Project Proposal Submission

To

Ministry of Post, Telecommunications and Information Technology

Government of Bangladesh

E-fisheries: A Digital App for Fish Farming

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IMPLEMENTING ENTITY

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1.0 Brief Project Description

Fish culture is one of the main cultures as it plays an important role to the national economic growth in Bangladesh. Bangladesh is a South Asian country, and there are hardly any areas where river or other water source is not available. In a word, Bangladesh is surrounded by rivers and various types of water sources like pond, stream, lake, etc. And a major part of the total population (especially the people of southern area) of this country are directly or indirectly involved with fish or fish related business. Khulna, Barisal, Bagerhat, Satkhira, etc. are considered as the best places for commercial fish farming. The proper planned fish farming can contribute to the production of fishes. However, the fish farmers of Bangladesh are lacked of proper guideline for fish farming. Due to the lacking of proper guideline, the production of fishes may suffer a lot.

Over 80% of the Earth's surface is covered by water. Fish are ubiquitous inhabitants of this ecosystem. Bangladesh has a great source of fish cultivation. The people of Bangladesh are commonly known as "মাছে ভাতে বাঙালী" means that the people always eat fish and rice. Rice and fish are essential food of Bangladeshi people from time immemorial. Rice is the foremost agriculture crop in Bangladesh with an annual production over 33.833 million tons (ASI-2015, BBS), while annual fish production is 3.8 million tons. The demand of rice and fish is constantly increasing in Bangladesh with the growth of population. As we have already mentioned, Bangladesh is very rich in water resources, these all together offers tremendous opportunities for fisheries development.

Fig. 1 shows some of the fishes which are very common to the people of Bangladesh. The more the fish cultivation is, the more the increment of economy. Besides this, the people can take fish as much as they desired.

Fig 1. Some of the fishes available in Bangladesh

Although lots of resources of fish production are available, the production may be hampered due to the lacking of proper knowledge. In the current system, some training sessions have been called from Upazilla office and fish farmers joined in those training sessions. It may happen that due to some problems, fish farmers cannot attend in the training session. In that case, the effect may be severe because of not having any knowledge about the fish firming. Another issue may be raised and that is, a fish may suffer from different diseases in any time and the action against those diseases needs to be taken as fast as possible. If the farmer waits for the training session, or goes to the Upazilla office for taking prescription for the disease, those people may not be available in the right time. As a result, whole production may be bore in fruit. The disease management and assessment of cultured fish is a major concern to commercial aqua-culturists. The ability to identification of the presence or absence of a pathogenic organism in fish quickly, would have significant economic benefits. To be commercially successful in fish culture, every aqua-culturist and workers must have knowledge on the diagnosis and treatments of common fish diseases. With a view to mitigating the dependency on manual training and on human suggestion, in this proposal we have intended to develop a mobile app which will acts as a guideline for fish cultivation. This will also help to identify the most commonly encountered fish diseases, and to provide with the knowledge to manage these problems effectively.

In the ear of digitization, still for taking any suggestion or information, fish farmers have to go to the Upazilla office and wait for consultancy. In the current system, the officers offer some training sessions and fish farmers attend in there. Arranging a large number of training is also a time consuming and costly process in respective to the Government. Besides this, any time a farmer can face any kind of problem. In that case, no one is available to help them. To reduce the above mentioned cost and time, and to enable the farmers, a **smart phone based** solution can be proposed. As smart phones are now cheap and available to most of the people, it will give instant solution to the farmer. So, to provide proper guideline to the fish farmers, in this proposal we have planned to develop a mobile application (in Bengali language) which will provide all the necessary steps and information for effective fish cultivation and marketing. Besides this, identification of fish diseases and treatment of the respective diseases will be suggested.

2.0 Project Background

Fisheries sector plays an important role in national economy. In the year of (2014-2015), 3.8 million Hilsa production has been found in Bangladesh. According to the latest (2014) Food and Agriculture Organization (FAO) report, Bangladesh continues to be the fourth largest fish producer in the world for Inland water's fish capturing.

In recent years, several kinds of private and Govt. firms are concerned to increase the production of fish. With a view to increasing the production, they take lots of steps. Among those, a large scale of time and cost have been spent for giving training to the fishermen. Training program is concerned about multiple issues such as pond's soil fertilization (e.g., Uria, TSP, MP, Cow dung, polarity, etc.). After that, about phytoplankton, zooplankton related knowledge are shared with the fishermen. Besides this, the size of the pond related knowledge are also discussed because the types of the fish may vary based on the size of the pond. Moreover, a training has been conducted on the food habit of fish. This is because different types of fish eat food from different layers of the pond. So, the fishermen need to know which type of food needs to be given for which types of fishes. Later, liming of the ponds, test of natural productivity of the water are discussed in the training session.

From the aforementioned discussion, it is clear that the training is more informative. After performing this large set of training, it may happen that the fishermen forget all the things in the proper time i.e., when that information is necessary. As a result, mistake may be done in fish firming. Hence, it is needed to make a solution which can give information whenever the fishermen wants, where no memorization is needed for fish cultivation.

Except this knowledge sharing or training process, observation is an important part of fish cultivation. In the observation phase, fishermen observe the fish and if they find any problem of fishes then they go to the local fisheries office and talk to the officer. Later the officer observes the fish, and based on his observation if any disease occurs, then he (officer) suggests some treatments to the fisherman. Among several kinds of fish diseases, some of the commonly attacked fish diseases are discussed in the following.

1. **Disease Name: Fungus Disease**

   Symptoms: Fish infected with fungus occurs like cotton and water currents when the wound is still in the tank, or the unfertilized egg hatchery or during the meeting, and therein fungal disease spread rapidly.

   Affected fish species - Rui

Fig. 2: Fish affected by Fungus diseases

2. **Disease Name: Fish lesions**

   Affected fish species - Sola, snakehead, Taki, Pumti, Meni, Mrigal, Carpio.

Symptoms: Grayish-white film on skin, damaged fins, ulcers, yellow to gray patches on gills, tissue on head may be eaten away. Inactivity, loss of color or appetite, weight loss, skin defects.

Medical Treatment: 0.01 ppm healing salt or lime to a depth of 7-8 feet of water per 1 kg of lime and salt when applied at the rate of 1 kg of infected fish cured in two weeks.

Fig. 3: Disease of fish lesions

3. **Disease Name: Tail fins or rotten disease**

Affected fish species – Rui national fish, catfish and horn fish.

Symptoms: Back fin and other fins are affected primarily gradually

Medical treatment:

A. Potash infected fish 3-5 minutes in the water bath to 0.5 ppm.
B. Pond fertilization should be stopped.

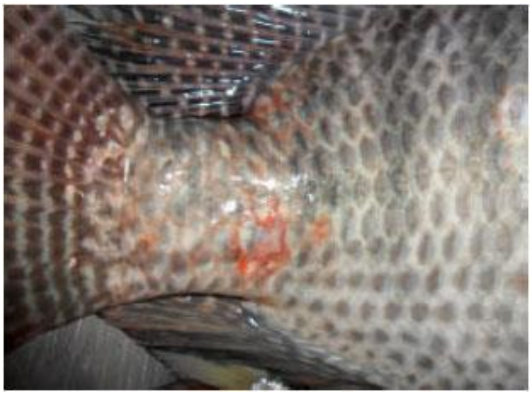


Fig. 4: Tail fins or rotten disease

4. **Disease Name: Stomach swelling disease**

   Affected fish species - Rui national fish, catfish.

   Symptoms: Fish flesh is pale and swollen belly with running water. Infected fish die soon.

Fig. 5: Stomach swelling disease

5. **Disease Name: Eye diseases**

Fig. 6: Eye diseases

The manual fish skin disease observation process consumes lots of time, cost and effort. Here, the first thing depends on the fishermen decision, it may happen that due to lacking of knowledge, the fisherman may not feel any disturbance into the fish. As a result, the whole fishes may get affected by several skin disease of the fish. The second thing is it may delay to go the Upazilla office for any issue (such as for raining, for health issue or others). And gradually all the fishes may get suffered a lot by the disease which hampered the fish production significantly. However, if there exists a mobile application in a hand by which the fishermen can easily identify which problem has been occurred into the fish, and based on that, he can easily take the necessary steps using the mobile application. Hence, an automated mobile based solution is a crying need in fish culture.

3.0 Motivation

The economy of Bangladesh is mostly dependent on agriculture and agriculture related business. And fish farming has a great contribution in this case. The main benefits of starting fish farming in Bangladesh are listed in the followings.

- Various types of fish species are available which are very effective for profitable fish farming business.
- Low cost labor and other management costs are also minimum.
- Suitable market for selling the products. Fish has a great demand to the people of the whole world.
- Fish farming in Bangladesh is already a major source of employment and many working facilities can be created through high tech commercial fish farming system. Even the unemployed educated people can also contribute this business and create a lucrative business and earning opportunity for them.
- Since Bangladesh is exporting fishes from a long time ago and earning good foreign currencies, developed fish farming methods can also produce more and may help to earn more foreign currencies.
- To become one of the most digital countries in the world, we need digitalization/ automation in all the aspects of our life. So it is a crying need to develop an automatic application to share fish firming related knowledge among the mass people of Bangladesh. This will help to achieve the **Vision 2021** to become a **Digital Bangladesh**.
- To become one of the developed countries of the world, our honorable Government have set the **Vision 2041**. To achieve the Vision 2041 of our honorable government, it is needed to increase fish production which will contribute in national economic growth.
- If anyone wants to start fish farming business, then he can easily train up himself from the proposed application.

4.0 Project Objectives

The proposed project primarily aims at raising awareness about the fish cultivation and facilitating fish cultivator to gain much profit. To ensure the achievement of this goal, we have determined several specific objectives. As several kinds of training of fishes are given to the fish farmers in the current system, here human intervention has been occurred. And the more the human intervention has been occurred, the more the time consumption and mistake may be witnessed. Hence, the main objective of this project is to develop a mobile app which will contain a database on fishes and fish firming. This database will be similar to the training content. The main difference will be that the database will be much more structured so that farmers can easily use the database whenever needs.

The main objectives of this project are listed as follows:

1. This application will provide step by step information (pond selection, preparation, etc.) for fish cultivation.
2. **Bengali** language will be used to represent all the contents of the App as this application will be developed mainly concerning the fish culture in Bangladesh.
3. Building a fish database where at least 50 types of commonly used fish information will be stored.
4. A mobile app will be developed by which the suitability, adaptability of each fish will be described. For example, for a particular environment which fishes will be produced at a large rate?
5. App will contain different videos of fishes for increasing motivation in fish farming.
6. App will also carry some videos of diseases affected fishes for raising concern against fish diseases which will help to increase productivity.
7. This app will also be acted as a doctor of fish.
8. Arrange some training or seminar for fish farmer on how to use this App.

5.0 Project Beneficiaries

Number of fisheries firm and consumers in Bangladesh have increased noticeably. As a result, with the implementation of this project, fish cultivator (from top to bottom level) will be influenced and benefited. We have identified several sectors which will be significantly influenced by the implementation of this project. These are:

5.1 Bangladesh Fisheries Research Institute (BFRI)

The primary aim of BFRI is to assist the nation to achieve fisheries development as set out in successive development plans. BFRI works to achieve its primary objective through a number of activities and services including: conducting and coordinating nationwide research efforts, standardizing techniques to maximize production and improve resource management, identifying and cultivating new production opportunities and providing trainings and disseminating important skills and technologies to relevant actors within the fisheries sector.

As maximizing fish production, providing trainings and disseminating skills and technologies are one of the main purposes of BFRI, through the proposed mobile application their purpose may be served.

5.2 Bangladesh Fisheries Development Corporation (BFDC)

The main functions of this corporation is to develop the fisheries sector by carrying out some objectives. Among those, improvement of fish production is one of the vital role.

As the production of fish depends on the proper knowledge of the fishermen about the fish and the taking care of the fish, the proposed project can help a lot in this case.

5.3 Fisherman

As fishermen are closely related to the production of fish, this app will be very helpful for them, because whenever need they will get tips what is needed to do or if any problem occurs in fish, they will get suggestion what is the solution.

5.4 Government of Bangladesh

Increased number of fish monitoring app in countrywide, growth at skilled workforce in fish culture and flourish in fish related research endeavor will help Bangladesh to extend its GDP growth by exporting fish. Moreover, business enterprise based on fish will create ample job opportunities for skilled workforce in our country.

6.0 Project Methodology

To successfully increase the productivity of fishes in Bangladesh, it is a crying need to develop a fish guide application. This project will provide those desired supports which will accelerate the fish production. The methodology of this project is explained step by step in details.

6.1 Knowledge Acquisition

To prepare a solid base for the project, knowledge about existing technologies, frameworks, and mobile application is a prerequisite. Additionally, utilizing the best combination of equipment for the entire platform in order to ensure maximum utilization and performance requires extensive study about system architecture.

In this phase, the technologies which are to be utilized in this project will be gathered and studied. Based on this knowledge, research assistants will later work with the selected framework and technologies to implement the mobile app. Additionally, the equipment to be used for implementation of the app will also be analyzed and selected in this phase.

6.2 Data Collection

As the proposed project concerns to inform the training details to the fisherman, at the first of this project the contents of the training data will be collected with the co-operation of training center. In this phase, the details of the training i.e., the steps for starting a fish cultivation, the way of taking care of the fishes, etc. will be included.

The types of fishes and which fishes contribute more in economy will be included into the application. The app also includes the proper way for improving the production of the fishes, process of improving the availability of zooplankton and phytoplankton, and so on. “Which types

of fishes will be better suited in which types of water and what type of sizes of a pond?" are also collected for this purpose.

6.3 Disease Identification and Treatment Process

In this phase, we will collect how the diseases are identified manually and what are the treatment process after identifying a disease. After identifying the process, we will start the development of the proposed project.

6.4 Application Design

Application design is the process of implementing the software solutions to one or more sets of problems. One of the main components of software design is the software requirements Specification (SRS). In this phase, we will make a design of the application. How the application will be behaved so that fish farmer can easily understand the app and easily interact with the app to get benefit in fish culture. Here, the first phase is the creation of SRS. For the preparation of SRS, we will talk to some fish farmers and officers. This is needed to increase the usability of the software. This SRS will contain the details of the application. This SRS will include Use Case Scenario, Activity Diagram, Database Design, Class Responsibility Collaboration (CRC), Data Flow Diagram (DFD), State Diagram, Sequence Diagram, etc. Each of the above mentioned steps will hold the behavior of the proposed project.

After the preparation of SRS, software User Interface will be prepared and that will be checked by general farmers and officers so that in future they don't face any problem. This phase will refer to all the activity involved in conceptualizing, framing, implementing, commissioning, and ultimately modifying complex systems.

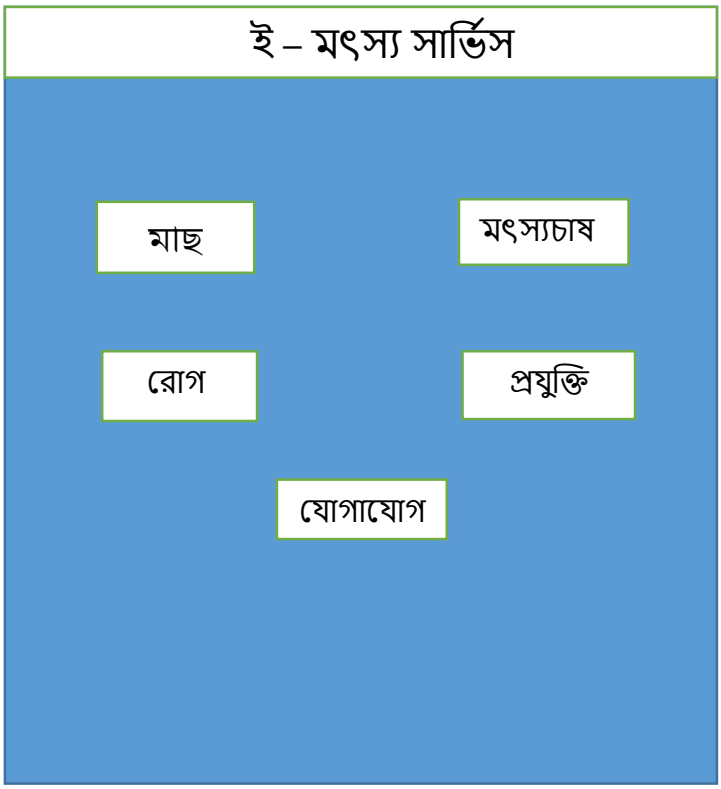


Fig. 7: First page view in Smart Phone

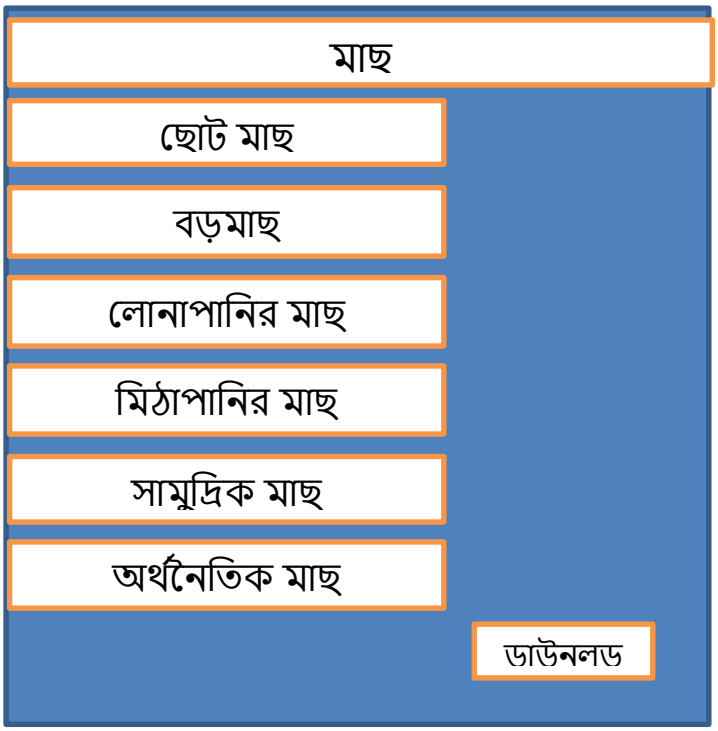


Fig. 8: Page view in Smart Phone after selecting "মাছ" button

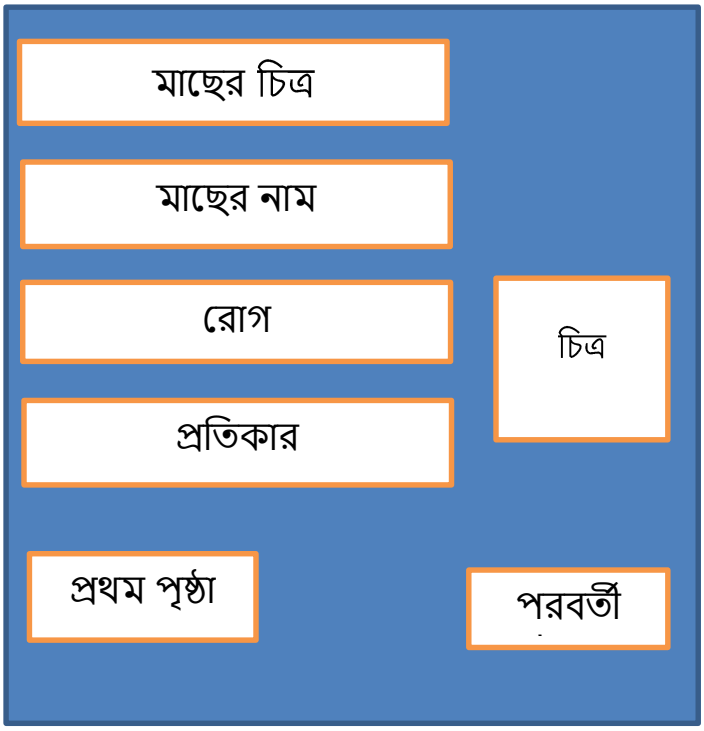


Fig. 9: Interface for identifying fish disease

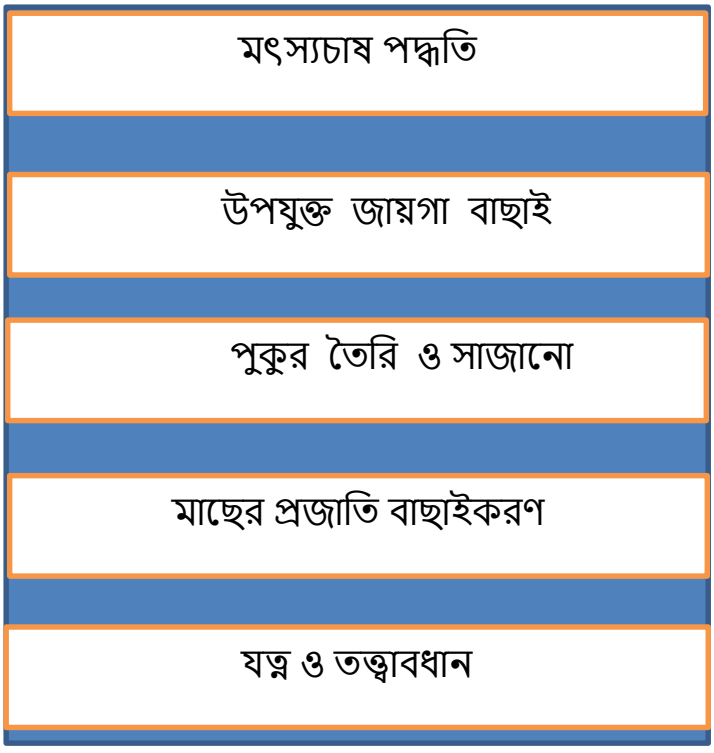


Fig. 10: Page view in Smart Phone after selecting "মৎস্যচাষ" button

6.5 App Development

In the phase of application development, we will start our implementation in Android mobile platform. It is noteworthy that our project has two parts- one is structured fish database development and knowledge sharing among the farmers (acts as a replacement of training) and another is automatic disease identification and providing treatment against those diseases. Afterwards, the app development will be started.

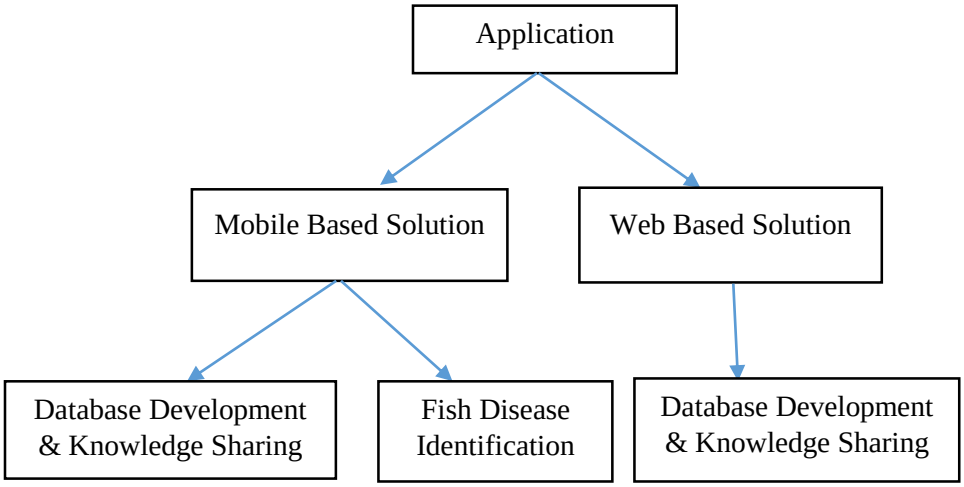


Fig. 11: Development plan of the proposed project

6.5.1 Web and android based applications

In this phase, the procured computers, server machines and other supporting equipment (e.g., Internet, smart phones, etc.) and stationeries by the human resources need to set up. Additionally, we will implement the chosen framework and software. A mobile application will be created in this phase, which will host in play store.

For developing a mobile based solution, Android studio will be used as a Development Integrated Environment (IDE). SQLite and MySQL will be used as the database of this application.

For web development of this project, PHP, Bootstrap, CSS, JavaScript, JQuery will be used. And MySQL database will be used. This application will have two portion- one for admin, who can add, edit or delete new information. And another part will be for common people mostly for farmers.

6.5.2 Computer vision based fish disease identification

For the second part i.e., fish disease identification and giving suggestions of the identified disease, a machine learning based approach will be implemented. Here, some research will also need to be conducted to improve the accuracy of fish skin disease identification and treatment. The main motivation is to ensure about 100% accuracy in this case. Finally research assistants will be allocated for conducting the research work regarding the app.

6.6 Video Share

For improving the fish productivity, some of the videos can be shared on the app to circulate among the farmers. These videos may be uploaded by the fisheries officer of Upazilla. Whenever, any farmer needs to know some real life experience, then he can see the video and can get information about aquaculture.

6.7 Release Phase

The last phase of this project is release phase. Here, rigorous testing will be performed and among those Unit testing, Black box testing, White box testing, etc. will be conducted. This project will target both fish farmers and officers (related to the fish) of the Upazilla. Finally, the application will be released to the general public.

After developing the project, we will setup the software to the farmer's phone. To continue the setup process, any person of the Upazilla can be involved to the setup process. As nowadays people are very much used to Facebook and smart device, it can be assumed that it will easily possible to increase their involvement in the proposed project.

6.8 Training / Seminars

At the beginning of the application, it may be needed to share the ideas and view regarding our progress in specific intervals. To accomplish this, seminars will be organized after reaching specific milestones during the duration of this project. Through seminars, we will also inform people about the features, usability and facilities provided through the proposed application.

For making quality apps, people need to know about the facilities of the app in detail. For ensuring that, few trainings are required. During the testing and release phase, several training or workshop will be arranged. In those workshops, people will be trained about the mobile app. Training

materials will also be made available online for better learning of the farmers. We aim to organize ten training events, each taking place for one day approximately. Tentative list of topics which will be covered in the workshop are discussed as follows:

1. What is fish guide application?
2. Why the fish guide application is necessary?
3. What are the facilities it will provide?
4. Life cycle of the proposed mobile and web app
5. Usability of the proposed application
6. How fish disease can be automatically identified?
7. How to treatment of a specific fish disease, a farmer can know?
8. Hands on demonstration

6.9 Publications

We intend to do research on effective fish diseases identification. Our aim is to publish our findings in international journals and conferences related to our research.

7.0 Project Technologies

To implement the project, we have analyzed existing technologies available relevant to our project as of 2017. The best choices in terms of flexibility and cost are handpicked for easier implementation and maintenance. The following technologies are decided to be used in project:

7.1 MongoDB

MongoDB is a cross-platform document-oriented database. Classified as a NoSQL database, MongoDB eliminates the traditional table-based relational database structure in favor of JSON-

like documents with dynamic schemas, making the integration of data in certain types of applications easier and faster.

7.2 NodeJS

NodeJS is a cross-platform runtime environment and a library for running applications written in JavaScript outside the browser (for example, on the server). Node.js applications are designed to maximize throughput and efficiency, using non-blocking I/O and asynchronous events. Those applications run single-threaded, although Node.js uses multiple threads for file and network events.

7.3 AngularJS

AngularJS is an open-source web application framework, maintained by Google and community, which assist with creating single-page applications, one-page web applications that only require HTML, CSS, and JavaScript on the client side. Its goal is to augment web applications with model–view–controller (MVC) capability, in an effort to make both development and testing easier.

7.4 Java Play

Play is an open source web application framework, written in Scala and Java, which follows the model–view–controller (MVC) architectural pattern. It aims to optimize developer productivity by using convention over configuration, hot code reloading and display of errors in the browser.

7.5 Primary Programming Languages

The programming languages which will be used to implement and utilize all the mentioned technologies above are:

- Java
- JavaScript
- C/C++
- PHP

8.0 Project Outcome

By the end of the project, we aim to achieve several specific outcomes. These outcomes are related to making a database for fish farming, and providing information whenever the farmers need. Besides this, a fish doctor will be on hand of farmers by which automatically fish diseases can be identified and against that diseases treatments will be suggested. The details are described as follows:

8.1 Globally Compatible Fish Farmers

The goal of this project is to increase the fish production by Bangladeshi farmers. We aim to do so by facilitating the farmers with the state of the art procedure of fish cultivation. It will be utilized by both farmers and officers of the Upazilla. Through the proposed mobile application, we aim to prepare them to contribute in the socio-economy of the Bangladesh.

8.2 Newly Joined Fish Farmers

Through the proposed project, the newly joined farmers can be benefited because they haven't any previous knowledge about the fish farming. In this case, without going here and there for knowledge searching or any consultancy for fish farming, they can easily find the proposed solution. And this proposed solution easily lead to him the information what the person needs.

8.3 Fish Doctor at Hand

Through the fish doctor, any farmer can find out easily whether the fish suffers any disease or not. As a result, farmers can be much more confident against a disease. After finding a disease, the fish doctor will also suggest the necessary treatments against the affected fish to the farmers. This will escape the fish farmers to loss of huge production.

8.4 Web Based Application

We aim to provide a web based solution, which can be accessed via Internet. This web based solution will contain the information about fish farming. The main benefit from this is that here no smart phone is needed. If any farmer has no smart phone, then he can get the information from anywhere only using Internet.

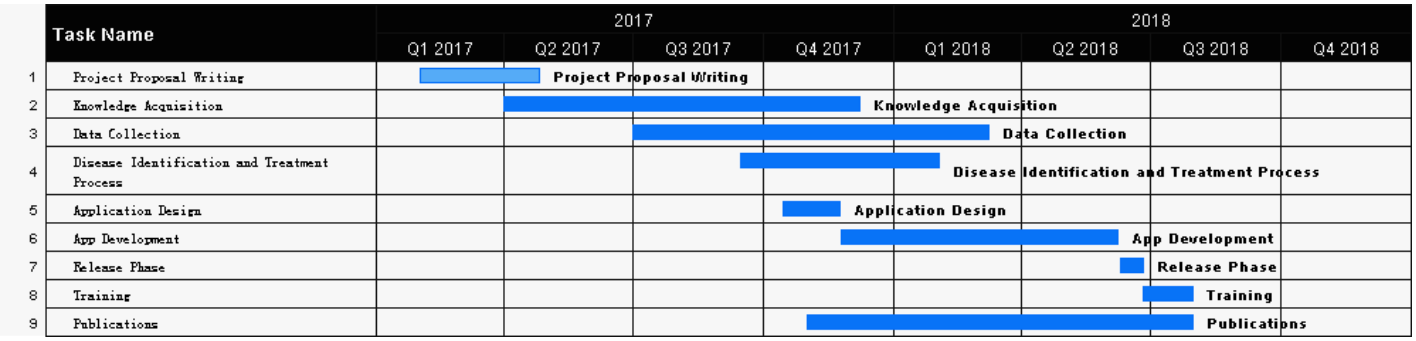
8.5 Revenue Growth in Fish Industry

By the uses of this application, Bangladesh will be able to generate more foreign income as well as employment opportunities for IT skilled workers.

9.0 Project Monitoring

The project will be monitored in terms of achieving milestones in predetermined time frame. The resource acquisition will be complete within March, 2018.

10.0 Project Timeline



11.0 Conclusion

In a word, fish farming in Bangladesh has many benefits and opportunities. It is necessary to improve this earning opportunities for making a good profit form fish farming business. So, in this proposal we have planned to prepare an android mobile based solution which will include a structured step by step guideline for fish farming and identify the disease of the fish skin with proper prescription. The successful completion of this project will lead to Bangladesh one step upward to achieve the Vision 2021 and 2041.