

UX Engineering

Milestone II



Code & Watch

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Section I: Needs Finding Report

Target Audience

New generation students have shorter attention spans, they are technologically savvy, and their information overflow and constant connectivity calls for changes in the way knowledge is presented and consumed. We are basically targeting the computer science students who are trying to learn data structures and other basic programming techniques, of any age group and whether they are enrolled in any school/university or not.

Description of Participants

All the participants of our research are students of FAST, National University of Computer & Emerging Sciences, Islamabad Campus. 2 of our participants are currently in their 2nd semester of BS in Computer Sciences, while others belong to senior and junior year. All of them are students and aged between 19 and 24. Technologically, all of them are sound and regularly use mobile phones, computers and explore internet. Our target population is 99% similar to this, as we are targeting new programmers (whether they are in any University/college and are struggling in understanding concepts of basic data structures). We are also targeting self-learners, who are not enrolled anywhere but have ability to learn or are trying to study themselves for whatever purposes.

Findings (Interviews)

Affinity Wall

Here is a picture of all the affinity notes, clustered and organized into three categories i.e. previously faced Issues, Suggestions and Improvements, Thoughts and Frustrations.



We conducted interviews of four students and here are their brief details:

Participant	Age	Gender	Semester	Experience with a Similar App
Participant #1	19	M	2 nd	No
Participant #2	19	F	2 nd	VisuCode
Participant #3	21	M	6 th	YouTube
Participant #4	22	M	8 th	Python Tutor

Our view of the user needs changed somehow after taking the interviews, as none of our participants was a regular user of existing applications, because they provide generic idea of the topic they are trying to learn so they drop this idea of searching here and there to find the best one. Therefore, we need to provide something that actually saves the time of learners and provide exactly what they are looking for.

As one of our participant stated:

‘In the start I didn’t get how a linked list works so I googled, youtubed and eventually gave up because I couldn’t understand after watching 4-5 videos. Then one of my friends taught me by the use of diagrams and code side by side and I got the idea’.

This is evident that no such tool is already available which can assist in the form of real time visualizations of C/C++ code. The most important thing here is the Time, we need to save students’ time as much as possible because of shorter attention span. They, in the start, try to find helping material but give up so easily.

Functional Requirements

After interviewing and observing, following are the functional requirements that we must implement in our design to fulfil the user needs:

- 1) A website where users can create their account.
- 2) Website must have a code editor to write code and a compiler to run the code.
- 3) It must have an option to split screen and view real time animations of basic data structures.
- 4) It should at least have visualizations supporting arrays, stacks, queue, linked list, and trees.
- 5) Users can add their friends, can share screens, can ask for help or comment on codes.
- 6) It should allow users to debug their code (run code line by line).
- 7) Users can save any piece of code or any animation for later use or revision.
- 8) It may have a forum where all the users can share their problems and any other user can share his/her code to visualize.

- 9) It may have a library of already made visualizations so that users can easily access without wandering on the internet and other websites.
- 10) It should be scalable and can later be converted into an offline application or a mobile app.

Constraints

- 1) Our application must be easy to learn and effective to use.
- 2) It must have all the information related to a topic available in order to save users' time.
- 3) It must not let users search for topics here and there on other websites.
- 4) It must be engaging and interactive to gain users' interest.
- 5) It must not violate users' privacy policies and it must take care of users' data.
- 6) It must not waste time of users.

Section II: Design Concept

Description

Computer Science has attracted thousands of students in past 2 decades and is still open for a lot of research and development. In our country, half of the students who end up in a computing field never thought of or were never aware of it during their high schools and therefore, they (despite the fact that they are high achievers) find it difficult to easily grasp the basic programming techniques and specifically data structures during their initial days and understanding of those days is plays vital role throughout their career.

Secondly, not everyone comes with the same level of intellect so there must be something to aid those who want to learn but are facing difficulties in understanding basic idea quickly or easily. We aim to empower coders (starters) by providing an additional resource through which they can visualize their code in real time because, recognize rather than recall!

Requirements

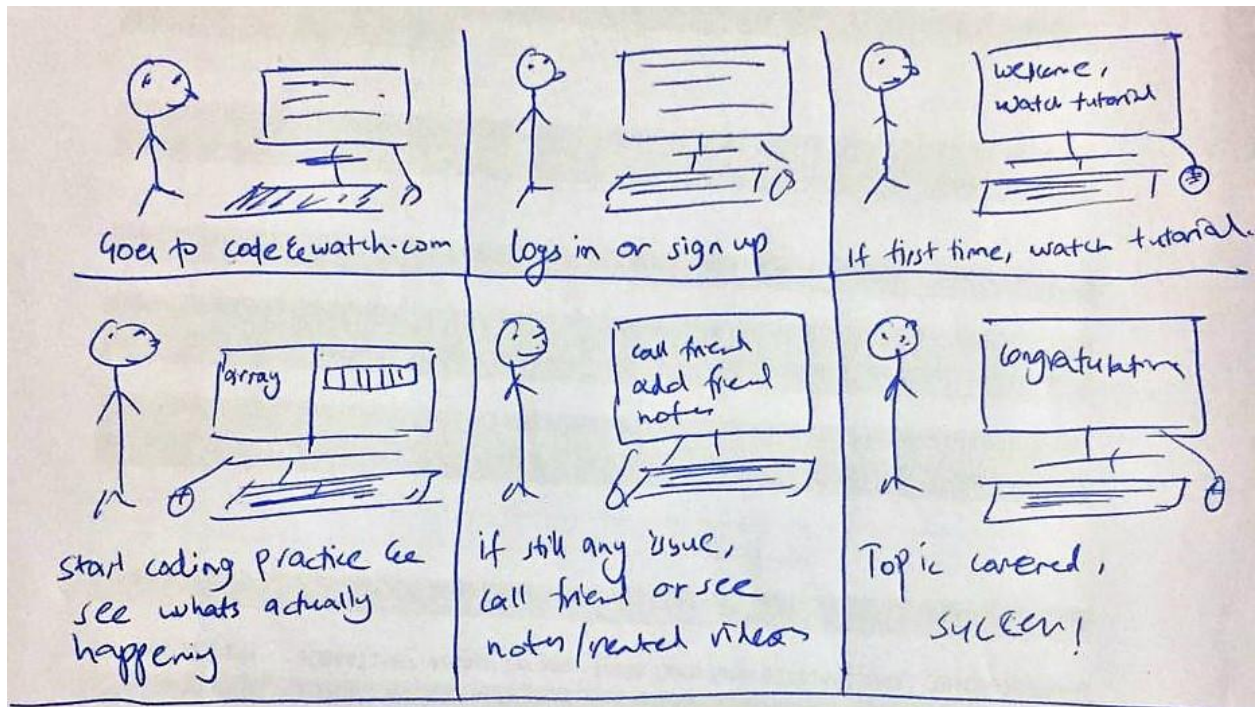
- 1) A website where users can create their account (With all assistance of recovering password in case of forgetting & Signing in using other accounts e.g. google, Microsoft or Facebook)
- 2) Website must have a code editor to write code and a compiler to run the code (code editor must be the one which has the best user experience e.g. Sublime Text).
- 3) It must have an option to split screen and view real time animations of basic data structures (for those who only want to use it for code and don't want to see animations).

- 4) It should at least have visualizations supporting arrays, stacks, queue, linked list, and trees (these are the basic needs of a new learner, it should be scalable to add more algorithms and data structures in future).
- 5) Users can add their friends, can share screens, can ask for help or comment on codes (in case animation is not enough for understanding or a user wants to help any of his or her friends).
- 6) It should allow users to debug their code (run code line by line for those who want to see what is happening by writing a single command).
- 7) Users can save any piece of code or any animation for later use or revision (so that they can revise what have they done in the past).
- 8) It may have a forum where all the users can share their problems and any other user can share his/her code to visualize.
- 9) It may have a library of already made visualizations so that users can easily access without wandering on the internet and other websites.
- 10) It should be scalable and can later be converted into an offline application or a mobile app.

Storyboards



Storyboard 1: It is showing that a girl is telling about Code&Watch to one of her friends.




Storyboard 2: A person's journey of learning from our application is summarized.

Section III: Personas & Scenarios

Personas

Abdul Mannan



Motivators

- To get good grades in all the courses.
- To continue learning with strong basic concepts.
- Not to depend on anyone else during exams and assignments.
- To be able to compete with classmates.

Constraints

- No IT background, takes long to understand.
- Not very social, difficult to find people who can actually help.
- Wastage of a of of important time while searching on the internet for the relevant material.

Academic Background


IT	<div><div></div></div>
Technical	<div><div></div></div>
Computer Literacy	<div><div></div></div>
Social	<div><div></div></div>
Marks/Grades in past	<div><div></div></div>

Demographics

Age: 20
Work: Student
Family: Single
Location: Islamabad

Persona I: Abdul Mannan

Irum Raza



Motivators

- To pass all courses with adequate grades.
- To be able to do assignments herself.
- Not to depend on anyone else during exams and assignments for notes,
- To not to delay graduation any further

Constraints

- Low mental processing speed.
- Not interested in theory at all, difficulty in grabbing basic knowledge.
- A lot of friends, parties and hangouts; therefore, very less time to study.

Academic Background

IT	<div><div></div></div>
Technical	<div><div></div></div>
Computer Literacy	<div><div></div></div>
Social	<div><div></div></div>
Marks/Grades in past	<div><div></div></div>

Demographics

Age: 21
Work: Student
Family: Single
Location: Islamabad

Persona 2: Irum Raza

Scenarios

Scenario 1: for Abdul Mannan

Ever since, Abdul was a bright student academically and he passed intermediate with outstanding marks; however, he was a pre-engineering student and therefore, was never interested in Computer Science degree. After he got admission in FAST, he struggled while understanding basic concepts of programming and it was not because he is not intelligent but because of no IT background. On the top of it, he is naturally not very social so he couldn't ask any of his classmates to help him in learning these concepts. To overcome this situation, he wasted many hours while sitting in front of his computer searching for related videos and notes so that he can grasp these ideas in a way that he face no difficult in future. When he got to know about our portal, Code&Watch.com, he was quite impressed. Because he found everything that he had to search for on different websites at one place and that too very specific. Using this portal changed his mind from thinking of Computer Science very difficult to very understandable and easier. He used this application and saw real-time visualizations of each and every line of code. Secondly, he added his classmates there and while interacting for academic reasons, he made new friends, upcoming the issue of being less social.

Scenario 2: for Irum Raza

Irum Raza is a mediocre student and was never interested in studies but realizing the fact that getting quality education is a social need to survive in the current hi-paced world, she decided to just pass every course and not to spend even a minute extra on it. Therefore, in order to accomplish her goals she decided not to waste time in focusing on lectures or moving here and there on different websites, she went to code&watch.com, created new account and start learning the basics so that she can just pass the upcoming mid exams. As she is aware of the fact that, getting low marks in the mid exams can cause serious damage to the course so she straightaway saved her time and visualization helped her in grasping the knowledge easily. Being part of the new generation, she has a very less attention span so she was actually in need of something that can help in utilizing the short attention span to the best and that's where code&watch assisted her and got her out of the fear of failing her exams by practicing basic techniques easily and in an interactive manner.

Section IV: Competitive Analysis

Selection Criteria

In order to choose best competitors, we found which applications are offering following functionalities:

- Visualization of Data structures.
- Visualization of Algorithms (e.g. Searches)
- Debugging or running code one line at a time.
- Share code (or any part of code) with friends.
- Applications that are already in use of huge amount of people, not the ones which already have failed to attract handsome amount of users.

Competitive Matrix

Features	Visualgo.net	Python Tutor	Free Code Camp	Code&Watch
Real Time Visualization		✓		✓
Create Account			✓	✓
Personalized Recommendations				✓
Multi-Language Support		✓		✓
First write, then watch		✓		✓
Write and Watch				✓
Share with friends		✓		✓
Add friends				✓
Find related notes				✓
Audio/Video Call				✓
Discussion Forum				✓
Video Library				✓

It is evident from the above matrix that there are applications which provide some functionality but not that what we are aspiring to provide through Code&Watch, and there are few important points that must be noted before we proceed towards the next stage.

Currently, all the websites that provide visualization of code are following, 'Write, then watch' rule which means that first you will have to write the entire code and then if the code is error free, it will create and show visuals; however, our aim is different. We wish to provide a platform, where a screen is split into two parts: one for code and second for visuals. So that students are enabled to visualize their own code in real-time. Secondly, our

platform will provide an option to the users through which they can add their friends for helping them or to ask for help in case if anything is still unclear or ambiguous. Our video and notes library will allow the users to explore customized notes and exercises for each topic.

One most important issue with one of our competitors (Python Tutor) is User Interface and User Experience. Our interview participants complained about their interface's no interactivity, low aesthetically pleasing and less engaging; therefore, we are focusing on improving our interface, for providing enjoyable experience to all the users.

Appendices

As both the milestones are being submitted together; therefore, we couldn't update our plans because we didn't receive any feedback yet. However, we will update this section once we have enough data.