1 was completely fixed then it was important for the team to conduct the regression testing. Hence, we ran all the test cases once more and conducted the regression testing, to ensure if the code fix did not change any successful running code.

11.1.7 Daily Scrum meeting

We scheduled daily scrum meetings at 9:00 AM every morning from Monday to Friday with the team for discussing about the story lines which are part of iteration 1. During iteration 1, the following were the important topics which were discussed.

1. Clarity on the input and the output of the algorithm
2. Clarity on the font size
3. Clarity on the font color
4. Requirements of the Reset button

The solution of these queries was discussed with the Scrum Master Ketaki and a clear idea was provided. Hence, implemented with the appropriate solution.

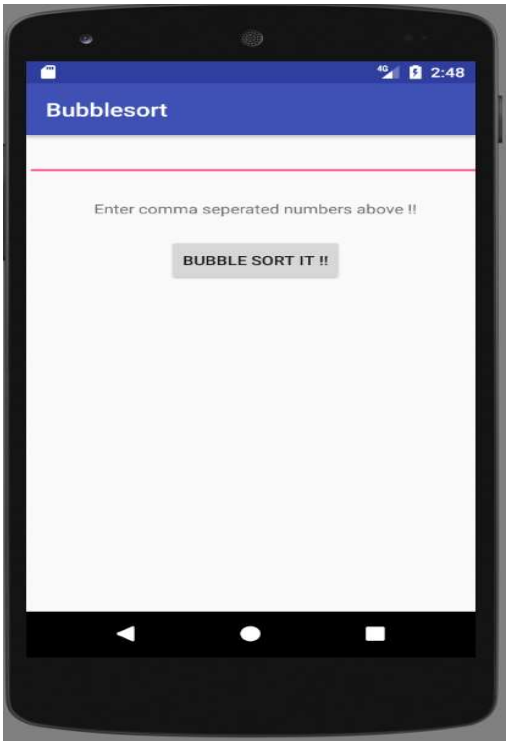
11.1.8 Sprint Review

Figure 7. Sprint review meeting with Product Owner

1. The team gave the product owner Saranya a demo of the work completed for iteration 1
2. The product owner Saranya evaluated the design and the design 2 was picked for the application screen.
3. Product owner suggested the team to test the application using valid, invalid and null input.
4. Product owner further suggested the team to display the “ok” and “swap” on the screen for easy understanding of the algorithm.
5. The team followed all the feedback given by the product owner Saranya and displayed the final demo successfully for iteration 1

The user stories which are part of iteration 1 was developed and presented to the Product owner. Following screen shots gives an idea about the work completed and the presentation provided to the Product owner(Saranya):

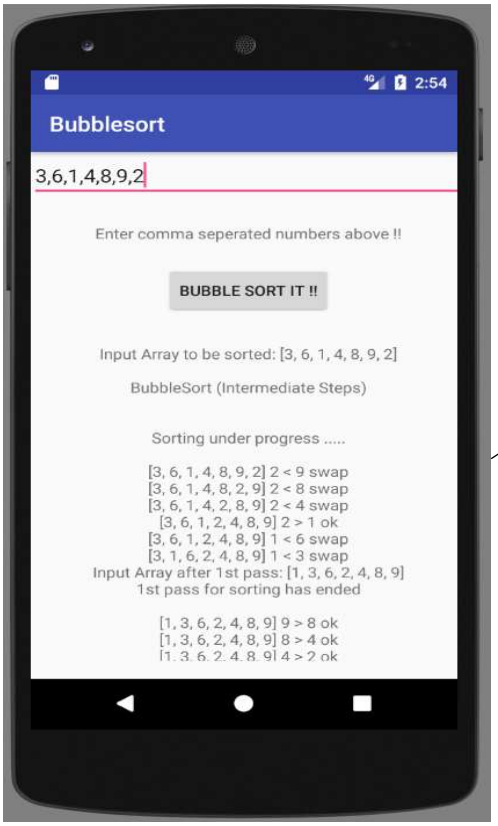
(a) Screen 1- BubbleSort App



Initial stage of the BubbleSort App

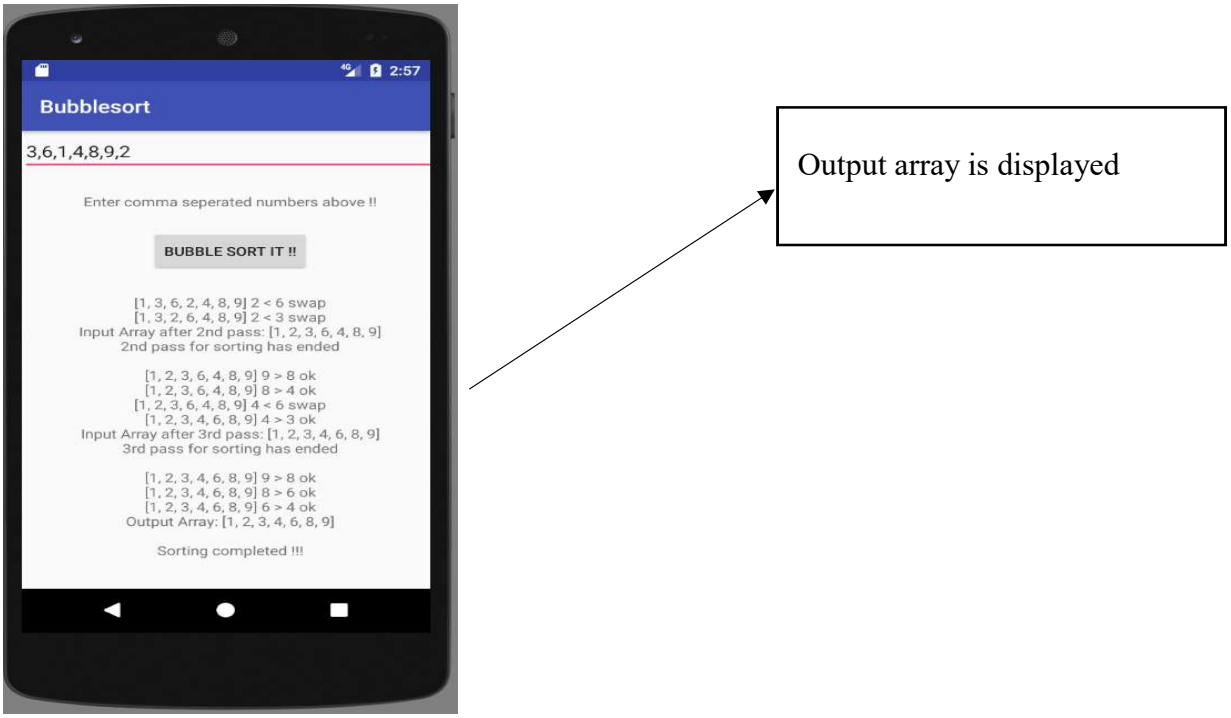
Screen 1

(b) Input array & Ok/Swap techniques

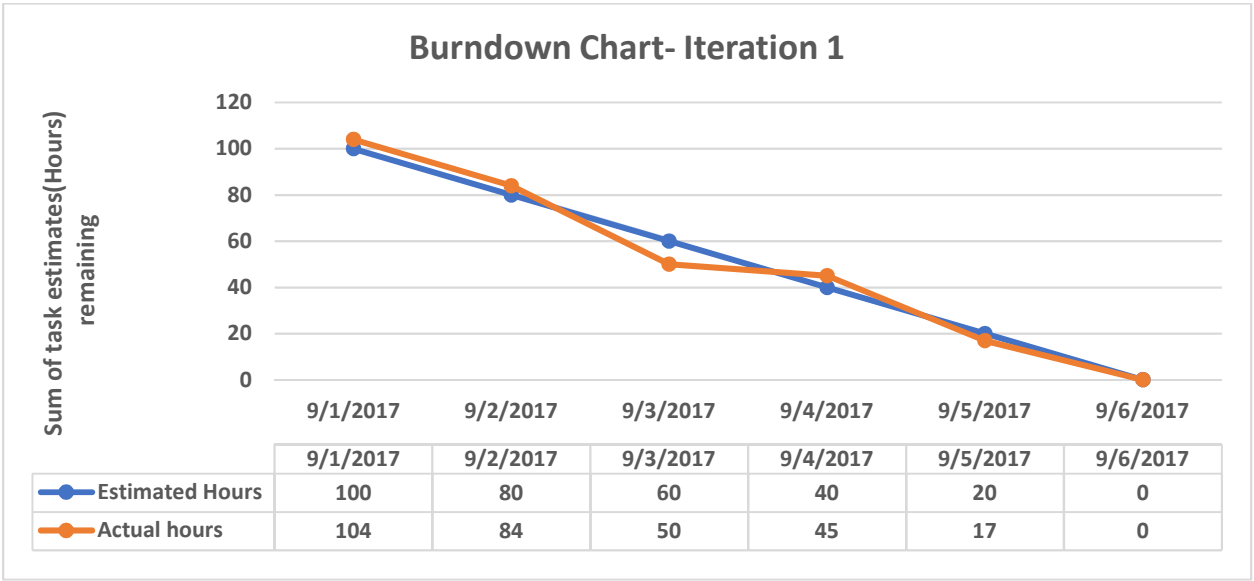


- Input array is displayed
- Ok and Swap techniques
- The execution steps displayed

(c) Output array



11.1.9 Burndown Chart



	9/1/2017	9/2/2017	9/3/2017	9/4/2017	9/5/2017	9/6/2017
Estimated Hours	100	80	60	40	20	0
Actual hours	104	84	50	45	17	0

Figure 8. Burndown Chart-Iteration1

Burndown chart is an effective tool used at the end of the Sprint to provide the graphical representation of how the work progressed with time. In our project, for the first iteration we can see that the work has been completed by the end of sprint (September 6th). We can see that there was a backlog during the initial days as there was training provided to the team for Android

programming. The team effectively managed work within the next two days and completed work on time.

11.2 Iteration II

11.2.1 User stories

For Iteration 2 we have considered Ketaki as the product owner, who is responsible to discuss with the customers and get appropriate inputs. Based on the complexity and the estimation hours the priority list of user stories was created.

Following are the User stories that are focused in the Iteration 2:

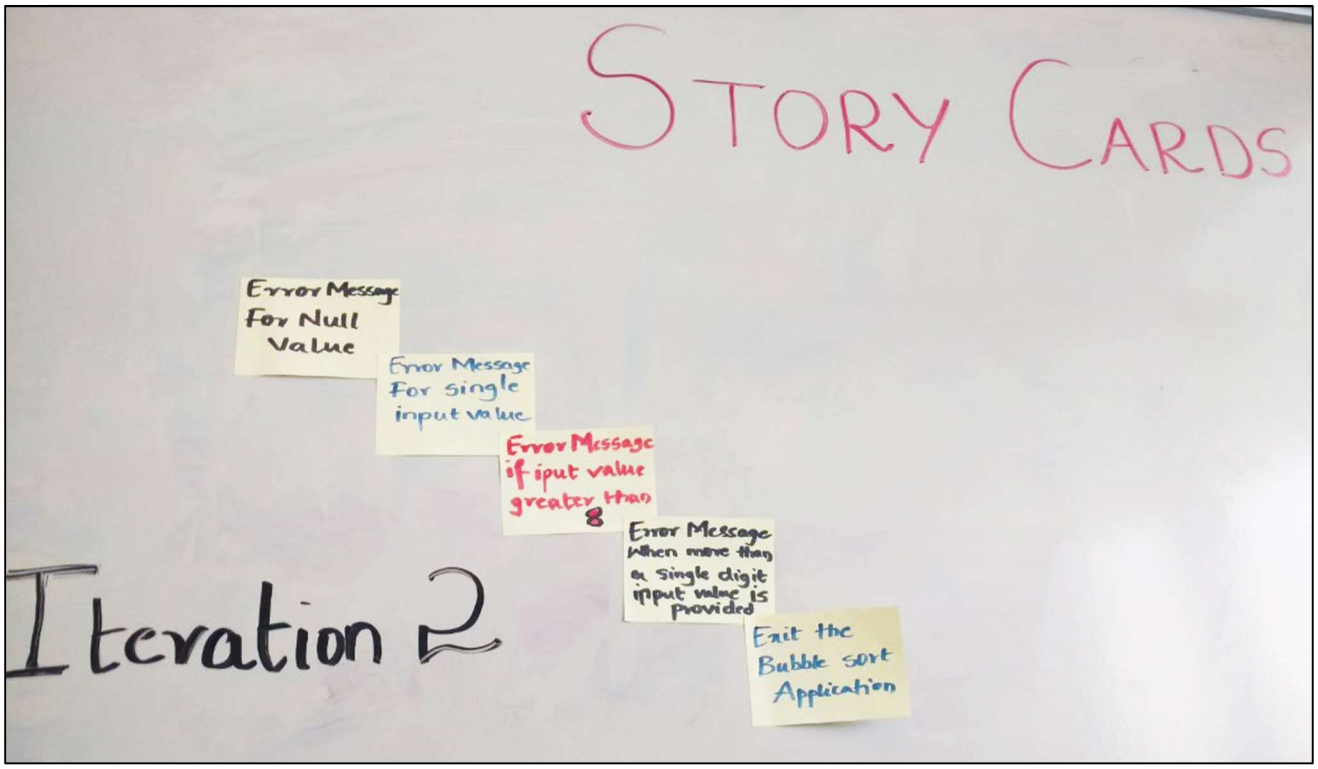


Figure 9. User stories- Iteration 2

User Story 7: As a user, I should be able to view an error message "Please enter some values to sort before proceeding!" when a null value is given

User Story 8: As a user, I should be able to view an error message "Total minimum number of integers to sort should be 2" when a single input value is provided

User Story 9: As a user, I should be able to view an error message "Total number of integers to sort should not cross 8" when more than eight input values are provided.

User Story 10: As a user, I should be able to view an error message "Numbers to sort should only contain integers from 0 to 9" when a more than a single digit input value is provided.

User Story 11: As a user, I should be able to successfully exit from the bubble sort app when an Quit button is clicked.

11.2.2 Iteration Planning

Sprint Backlog:

User story	Task Description	Originator	Responsible	Status	Hours of work Remaining					
					Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
User story 7	Discuss all the negative scenarios	SP	SA	Complete	2	7	8	2	5	2
	Discuss the description of the Error messages	SA	KS	Complete	2	2	3	2	3	1
	Provide Error message for the null value	CA	SP	Complete	3	2	1	2	3	1
	Validate the error messages	SA	SP	Complete	1	3	2	4	2	4
User story 8	Provide the Error message, when a single input value is provided	KS	SA	Complete	5	4	5	4	4	4
	Validate the error messages	CA	SP	Complete	2	1	3	2	5	2
User story 9	Provide the Error message, when more than 8 input values are provided	SP	KS	In-Progress	3	2	2	3	3	1
	Validate the error messages	KS	SA	In-Progress	1	1	1	2	8	1
User story 10	Provide the Error message, when more than a single digit input value is provided	SP	KS	Complete	3	2	2	1	3	1

	Validate the error messages	CA	SP	In-Progress	5	8	2	1	1	3
User story 11	Discuss the methods to exit the application	CA	SP	Complete	2	1	3	2	5	2
	Validate the Quit button	KS	SA	Complete	8	2	2	1	3	5

11.2.3 Managing

Our team choose college classroom as our workspace, as open environment allowed us to work more collaborative and maintain effective interaction with the team members. The workspace is situated at California State University, Fullerton UH204. This open workspace helped us to work together with different teams and allowed us to ease the level of difficulties faced by the teams.

Daily stand up meeting

We scheduled daily stand up meetings at 8:00 AM every morning from Monday to Friday for discussing various important topics which are going as per the schedule and about the future targeted topics. The Scrum master Sonal would take the initiative and make sure all the topics are discussed. The issues faced during iteration 2 was discussed during the meetings. We made sure that each of us had done homework about the further topics which were to be discussed so that they can give inputs on those topics. We had chosen one team member to record the minutes of meeting which can be used for future releases.

Project Velocity

For iteration 2, we have total of 5 story lines and based on the team's prior experience we estimated that it would approximately be around 15 lines of code which would involve the core logic of the bubble sort app. Hence for this iteration we have estimated 40 hours for completion of the code.

11.2.4 Designing

Basic Design

1. **Error Screen design**

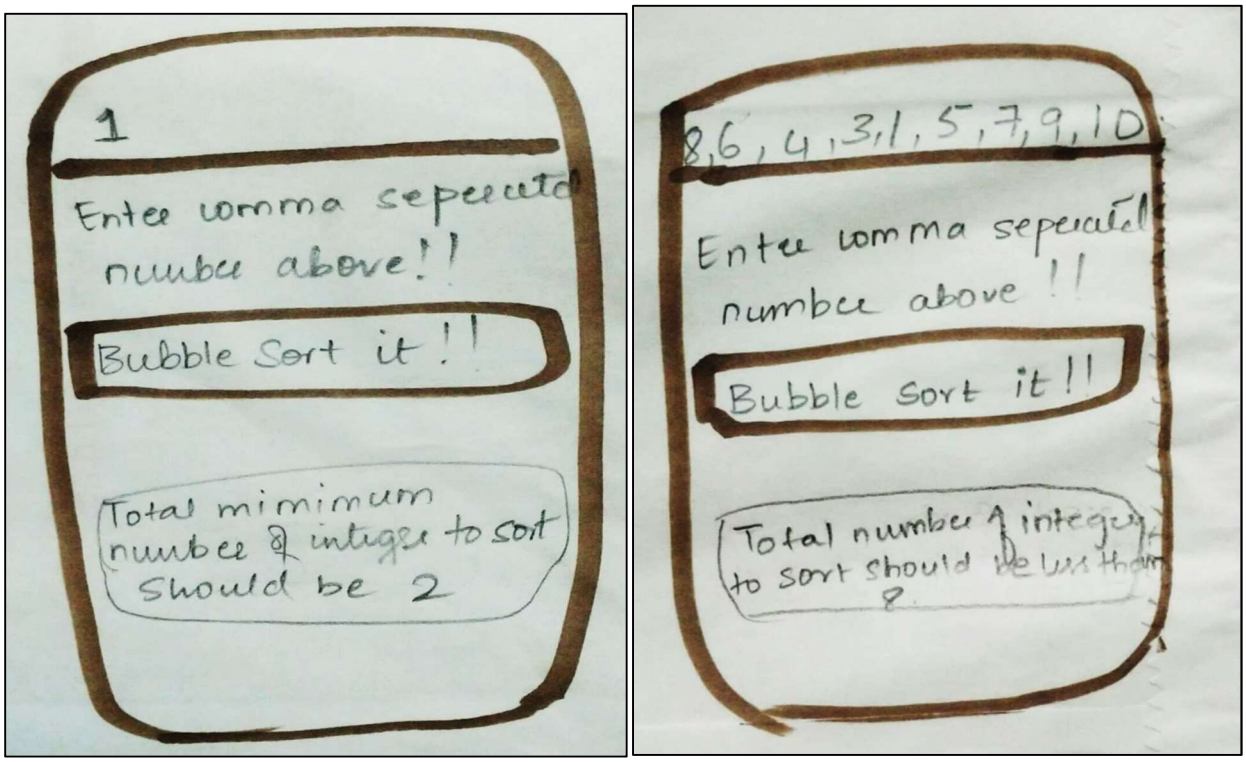


Figure 10. Basic design for error screens

Spike answer

There was no major technical hurdle which was faced during the iteration 2 process but there was multiple miscommunication in the team regarding the error messages and the Scrum master Sonal had to work with Product owner to get clarity regarding the exact error message.

11.2.5 Coding

The customer was always available to provide information to the developers regarding any queries and clarifications with respect to the code. The developers generated the code following the coding stands provided by the customers. During technical difficulties, the developers followed the method of pair programming.

```
sortIt.setOnClickListener(new View.OnClickListener() {
  public void onClick(View v) {
    if(inputView.getText().toString().isEmpty()) {
       Toast.makeText(getBaseContext(), "Please enter some values to sort before proceeding !" ,
            Toast.LENGTH_LONG).show();
       return;
    }
    String[] numbersToBeSorted = inputView.getText().toString().split(",");
```

```
        int[] numbers = new int[numbersToBeSorted.length];
        for(int i = 0;i < numbersToBeSorted.length;i++)
        {
           numbers[i] = Integer.parseInt(numbersToBeSorted[i]);
        }
        ValidateArrayAndSort(numbers);
    }
});


public void ValidateArrayAndSort(int[] arrayToSort) {

    if(arrayToSort.length > 8) {
        Toast.makeText(getBaseContext(), "Total number of integers to sort should not cross 8" ,
                Toast.LENGTH_LONG).show();
        return;
    } else if (arrayToSort.length < 2) {
        Toast.makeText(getBaseContext(), "Total minimum number of integers to sort should be 2" ,
                Toast.LENGTH_LONG).show();
        return;
    } else if(IntStream.of(arrayToSort).anyMatch(x -> !(x >= 0 && x<=9) )) {
        Toast.makeText(getBaseContext(), "Numbers to sort should only contain integers from 0 to 9" ,
                Toast.LENGTH_LONG).show();
        return;
    }
    bubbleSort(arrayToSort);
}
```

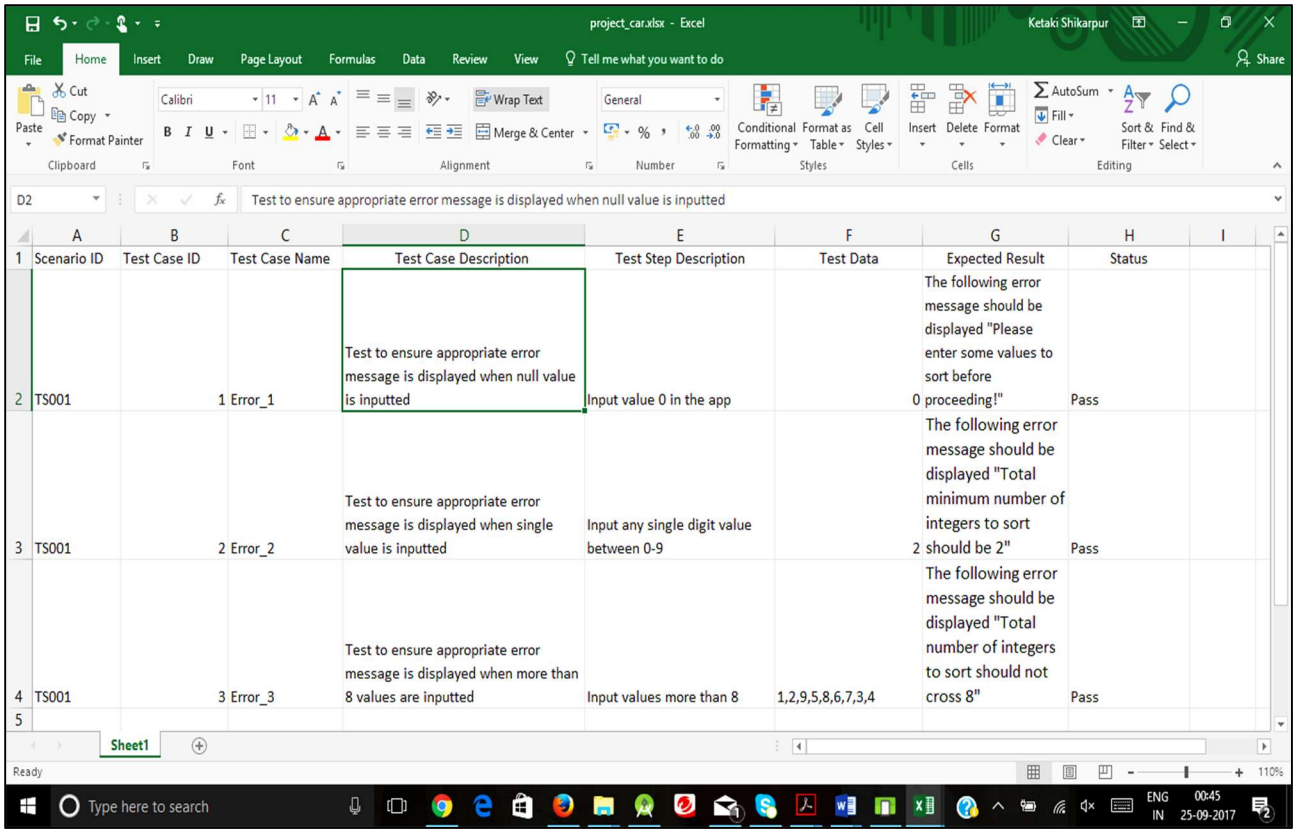
11.2.6 Testing

Functional testing

For iteration 2 the team decided to proceed with the Functional testing as the user stories of iteration 2 are error message based testing. So, the focus is on the functionality of the app and checking the expected output. Here the main testing focused on the error message description.

The main testing was focused on the following:

1. Checking the error message for null value
2. Checking the error message for single input value
3. Checking the error message for input value greater than 8
4. Checking the error message for more than one-digit value



Scenario ID	Test Case ID	Test Case Name	Test Case Description	Test Step Description	Test Data	Expected Result	Status
TS001	1	Error_1	Test to ensure appropriate error message is displayed when null value is inputted	Input value 0 in the app	0	The following error message should be displayed "Please enter some values to sort before proceeding!"	Pass
TS001	2	Error_2	Test to ensure appropriate error message is displayed when single value is inputted	Input any single digit value between 0-9	2	The following error message should be displayed "Total minimum number of integers to sort should be 2"	Pass
TS001	3	Error_3	Test to ensure appropriate error message is displayed when more than 8 values are inputted	Input values more than 8	1,2,9,5,8,6,7,3,4	The following error message should be displayed "Total number of integers to sort should not cross 8"	Pass

The above screen shot represents the test case which have used for our project for iteration 2. Here we have list all the test cases in the form of test scripts and manually executed them and updated their status as either “Pass” or “fail”.

Here we have two of two scenarios in this iteration one deals with all the error messages and it negative scenarios and other deals with all the Quit button related scenarios.

11.2.7 Daily Scrum meeting

We scheduled daily scrum meetings at 9:00 AM every morning from Monday to Friday with the team for discussing about the story lines which are part of iteration 2. During iteration 2 the following were the important topics which were discussed.

1. Clarity on the Error messages
2. Validation of the error message
3. Clarity on the display of the error message
4. The delay of tasks was discussed

The solution of these queries was discussed with the scrum master Sonal and a clear idea was provided. Scrum master Sonal discussed with the Product owner and team on the delay of User story 11 and a plan was provided to work on it in Iteration 3.

11.2.8 Sprint Review

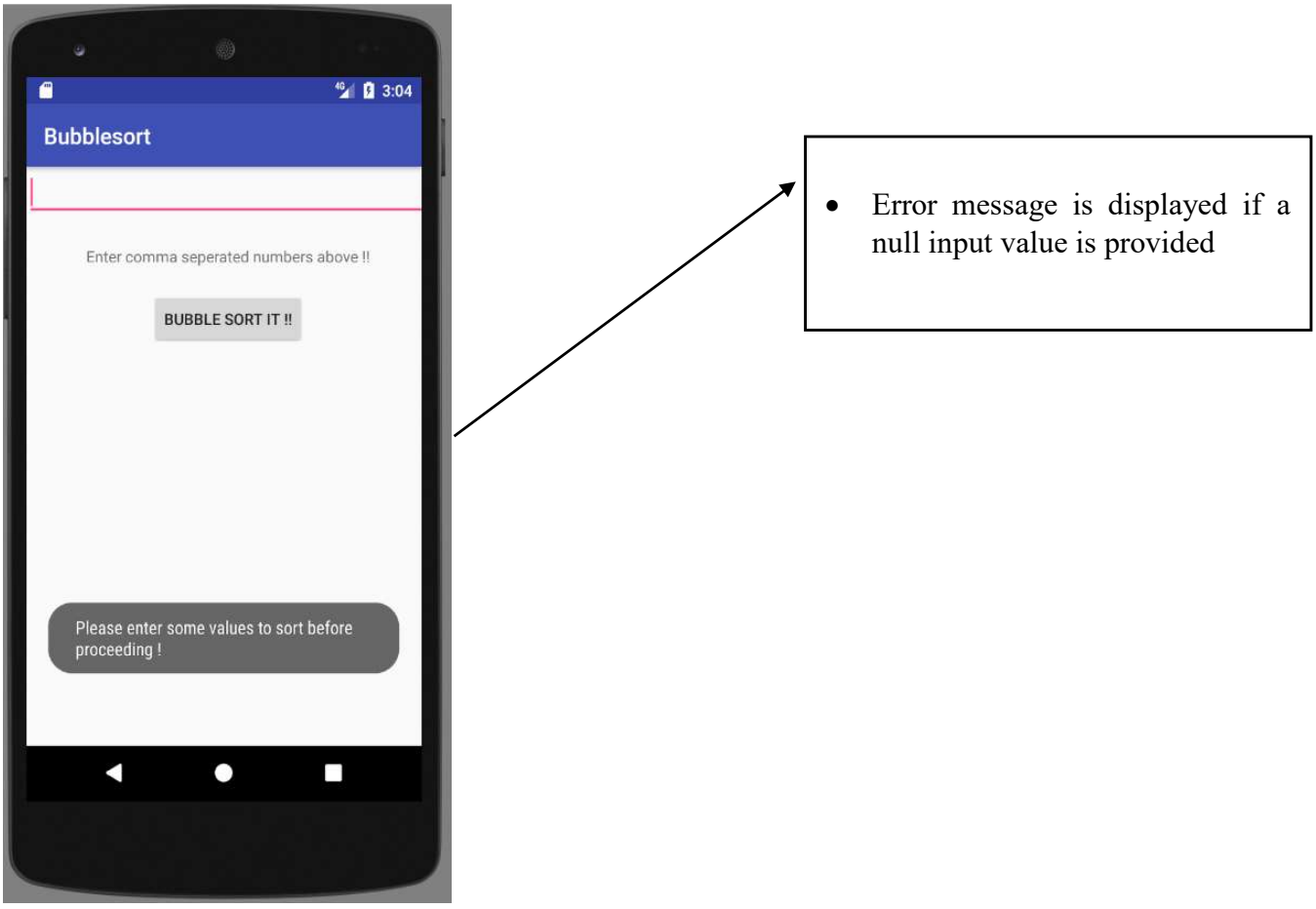
1. The team gave the product owner Ketaki a demo of the work completed for iteration 2

2. The product owner evaluated the design and the Error messages
3. The product owner Ketaki approved the design and asked the team to go ahead with the process.
4. The team followed all the feedback given by the product owner Ketaki and displayed the final demo successfully for iteration 2

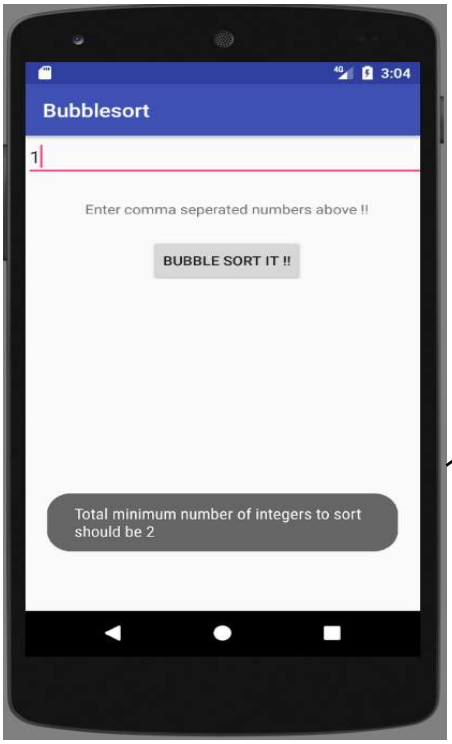
Note: There was miscommunication within the team regarding the error messages which caused a delay. The team was not able to complete the User story 11 which is to create an Quit button and validate the button. Thus, the User story 11 was moved to iteration 3 as a prioritized task.

The user stories which are part of iteration 2 was developed and presented to the Product owner. Following screen shots gives an idea about the work completed and the presentation provided to the Product owner(Ketaki):

(a) Error message 1

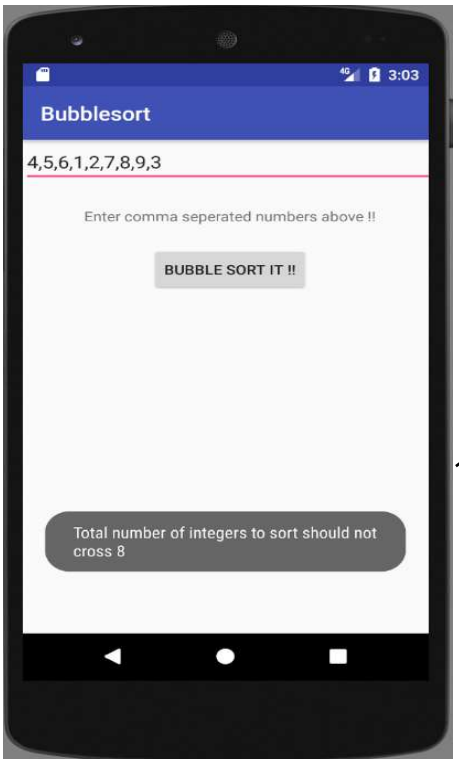


(b) Error message 2



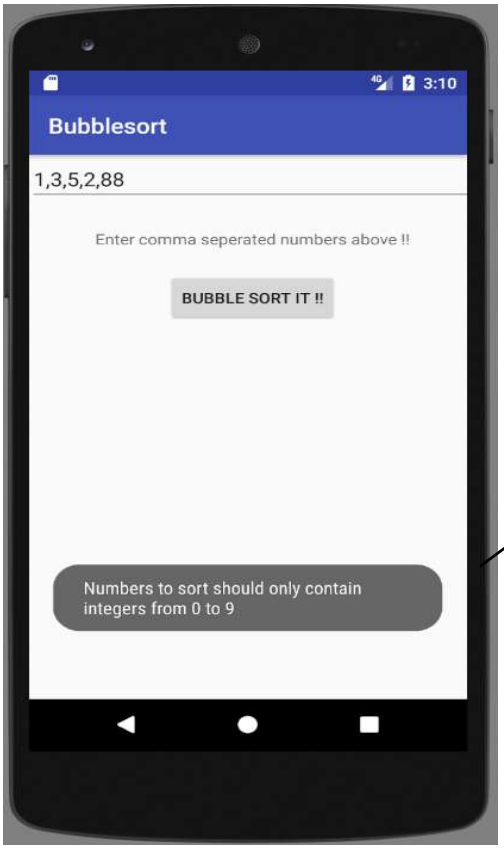
- Error message is displayed if one only digit input is provided
- Minimum input should be at least 2 digits

(c) Error message 3



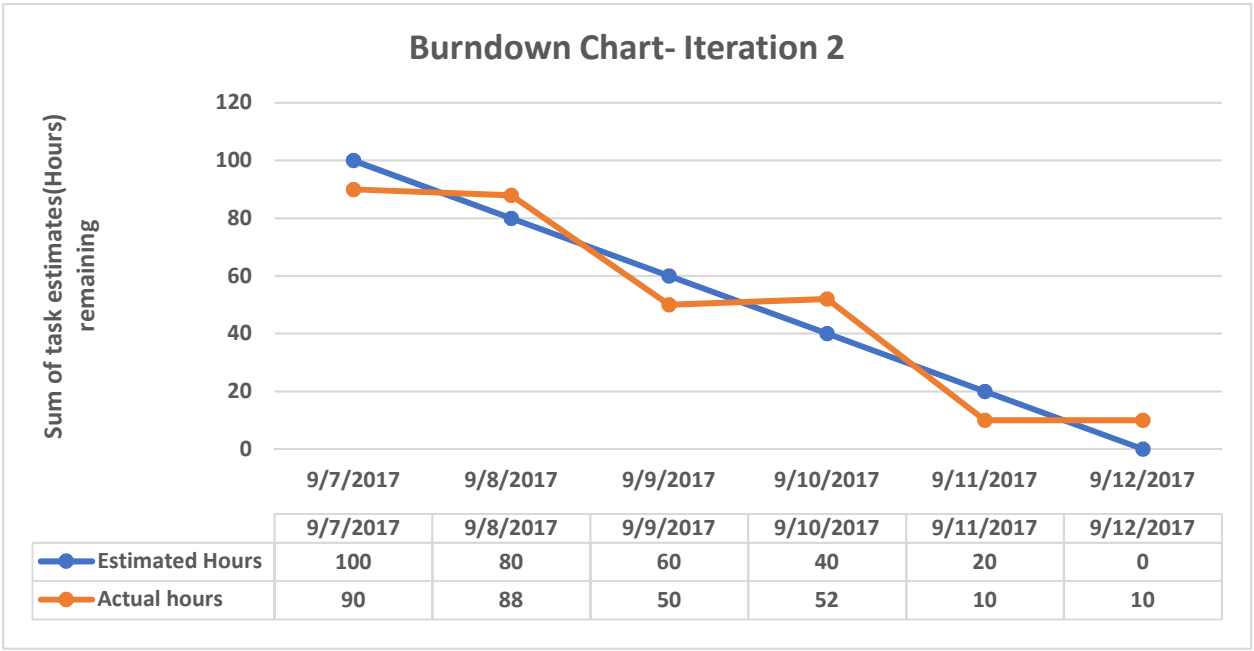
- Error message is displayed if more than 8 digits input is provided
- Maximum input should be at 8 digits

(d) Error message 4



- Error message is displayed if more than single digits input value is provided
- Input range should be at [0-9] digits

11.2.9 Burndown Chart- Iteration2



	9/7/2017	9/8/2017	9/9/2017	9/10/2017	9/11/2017	9/12/2017
Estimated Hours	100	80	60	40	20	0
Actual hours	90	88	50	52	10	10

Figure 11. Burndown Chart- Iteration 2

Burndown chart is an effective tool used at the end of the Sprint to provide the graphical representation of how the work progressed with time. During iteration 2, there was a backlog of 10 hours of work remaining on 9th September (End of sprint) as the team was waiting for clarity on the error messages from the Product Owner. Though the team worked effectively to complete the work, they were unable to finish all the task on time. Due to the delay, the team was unable to complete the tasks of User story 11.

11.3 Iteration III

11.3.1 User stories

For iteration 3 we have considered Sonal as the Product owner, who is responsible to discuss with the customers and get appropriate inputs. Based on the complexity and the estimation hours the priority list of user stories was created. In iteration 3, User story 11 was considered as a prioritized task as it was not completed in Iteration 2.

Following are the User stories that are focused in the Iteration 3:

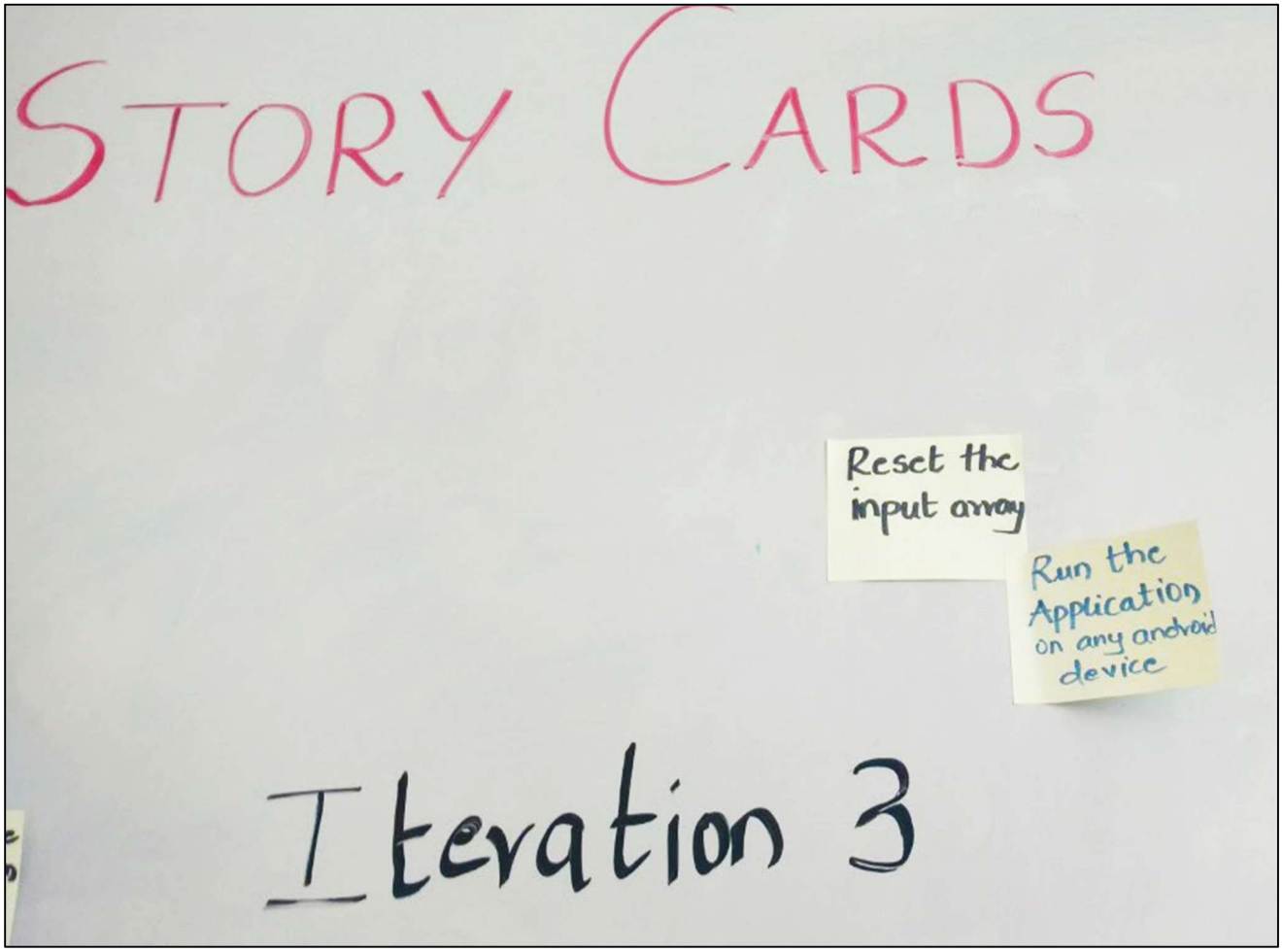


Figure 12. User stories- Iteration 3

User Story 11: As a user, I should be able to successfully exit from the bubble sort app when an Quit button is clicked.

User Story 12: As a user, I should be able to reset the input array such that a new input can be taken.

User Story 13: As a user, I should be able to run the application on any android device.

11.3.2 Iteration Planning

Sprint Backlog

User story	Task Description	Originator	Responsible	Status	Hours of work Remaining					
					Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
User story 11	Discuss the methods to exit the application	CA	SP	Complete	2	1	3	2	5	2
	Validate the Quit button	KS	SA	Complete	8	2	2	1	3	5
User story 12	Discuss the method to reset the input array such that new input values can be taken	KS	SA	Complete	2	7	8	2	5	2
	Validate the reset button	SA	KS	Complete	2	2	3	2	3	1
User story 13	Run and check if the application is compatible on all the android devices.	CA	KS	Complete	3	2	1	2	3	1

11.3.3 Managing

Our team choose college classroom as our workspace, as open environment allowed us to work more collaborative and maintain effective interaction with the team members. The workspace is situated at California State University, Fullerton UH204. This open workspace helped us to work together with different teams and allowed us to ease the level of difficulties faced by the teams.

Daily stand up meeting

We scheduled daily stand up meetings at 8:00 AM every morning from Monday to Friday for discussing various important topics which are going as per the schedule. The Scrum master Saranya would take the initiative and make sure all the topics are discussed. The Scrum master

focused on the pending work of iteration 2 and provided the team directions. We had chosen one team member to record the minutes of meeting which can be used for future releases.

11.3.4 Designing

Basic Design

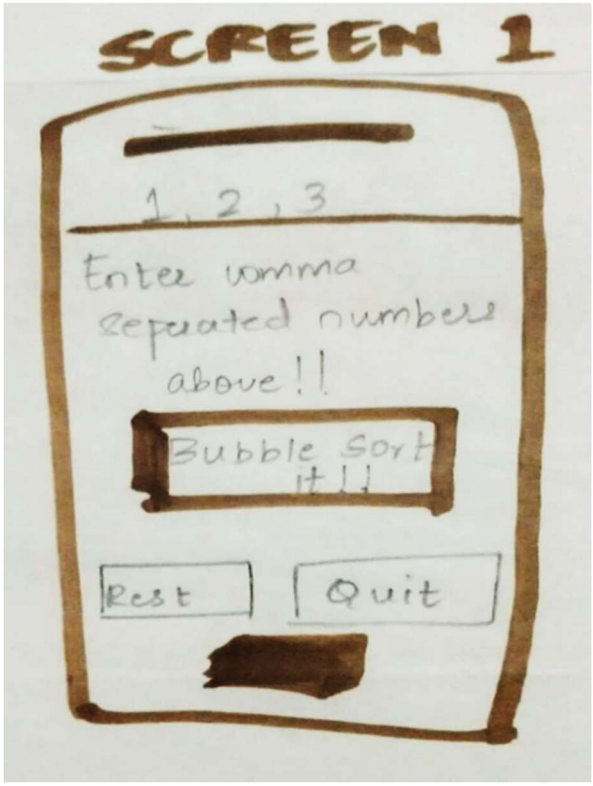


Figure 13. Basic design for screen 1- BubbleSort App

Spike answer

There was no major technical hurdle faced during the iteration 3 process.

11.3.5 Coding

The customer was always available to provide information to the developers regarding any queries and clarifications with respect to the code. The developers generated the code following the coding standards provided by the customers.

```
quit.setOnClickListener(new View.OnClickListener() {
    public void onClick(View v) {
        finish();
    }
});

reset.setOnClickListener(new View.OnClickListener() {
    public void onClick(View v) {
        outputView.setText("");
        inputView.setText("");
```

```
        }
    });

}
public void bubbleSort(int[] arrayToSort) {
    final TextView outputView = (TextView) findViewById(R.id.OutputView);
    Button quit = (Button) findViewById(R.id.btn_quit);
    Button reset = (Button) findViewById(R.id.btn_rst);
```

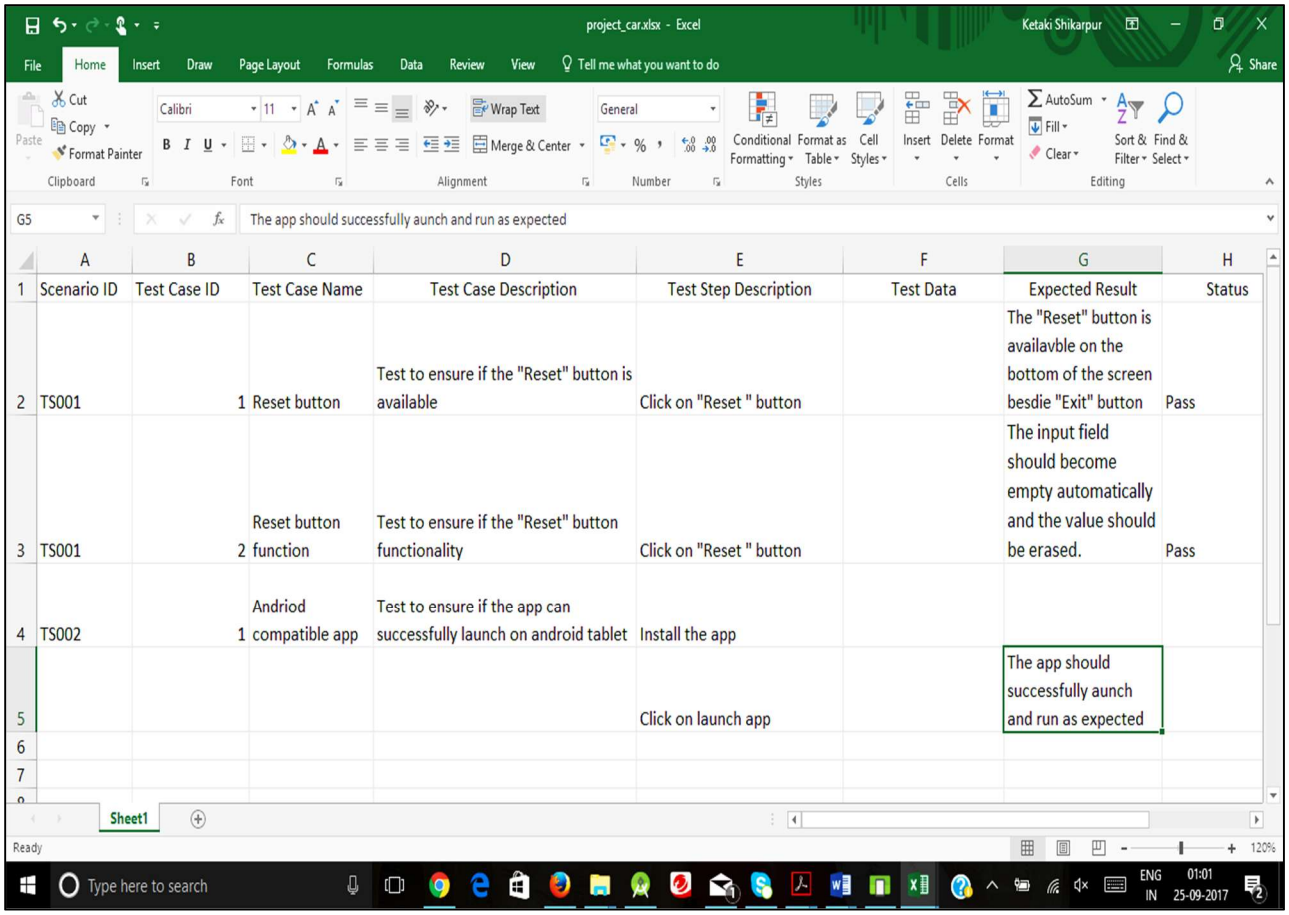
11.3.6 Testing

Functional testing

For iteration 3 the team decided to proceed with the Functional testing as the user stories of iteration 3 are just the button validation. So, the focus is on the functionality of the app and checking the expected output. Here the main testing focused on the button and its functionality.

The main testing was focused on the following:

1. Checking for Quit button
2. Checking the Quit button functionality
3. Checking if the “Reset” button is available
4. Checking of the functionality of the “Reset” button
5. Checking if the app is compatible for all android devices



	A	B	C	D	E	F	G	H
1	Scenario ID	Test Case ID	Test Case Name	Test Case Description	Test Step Description	Test Data	Expected Result	Status
2	TS001	1	Reset button	Test to ensure if the "Reset" button is available	Click on "Reset " button		The "Reset" button is availavble on the bottom of the screen besdie "Exit" button	Pass
3	TS001	2	Reset button function	Test to ensure if the "Reset" button functionality	Click on "Reset " button		The input field should become empty automatically and the value should be erased.	Pass
4	TS002	1	Andriod compatible app	Test to ensure if the app can successfully launch on android tablet	Install the app			
5					Click on launch app		The app should successfully aunch and run as expected	
6								
7								

11.3.7 Daily Scrum meeting

We scheduled daily scrum meetings at 9:00 AM every morning from Monday to Friday with the team for discussing about the story lines which are part of Iteration 3. During Iteration 3 the following were the important topics which were discussed.

1. Discussed on the Quit option (Part of Iteration 2)
2. Discussed on the resetting of the input data
3. Discussed on the compatibility of the Android application

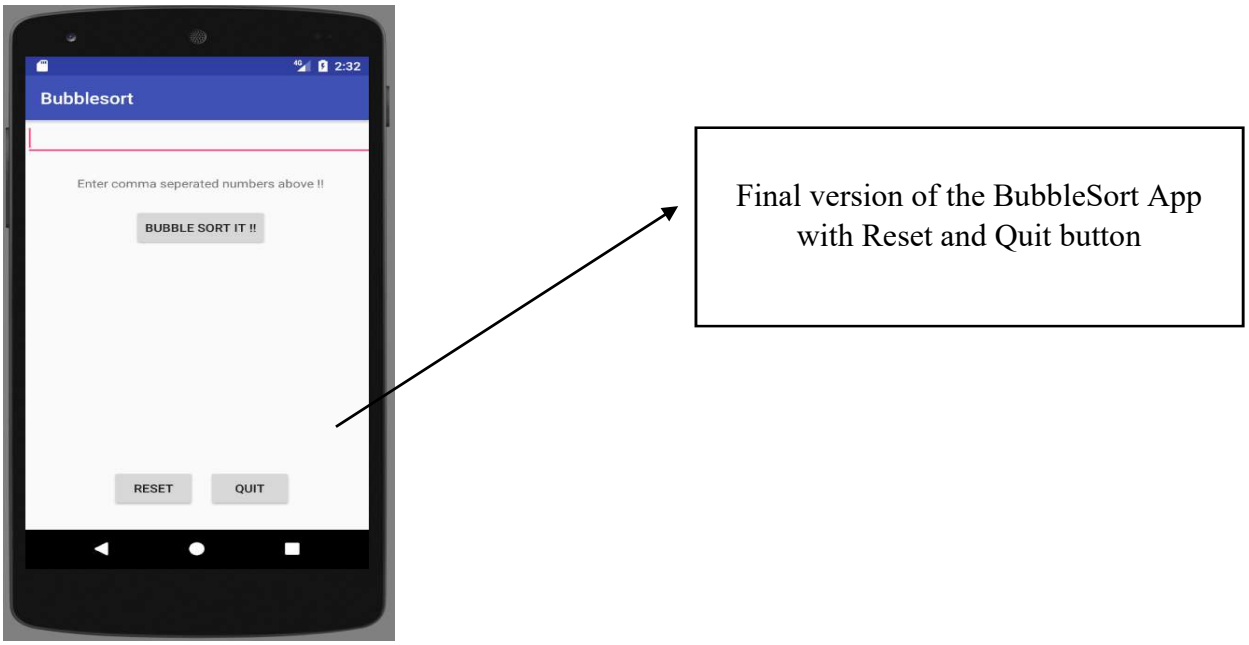
The solution of these queries was discussed with the scrum master Saranya and a clear idea was provided. Hence, implemented with the appropriate solution.

11.3.8 Sprint Review

1. The team gave the Product owner Sonal a demo of the work completed for Iteration 3
2. The team completed the pending work and gave a presentation to the Product owner Sonal
3. The product owner evaluated the Quit and Reset button design
4. The product owner Sonal suggested to go with the design provided during the design phase and have the “Quit” and “Reset” button
5. The team followed all the feedback given by the product owner Sonal and displayed the final demo successfully for Iteration 3

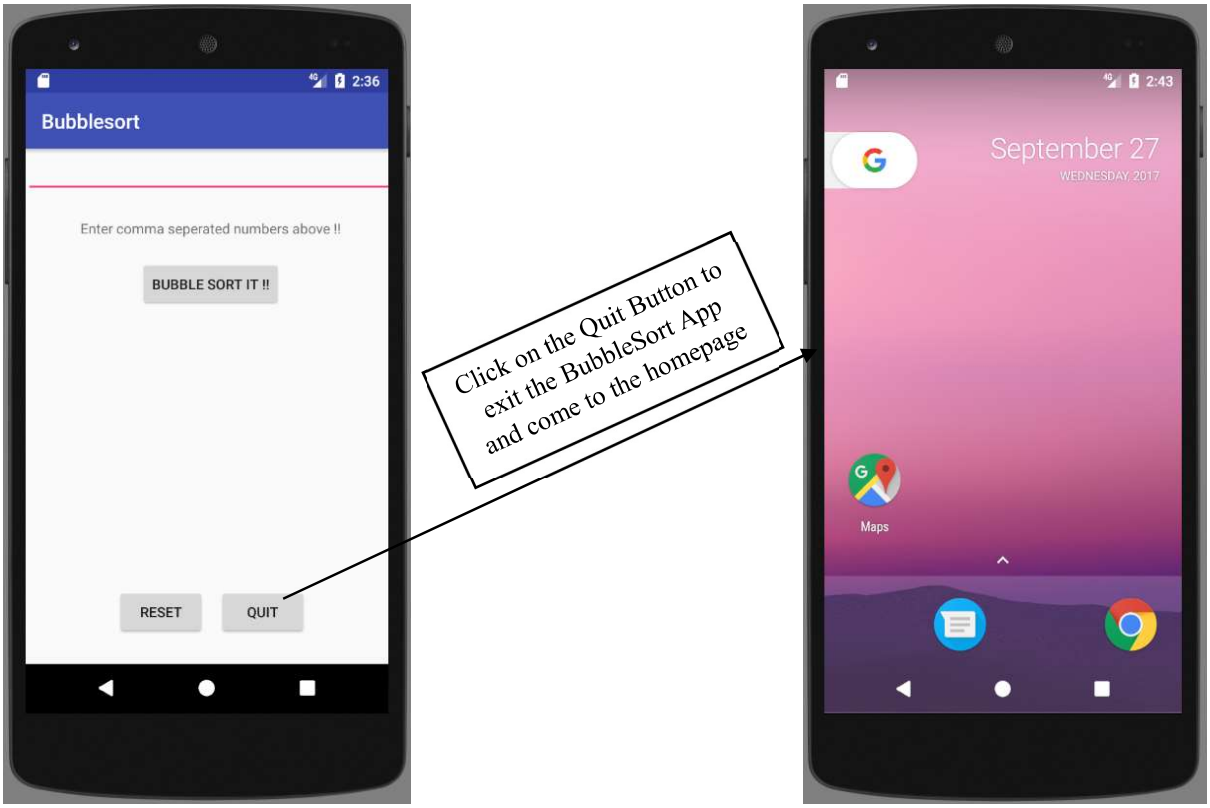
The user stories which are part of Iteration 3 was developed and presented to the Product owner. Following screen shots gives an idea about the work completed and the presentation provided to the Product owner(Sonal):

(a) BubbleSort App- Final



(b) Reset Button

(c) Quit Button



11.3.9 Burndown Chart

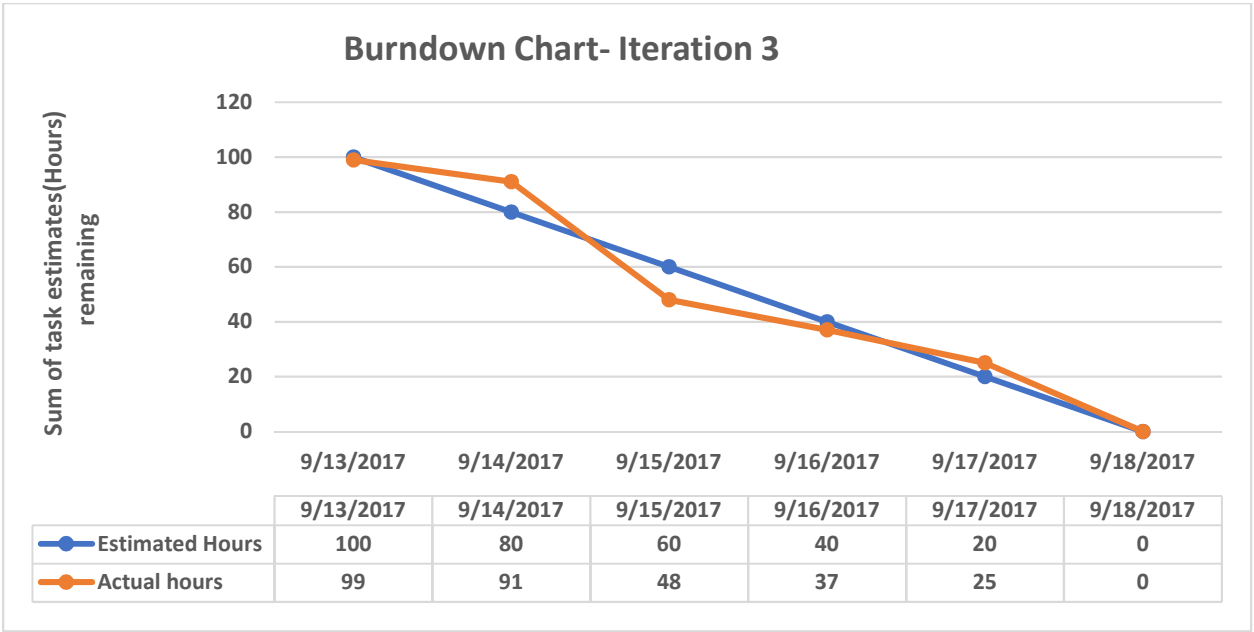


Figure 14. Burndown Chart- Iteration 3

Burndown chart is an effective tool used at the end of the Sprint to provide the graphical representation of how the work progressed with time. During iteration 3, the team was working towards completing all the tasks and the prioritized user story of Iteration 2. They effectively worked on the development and testing of the application and completed of the project by 18th September as scheduled.

11.4 Acceptance Testing

The acceptance testing was done to evaluate the BubbleSort App compliance with the customer and business requirements and assess if it is acceptable for delivery.

Following test are carried out to check the working of the final version of the BubbleSort application

- **Scenario 1:** The application should provide the input and output array of digits with the execution steps.

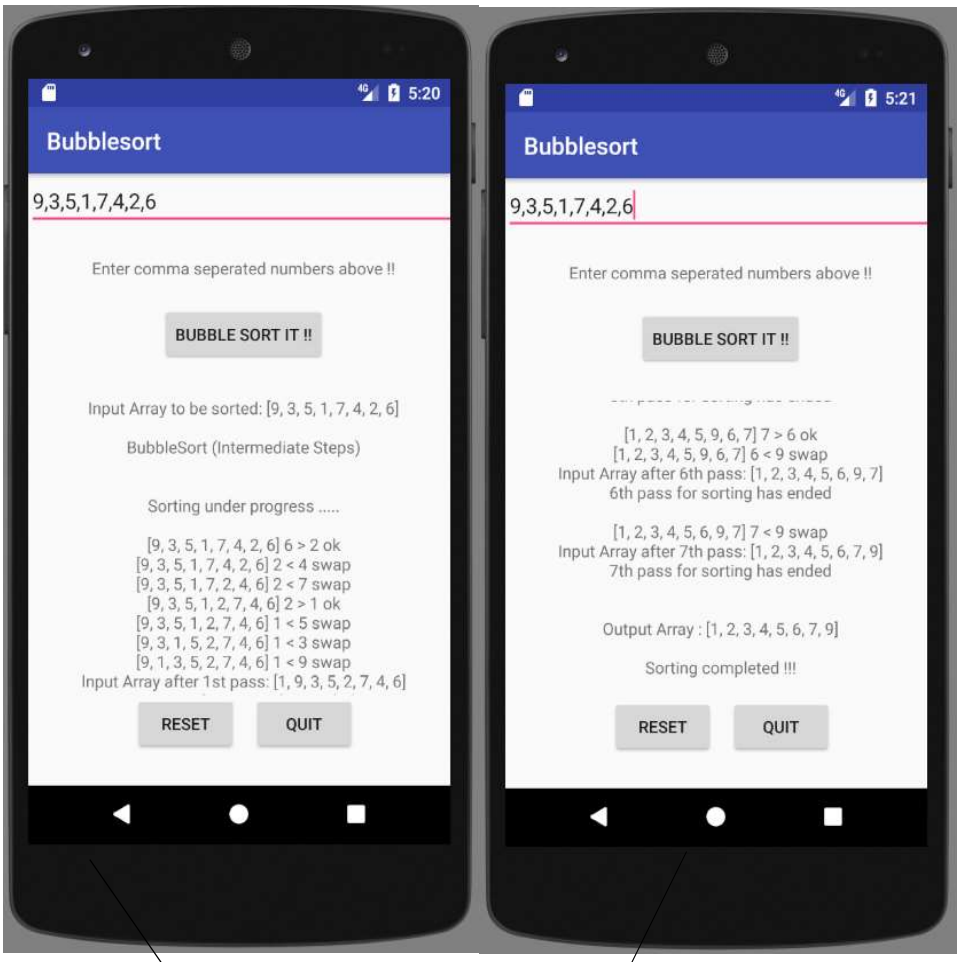
Input: 9,3,5,1,7,4,2,6

Expected Output: 1,2,3,4,5,6,7,9

[Along with the execution step using “Ok” and “Swap” techniques]

BubbleSort Output: 1,2,3,4,5,6,7,9

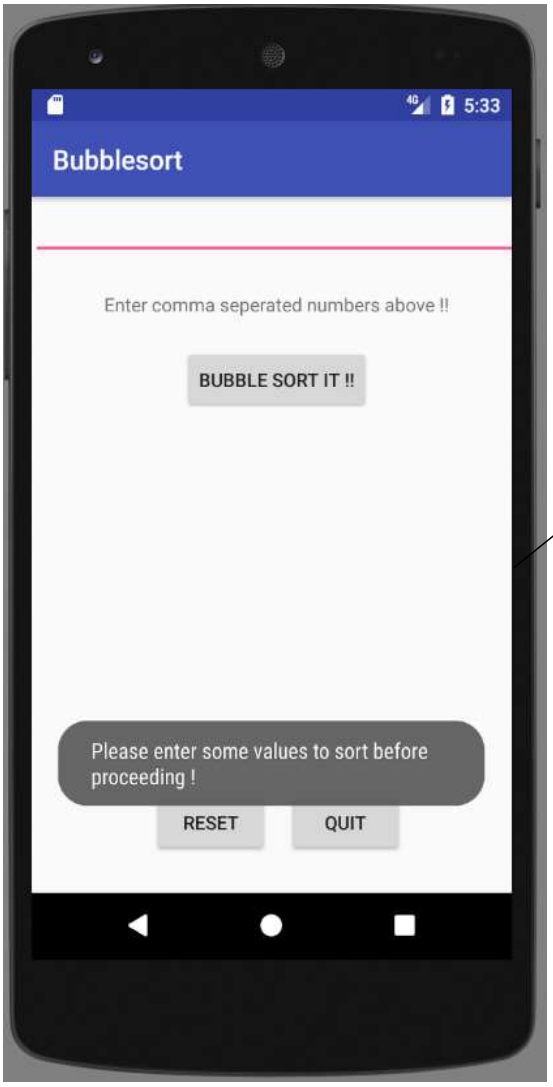
Result: Pass



- The output displays the input array provided by the user
- The output displays the output array to the user
- The output displays the execution steps
- The output displays the “ok” and “swap” techniques used for easy understanding for the user
- The output displayed is as per customer requirement
- **Scenario 1: Pass**

- Scenario 2: The application should provide appropriate error messages

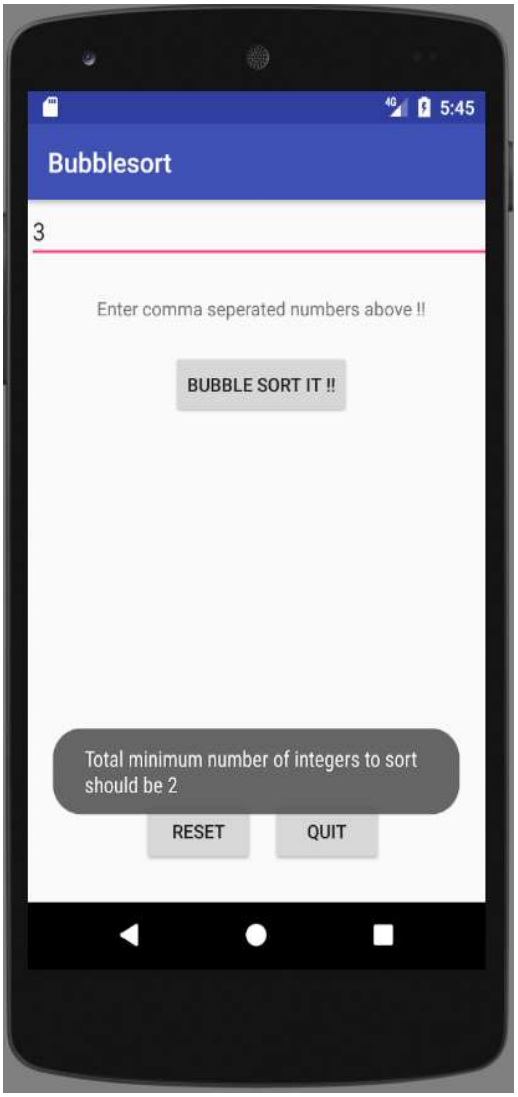
  (a) To check the error message if the input is a null value
  Input: Null value
  Expected output: “Please enter some values to sort before proceeding!”
  BubbleSort Output: “Please enter some values to sort before proceeding!”
  Result: Pass



- Error message “Please enter some values to sort before proceeding!” is displayed for null input
- The output displayed is as per customer requirement
- **Scenario 2 (a): Pass**

(b) To check the error message if a single digit input is provided

Input: 3
Expected output: “Total minimum number of integers to sort should be 2”
BubbleSort Output: “Total minimum number of integers to sort should be 2”
Result: Pass



- Error message “Total minimum number of integers to sort should be 2” is displayed when single digit input is provided
- The output displayed is as per customer requirement
- **Scenario 2 (b): Pass**

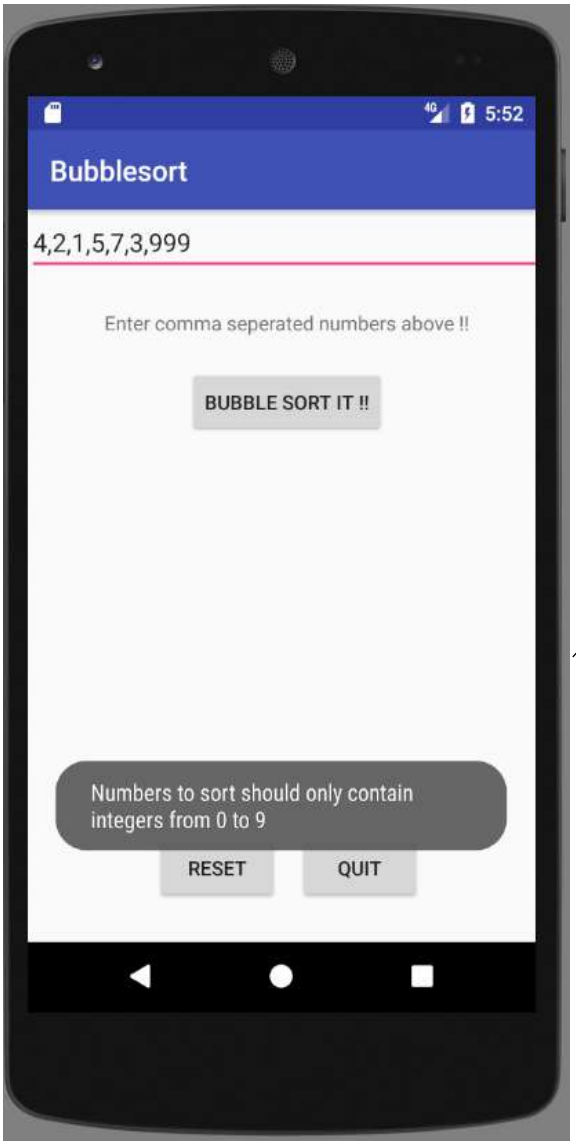
(c) To check the error message if more than 8 digits input is provided

Input: 4,2,1,5,7,3,9,5,8
Expected output: “Total minimum number of integers to sort should not cross 8”
BubbleSort Output: “Total minimum number of integers to sort should not cross 8”
Result: Pass

- Error message “Total minimum number of integers to sort should not cross 8” is displayed when more than 8 digits input is provided
- The output displayed is as per customer requirement
- **Scenario 2 (c): Pass**

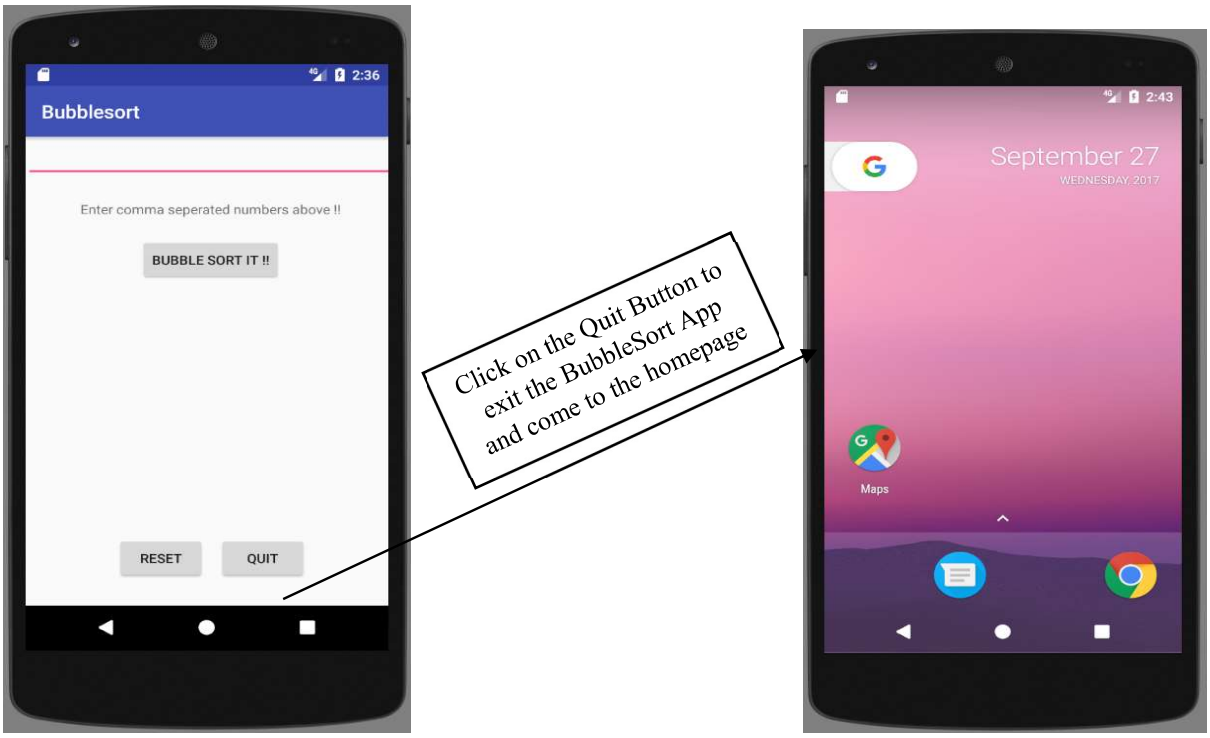
(d) To check the error message if the input provide is not in the range 0 to 9

Input: 4,2,1,5,7,3,999
Expected output: “Numbers to sort should only contain integers from 0 to 9”
BubbleSort Output: “Numbers to sort should only contain integers from 0 to 9”
Result: Pass



- Error message “Numbers to sort should only contain integers from 0 to 9” is displayed when input is not in the range of 0 to 9
- The output displayed is as per customer requirement
- **Scenario 2 (d): Pass**

- **Scenario 3:** The applications “Reset” and “Quit” should function properly



- On clicking the Reset button, the screen resets to initial stage. On clicking the Quit button, the application exits and comes to the homepage
- The output displayed is as per customer requirement
- **Scenario 3: Pass**

12. Release

The release criteria were discussed in the sprint meetings. We observed a close connection with implementing the product backlog with an emphasis on vision, goals, schedule, scope, and all other resource-related project necessities. We often updated the release criteria according to the changing conditions to give us a proper roadmap for the development process.

We used a To-Do list with significant effect to offer a point's scale for keeping release goals in proper estimation boundaries with respect to user stories. In completing each requested function or changes, we checked back to the Release goals and plan for guidance on the next iteration tasks for continued to process each user story at varying revisiting of past iterative blockages.

Documenting every step with all the details was given the highest priority as having a written record of all the things done, provides a clear roadmap of what is done and what else is to be done yet. A written document serves as a proof of the tasks accomplished and the to be determined tasks too.

This project was a small one and to be completed within less time there was no scope for mistakes. As mistakes done in one sprint would affect the tasks in the other sprint, which was not feasible due to limited time. Therefore, providing adequate training all the team members in android programming and the things associated with the development of the application was a must.

Before starting the development, the team decided to spare some time for training in the android development to avoid any hindrances in the actual development process. We all prepared timetable for ourselves to learn android app development and complete the learning in the decided time frame.

As part of training, we opted for pair programming of developers. Senior development team members work with the junior team members to train and understand the BubbleSort algorithm. Various study material was provided to the team to learn about the Android programming.

Following are few training materials and videos shared with the team for Android programming:

1. http://www.vogella.com/tutorials/Android/article.html
2. https://www.youtube.com/playlist?list=PLB03EA9545DD188C3

Each one of us took separate roles each sprint so that everyone gets a fair idea about all the roles played in a scrum team. All the activities were controlled and performed with utmost care and perfection. All the changes that were requested were done and the feedback given was taken into consideration keeping the release goals and plan for guidance on the next iteration tasks for continued to process each user story at varying revisiting of past iterative blockages.

During acceptance testing in our releases, performed by product owners, significant bugs involving feature design not compatible with user stories and acceptance criteria were revealed by the product owners. These issues were resolved prior to release before customers could find them.

13. Other activities

13.1 Estimation

The estimation is one of the important part of the project. Having the right plan and better estimate will lead the project to its success.

As per Barry Boehm, the organizations always give a range estimate based on the future requirement uncertainty. It considers both the **cost and schedule estimates**. As the project progresses, the risk will reduce and will have the better estimates. It is also known as "cone of uncertainty."

For estimation, list every single component of the system. After installation of an android studio, the next step was user stories, Iterations, managing, designing, Coding, Testing, Small Releases, Scrum meetings and daily scrum.

To work on each of this part, people are working on this project. They gather user stories, go through them with the client to select which task should be performed in which sprint or iteration to code, test, etc.

Each of these people must be paid in order to work properly. People must be paid satisfactory to work perfectly. Otherwise they will not work properly. Another significant estimation is the task estimation to complete the project as per schedule and cost estimate for training the employees to work in Java and Android.

To estimate the schedule with the task to be completed. It is considered that each main task will take at least take three days and two developers to work on the main task.

Since the one sprint time is three weeks. And in one week we considered two days to work on this. The estimation will be based on the simulated time, not real time. Each team member completes all tasks as per time allotted in each week.

The list of estimated costs are as follows:

- Salary: The team consists of 4 people. The minimum cost for each team member in the group is $10 per hour. The complete project will be finished in 9 weeks, i.e., three sprints. The one sprint or iteration consists of three weeks. Everyone worked 5 hours a day in each week. So, 10 hours per week. And the project will be completed in 90 hours in all three sprints.
  The salary for each team member will be:
  $10*90*4 = $3600
- Training: We assumed that we had a Mobile Application Development training that costs $500 each.
- Buying equipment: we already had all equipment's needed for this application. Otherwise, there is also needed to add cost estimation for new parts.
  $3,600+$500*4=$5600

That will be the total estimated cost to develop the Android application for bubble sort with agile methodology.

13.2 Project Planning

Project planning is a the most crucial step in project management, where documentation is done to ensure the project is completed successfully. Documentation consists of all the actions necessary to define, prepare and coordinate the plans. A good project plan would define how the project is executed, monitored, and controlled.

For our project, we have taken planning seriously as we believe that planning acts as solid foundation for the project and is necessary for making the project successful. We have taken time and effort to come up with our planning such that we the project would be delivered on time.

Planning in Scrum

Our Scrum team held Sprint Planning meetings at the beginning of every sprint to discuss the prioritized user story from the Product Backlog. During the meeting, the scrum team selected the high priority requirement of the customer from the Product Backlog which was further broken down to tasks as sprint backlog. The development team then evaluates and provide commitment towards the delivery of the sprint backlog tasks within the sprint. In our project, every iteration is 3 weeks-iterations/sprints. We planned to complete the project within three Iterations.

We have combined the scrum practices with the Release and Iteration planning practices of XP. This helps to place a roadmap using combination of both practices which helps to complete our tight scheduled project successfully.

Scrum Planning- Artifacts

In our project, we have used certain artifacts as part of the planning. The artifact is:

1. Product Backlog
2. Sprint Backlog
3. Burndown charts

The Product Backlog was created at the initial stage which helps to track the story points by prioritization. The priority was decided based on the customer, stakeholder requirements. The product backlog has the user story details, the number of task for each user story, the primary assigned team member and the estimation. We have produced the Product Backlog using an Excel worksheet.

The Sprint backlog is another important artifact which we have used for our project, it consists of the user stories and the different task that are to be carried out for successful completion of the user story. It also consists the estimation done in hours for completion of the task and the team member it is being assigned.

We have created Burndown charts during every iteration which helped us to understand the amount of work that remains after each Sprint of our project. We can observe that in our burndown charts we have showed effective team work and have completed all work at the end of every Sprint.

For our brainstorming sessions, we have used the white board and sticky note to finalize the user story for each iteration. This gives the team to look up to the board and get an idea about each iteration. We have also done the release planning as part of the planning process.

13.3 Project Monitoring and Control

The Monitoring and Controlling of the project is one important part of any software project. The Process Groups consists of those processes which are required to track and review the progress and performance of an entire project. The key here is to identify any such areas in which changes

to the plan are mainly require and it focuses on initiating the corresponding changes. Involved in the project. This mainly focuses on those processes which are performed to observe project execution so that potential problems can be identified in a timely fashion and correct action can be taking by controlling in in the near further

The primary goal of Monitor & Control for a project is to verify and compare the deliverables to the project plan and the business requirements which are given by the customers. These monitoring and control activities are performed throughout the project. However, the entire work can be done with respect to the execution of the project. Monitoring and control is done for the entire project phases but it more focuses on the execution phases. Here risk and change management plans play a huge role in the success of the project as the plan which are developed during the risk and change phases and keenly maintained and updates with all the latest changes.

During this phase of monitoring and control the Project Manager may find out various risk or problems associated with the project and which makes us realise that those are the once which may cause hindrance will be controlled. Once all the risk and defects are detected, the focus will go to correcting and preventing of those risks and this can be done using the control mechanism. The changes that configuration the deliverable and the baseline elements of our project must be made with proper outcomes. Quality control is performed throughout whole process of the project lifecycle.

Monitoring and control activities for our project.

1. We had to provide regular status report as per the communication plan. One of the team member was responsible to monitors all the on-going status of the project and had a complete note of it. The made the task easy for the team as all the things were thoroughly monitored. The daily status report was captured where in all the tasks and the risk which was involved on that day was noted and documented. The status report covered various major things such as the completions of the tasks, risk involved to solve any task, show stopper defects, scope changes and various other things which are directly involved in decision making o the project.

2. The next activity is to track and manage project issues and risk. It is important for the team to know the major issues which can be very dangerous in the later phases of the project. Hence it is extremely important to have a log which gives all the information of which issues are open and which are closed. This log should also have a count on the resolved issue which would help the project developers or tester to note them when the issue reappears.

3. The next thing which we followed was to conduct the change management. As it is an agile project there are various things which are changing every now and then and it is extremely necessary for the team to have an account of all the changes which has been carried out. The team maintained a file called Change log which has all the changes which was suggested to us

by the product owner or the testing team or the development team. The team also gave a change request to the other team which was formally submitted from one team to another.

Monitoring and control deliverable for our project.

1. Issue and risk log: The log has all the information's of various issue the team has come across and all the risk the team has predicted. It also contains the decisions taken for all the issue the team faced. In short it gives a complete idea about all the issue and risk for the entire project.

2. Change request log: We maintained a log which officially contain all the changes which was requested from all the different teams during the project.

3. Status Report: This report was a part of our communication plan which had all the task and it corresponding status. Once the task was completed in the particular time frame the status was updated. This way the team documented the regular status report for our project.

13.4 Configuration Management

Configuration management is a system engineering process used by software developers and Military engineers for managing the complex products. Change Management is nothing but managing people efficiently and productively during the required change period.

Some basic steps of change management are:

i. Identify Need
ii. Investigate that need
iii. Plan the Change
iv. Implement the change (continue performance monitoring after that)

The main aim of change management is to create a custom-made change strategy and apply it is such a way that reduces the disturbance to the employees. In other words, when we are implementing any system and already have fixed deadline and schedule. If a customer asks for a change in some part of the project, it is not right to accept is without considering schedule and resources.

It is good to manage the changes as per immediate need. If change can wait, it is better to ask clients to wait till the next releases.

We handled configuration management process in our project. Some features such as animation and the end button were missed while implementing first iteration (first sprint) of the project. We overlooked it.

The stakeholder asked to include these to the project. The change control board (CCB) which we put together consist of product owner and scrum master, discussed whether it is possible to add these changes in this sprint. The change control board proved the client's request. The scrum master explained these new features to the scrum team. The scrum team told that it is hard to add these new features to sprint one backlog, as they are working on bubble sort algorithm.

The scrum master asked product owner the possibility to carry forward this to the sprint backlog to the next sprint but having it as the highest priority. The product owner understood the situation. He negotiated it with the clients and pushed these features to the next sprint. The client agreed, and product owner signs off on having the print backlog pushed into sprint 2.

In this process, the change control board was responsible for accepting the change request. Once the change request is approved, then the scrum master needs to notify the team as per the project's status. The scrum master was responsible for acquiring the current team status based on daily scrum meeting and notifying the product owner. In this case, the scrum team will receive approval from the product owner to push the sprint backlog to the next sprint.
In our project, the product owner had final approval to push the sprint backlog to the next sprint as he is the one who will interact with client/customer.

13.5 Quality Assurance

The quality assurance of the project depends on the processes which are involved in maintaining the quality of the product. The quality assurance ensures that project processes are used effectively to produce a quality deliverable for the project. The quality of the project is measured in terms of continuously improving project work, meeting standards and correcting project defects. There are three major key items which needs to be considered for any quality assurance project, the first is the developing of the quality assurance plan, quality audit and the analyzing of the project quality.

To maintain a excellent quality of a project it is extremely important to develop and maintain a good Quality Assurance Plan. The first major task of the quality assurance is to plan the overall process of assuring the quality. The quality assurance plan mainly focusses on the designing of the quality assurance plan template which would mostly be in the form of tool and which would help in measuring the quality of the product. The quality assurance also helps to monitor problems and drawbacks, which may appear during the project implementation process. The quality assurance team needs to build a plan to do the task of the quality assurance activities, such Analysis and Audit.

The basic steps in creating a quality assurance plan template would involve the following task, such as to setting up goals of project assurance, assigning responsibilities to members of the quality team and determining the hierarchy of management, gathering of relevant information on the project standards and defining the compliance criteria, identifying a set of measurements and metrics to be used to determine quality levels and performance.

The next important task in the quality assurance is to have a quality audit for regular basis. With the appropriate quality audit, the systematic review of project activities is to identify whether the activities that are performed is in line with organizational processes. The main goal of the quality audit is to carry out a project quality and reveal if any, procedures or processes or missing or inefficient policies that reduce quality levels and increase the probability of failure. The quality audit session is carried out by the quality team and can review quality metrics like on-time performance, budget deviation, failure rate and defect frequency and all these activities are measured against the quality baseline.

The Auditing quality mainly allows the correcting and identifying any of the deficiencies which are available in project. As the result of quality auditing the decreased cost of quality management will in turn enhance the product acceptance and the customer satisfaction. The quality auditing activities are done by the external and independent auditors. The quality assurance activity will form a formal confirmation of the document that will prove the necessary changes to implement the process and serves as a foundation for developing corrective actions.

The Quality analysis is the set of series of the steps to examine and investigate the certain project activity and it helps in identifying what will enhance the activity's value and what can cause a problem. The main aim of the project quality analysis is to thoroughly review quality levels and then define necessary changes or any improvements for the existing quality management framework.

The quality assurance activities help in examining the deviations in constraints, experienced problems and any activities that will in turn provide a value. The quality analysis procedure will include the root cause analysis, fit analysis, methods for identifying and solving problems, and will also have the various techniques for developing corrective actions for the betterment of the project. While carrying out the fit analysis of the product, the testing is used as a method for examining whether the product features are accepted as the user acceptance criteria and this way we match it with the requirements of the user. A testing plan for the project becomes a complete scenario for analyzing and validating of the product quality.

For maintain of the quality of our bubble sort app we made sure we had a complete quality assurance plan at the start of the project during the planning phase and with detailed review in every stage we made sure we met all the goals and were in line with the plan what we had prepared. The next things to maintain the quality assurance we had a process of quality auditing where in the frequent auditing of the quality was checked during every iteration of the project. Lastly with all the result we had to analyze the overall quality of the project and this will help the team to assure the user that our bubble sort app is of excellent quality.

13.6 Risk Management

Risk is generally defined as an event that could affect the goals of the project and it can contribute to the success or failure. Risk can have a positive impact on the project (Opportunities) and have a negative impact which pose as a threat and impact the project negatively. Thus, for our project

we focus on managing the risk proactively and in an iterative process such that it starts from project planning to the end of the project. The risk management involves identification, assessment, prioritization, mitigation and effective communication.

The five steps to Risk Management:

1. **Risk identification:** Identify the potential risks.
2. **Risk assessment:** Evaluate and estimate the risks identified.
3. **Risk prioritization:** Prioritizing risk to be included in the Prioritized Product Backlog.
4. **Risk mitigation:** Developing an approach to deal with the risk.
5. **Risk communication:** Communicating the risk to the stakeholders

During risk identification, our Scrum team members attempted to identify the risks that would impact the project. The risk identified:

- Pair programming of developers for understanding the algorithm
- Lack of important skills in the team
- Estimating and completing the tasks as per schedule
- Effective communication within the team
- Budget constraints

Risk assessment was done to understand the potential impact of a risk. The effect of the risk on the business value was estimated and if the impact was very significant then a decision to whether continue the project is made. In addition to probability, risk assessment also evaluates the potential net effect of risks on the project or organization.

For risk prioritization, the identified risks are captured and give the priority based on the analysis and discussion with the customer, team, product owner etc. It is the Prioritized Product Backlog. The below table under risk mitigation consists of the risk prioritization for our project.

In the risk mitigation, we have been proactive and reactive. Following are the risk prioritized and corresponding mitigation plan provided:

	Risk priority	Risk description	Risk mitigation
	1	Pair programming of developers for understanding the algorithm	• Extra programmers are included in the team
	2	Lack of important skills in the team	• Technical session conducted for the team

			• Cross training is provided • Regular meeting to test the skills
	3	Estimating and completing the tasks as per schedule	• Efficient Product Backlog to be prepared • Efficient utilization of daily Scrum meeting
	4	Effective communication within the team	• Efficient utilization of daily Scrum meeting
Risk s	5	Budget constraints	• Monitor the budget on regular basis • Provide feedback to the customer early

-----→ High Priority
-----→ Medium Priority
Risk s-----→ Low Priority

Risk communication is necessary because stakeholders need to know the limitations of the project. In our project, the above-mentioned risk and the potential effect of the risk and the mitigation plans was communicated to the stakeholders. The communication was continuous and was done in parallel with the sequential steps- risk identification, assessment, prioritization and mitigation. The Scrum team also discussed the risks related to their tasks with the Scrum Master during Daily Standup Meetings.

14.Lesson Learnt

14.1 Saranya Arunachalam

This homework gave me a wonderful opportunity to work in an environment with the combination of two Agile methodologies; Scrum and XP programming. I could understand the how the process falls in place in a company. It gave me in-depth information on process, understanding the requirements for the project, functional & non-functional requirements, user stories, story cards, design, brainstorming on the basic design, prototypes, development and testing. In a short duration, I could understand the Scrum artifacts like Product Backlog, Sprint Backlog, Burndown charts. I could play multiple roles for the project as a Product owner, Scrum master, developer, tester.

We followed closely the instruction given in the homework outline for creating the process for the BubbleSort App. I understood the importance of maintaining and staying within the scope of the

project. Gave an insight of the open space working environment which helps team members to bring up any hurdles faced to the knowledge of the team. This helps to solve the issues immediately.

The other most important learning from this homework was to be able to create an application using android studio. It gave an opportunity to learn android programming as this kind of exposure would help in the search for job opportunities. It also helped in analytical thinking for understanding the algorithm for BubbleSort App.

As the IT industry is moving towards Agile methodologies through this homework I could work on both Scrum and Extreme programming. This exposure would give me a lead in the team as I would be able to understand the concepts easily. It will help to cope with the fast pace work culture and working with cross-functional team and the advantages of pair programming.

As a team, worked together and effectively understood the concepts of the Software process. We formed a Scrum team and every member played each role effectively. It gave me a chance to gain knowledge from others experience and share my experience with the team. It also gave me a chance to work in a team with members having equal interest and working hard to meet the goals. It was a great opportunity for collaborative learning.

14.2 Charushila Awhad

The lesson I learned from this homework 1 is to understand and follow the process to build a software application. This process was carefully framed that saves the various resources and time by dividing the tasks into subtasks and implementing it as per the customer's priority.

I learned how an agile process could work with scrum and extreme programming. I can relate all these scrum meetings and sprint review with the real-time corporate meetings. I also understood that how to overcome any problems that occurred during a project such as changing of requirements, risk management, etc. Project Estimation helped to know the estimated project cost based on schedule, tasks, and resources.

After completing this homework, helped me to understand the actual process followed by the companies. Scrum meetings helped me to understand how the project can meet the success by knowing each member's yesterday's works, what they will do today and any impediments occurred.

Frequent interaction with the professor and discussing the complete homework process with the team helped me to strengthen my skills. Getting involved in each of this activity will help me in future when I get to work in the industry. It helped me to understand the importance of group work and coordination.

14.3 Sonal Patil

This homework helped me understand the combination of agile methodologies and extreme programming. By doing this homework I also understood how the actual process of software

development in the industry is carried out. It taught me that each step is crucial and if missed or done wrong can have a huge impact on the others to come.

As this agile work culture was new for me. By following the agile process with scrum and extreme programming helped in understanding the fast pace work culture and working with cross-functional teams and handling various titles like product owner, scrum master, developer etc. This helps me understand that though the agile has small tasks distributed throughout the sprints, how important it is to document the reports regarding them and to finish the tasks that are assigned to a sprint as it can affect the tasks in the upcoming sprints, making the process slower.

This homework gave me an opportunity to learn android programming and to work in scrum teams and understand the working of these teams. While doing the homework we also understood the importance of pair programming and peer review. This homework will help in the future when we get to work in the industry.

It also gave me a chance to work in a team with members having an equal interest in the topics and working hard to meet the goals. It also gave me a chance for collaborative learning and a vast experience to value.

14.4 Ketaki Shikarpur

This home work has helped me to enhance my over-all knowledge about the software processes and the phases involved in building a complete product. As this project was extremely detailed oriented homework which involved me to explore various advanced skills such as android programming and software process phases which are currently being using in the software organization. This exercise gave a taste of the real-world project of working on the software industry.

I could relate to these various processes to the real-time experience which I had during my work experience in Accenture. The processes involved in building the android application was exactly correlating to my work and all the tasks which I performed. Back then, it was just my duty to carry out various processes but after doing this assignment I have detail and understanding about each process and its use.

Scrum and XP are one of the burning methodology which every industry these days want to follow and is extremely new concept for our team and with previous experience I had some knowledge about the concepts and it was very interesting that they caught my mind and extremely helpful to use them in my future work life. My previous project was an Agile project all the detailed charts like burn down chart, conducting sprint review was all done by my Team lead, hence I knew them about did not know how exactly to do it. This assignment helped me know all the agile methodology well.

We started the project from the scratch so that we did not miss any process and tried not to ignore any step in either developing the android app nor in documenting it. The team was so co-operative and helpful that they were always excited and enthusiastic in leaning all the new concepts of scrum

and agile. They were always prompt and keen towards the given task. The team was good at time management and we made sure we met every alternate day to check on the task completed and the pending work.

We had four members in our team, in which two of them had three of them had industry experience and one team member wasn't having any experience. But the team always made sure all the team members were on the same page and helped each other in doing peer reviews and correcting each other mistake by doing constructive criticism which made each team members to be motivated and work towards our goal and could finish way before the deadline and had a happy environment to compete our task.

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16.Team Charter

Course Title	CPSC 544- Advanced Software Process	*All team members participated in the creation of this charter and agree with its content.* ***Date*** *08/31/2017*
Instructor	Dr. Chang-Hyun Jo	
Course Dates	08/21/2017 – 12/08/2017	

Team Members

Name	Address (city, state, country)	Phone	Cell	Email
Saranya Arunachalam	Fullerton, CA	628-237-9241	628-237-9241	saranarun@csu.fullerton.edu
Charushila Awhad	LA, CA	919-649-9171	919-649-9171	charushila.awhad@csu.fullerton.edu
Sona Patil	Fullerton,CA	510-300-4962	510-300-4962	sonalpatil@csu.fullerton.edu
Ketaki Shikarpur	Fullerton,CA	657-243-5685	657-243-5685	ketaki_shikarpur@csu.fullerton.edu

Team Member Skill Inventory

Ketaki Shikarpur	▪ Database Design and Development ▪ Systems Architecture ▪ Agile Methodology and Scrum ▪ Project Management ▪ Software Lifecycles (waterfall, spiral, iterative and Requisite Pro ▪ Database (PL/SQL, Oracle 9i) ▪ MS Office Suite (Word, Excel, PowerPoint, Project) ▪ Automation testing (Selenium)

	▪ Operating System (Windows, Linux)
Sonal Patil	▪ No experience in industries ▪ Recently graduated from the Mumbai University in Information Technology ▪ MS office suite ▪ Database(MYSQL) ▪ Operating System (Windows, Linux)
Saranya Arunachalam	▪ MS Word, Excel, PowerPoint ▪ Mainframe Performance and capacity management ▪ SAS programming, TDS(Tivoli decision support), QMF(Query management), SQL, JCL(Job query Language),DB2, CICS ▪ Data analytics ▪ Operating system zOS ▪ C, C++ ▪ Project Lead ▪ Operating System (Windows, Linux)
Charushila Awhad	▪ Distributed System, Big Data/Hadoop ▪ Software lifecycle (Agile methodology, Scrum call) ▪ Microsoft Office (Word, Excel, PowerPoint) ▪ Project Management. ▪ Database design and modelling. ▪ Database(oracle10g)

Team Goals

- Understand software design and architecture method and process.
- Similarities among them. Their benefits and challenges.
- Group discussion, collaboration to submit assignment on time.
- Maintaining good relationship between teammates.
- Submit quality paper that contains all information as mentioned.
- Develop skills to work in corporate environment.

Team Roles

Ketaki Shikarpur (Software Architect)	▪ Documentation of each member's task and their completion deadlines. ▪ Schedules meetings an understands each team member's roles and responsibilities. ▪ Supervise each team member regarding their contribution for the work assigned.
Sonal Patil (System Architect)	▪ Consolidating each member's task. ▪ Ask teammate for their progress and task status. ▪ Make sure that each meeting covers all points and issues resolved.
Saranya Arunachalam (Team Lead)	▪ Responsible for coordinating and maintaining each task of team member. ▪ Ensure that every team member working towards goal. ▪ Consolidating each member's task. ▪ Consolidate the final report for review
Charushila Awhad (System Architect)	▪ Provide plan to each team member to submit assignment on time. ▪ Confirm that every team member is following schedule with task. ▪ Document vital information.

Ground Rules

- All team members must be punctual and prepared for each team meeting.
- Participation and input is expected from all team members.
- All opinions will be considered and equally valued.
- The team will meet at least once each week
- Team members will notify the lead in advance if they are not going to be able to attend a scheduled meeting.
- Team members should check email at least once a day to stay on top of things.
- In case of emergency, the team should be informed about the absence and also follow up on the missed days discussion.
- Homework should be completed at least 5 days prior to deadline.
- Schedule should be prepared and strictly followed.
- All work should be divided equally among all team members.
- All team members should completely avoid plagiarism and use own ideas and creative thinking for homework.

Time Commitments/Availability

Ketaki Shikarpur	▪ M & W from 8:00am to 10pm ▪ T & Th free before 1:00pm and after 7:pm ▪ 8am-5pm Saturday & Sunday, all day
Sonal Patil	▪ M , W,F,S,Su from 8:00am to 10pm ▪ T & Th free before 1:00pm and after 7:pm
Saranya Arunachalam	▪ M , W,F,S,Su from 8:00am to 10pm ▪ T & Th free before 1:00pm and after 7:pm
Charushila Awhad	▪ M , W,F,S,Su from 8:00am to 10pm ▪ T & Th free before 1:00pm and after 7:pm

Conflict Management

- Assign roles and responsibility to each member with deadline.
- In case of any disagreement between team members.
- If team member is having any issue regarding task allotted or any other issue, then all team members must sit together to resolve that conflict.

Risk Management

- Incomplete requirement and changing requirement is major issue in project failure.
- Lack of resources, less team support and skills, deficient planning, impractical expectations major risks involved in project.
- Project risk can be reduced by working with stakeholder, checking risk every week. Mitigation can be done by limiting risk impact.

Team Evaluation Criteria

- Evaluation is based on the work done, team meeting, participation, communication through email.
- Task completion on-time.

17.Team Evaluation

Members / Evaluators	Saranya Arunachalam	Charushila Awhad	Sonal Patil	Ketaki Shikarpur	Total	Comments on Your Evaluation on Team
Saranya Arunachalam	100	100	100	100	400	Every member put in effort
Charushila Awhad	100	100	100	100	400	All members did well.
Sonal Patil	100	100	100	100	400	Great team work and co-ordination
Ketaki Shikarpur	100	100	100	100	400	A nice team to work with
Total	400	400	400	400	1600	
Max	400	400	400	400	600	
Average	100.00	100.00	100.00	100.00	400.00	
Percent	100.00%	100.00%	100.00%	100.00%	100.00%	
Signature						
Comments on Your Score Earned from Team	I am happy with score. Hardwork paid off.	I got good score.	I deserve this score.	As per my performance I deserve it.		