Innovating E-training App for Digitalization of the Technical and Vocational Education

Md. Shahid Iqbal
Assistant Professor
Department of Electrical & Electronic Engineering

Sylhet Engineering College, Sylhet
Directorate of Technical Education
Technical & Madrasah Education Division
Ministry of Education

Declaration

I declare that the work is carried out by the author alone. Whole or any part of the work has not been submitted before as a research proposal. The content of the paper is the result of work which has been carried out since the approval of this research program. All the ethics procedures and guidelines have been followed properly while preparing the research.

Signature

Date:

Acknowledgements

At the beginning, I glorify Almighty Allah, who is the creator and the sustainer of this world and belongs to the supreme power. He has given me energy and spirit to fulfill all the requirements to complete this project.

It is my great pleasure to express my profound sense of gratitude to my supervisor Dr. Anwara Begum, Senior Research Fellow, BIDS for his constructive academic advice and guidance, constant encouragement and valuable suggestions, and all other supports throughout this work. I am really benefitted from his excellent supervision.

I would also like to give thanks to the proposal selection committee members as Rawnok Mahmud, Ex-DG, DTE, Md. Jahangir Alam, Director (Planning & Development), DTE, Dr. Anwara Begum, Senior Research Fellow, Bangladesh Institute of Development Studies, Biplab Bikash Paul Choudhury, In-Charge (Research and Knowledge Management Cell), DTE and Madina Akter, Designated Officer (Research and Knowledge Management Cell), DTE. I always grateful to them for their valuable discussions and other supports during this work. I wish to express gratitude to S M Hafizur Rahman PhD, Professor, IER, Dhaka University for his nice help and cooperation during this work.

I am grateful to the Abdur Rouf, Principal (In-Charge) and Amit Shaha Surja, Lecturer (EEE), Sylhet Engineering College, Sylhet and Principal, TSC, Sylhet, for his valuable suggestions in completing my project successfully. Also, special thank goes to all members from whom I get different kinds of support.

Abstract

A specialized E-training app based web with domain name EtvetBD has been developed in which online tutorials and job opportunities are integrated in a common digital platform. So anyone will get all the information to make him skilled. Moreover, this study will be beneficial for students in Bangladesh, and especially for DTE. Corona infection has made it imperative that on-line teaching should be ubiquitously done; it is also a tool for global integration. In pace with this, selection of data sources for collection and analysis of data for mixed method research has been done by considering the beneficiaries and experts. Then following the principle of purposive sampling data were collected by using focus group discussion and semi structured questionnaires. That's why; this app has been developed for android according to the demand from the users. Furthermore, online tutorials have been designed by analyzing the demand of trade courses such as electrical safety, wire size, hand tools & channel wiring. The search addresses for the developed website and app are https://etvetbd.com and play store with search name is EtvetBD.

Abbreviations

APP	Application
Android	Operating system
CSS	Cascading Style Sheets
DTE	Directorate of Technical Education
FGD	Focus Group Discussion
HTML	Hypertext markup language
IT	Information Technology
ILO	International Labor Organization
ICT	Information and Communications Technology
JAVA	Programming language
LARAVEL	Free, open-source PHP web framework
NISE	National Intelligence for Skills, Employment and Entrepreneurship
NTVQF	National Training and Vocational. Qualifications Framework
PHP	Personal Home Page
SUST	Shahjalal University of Science & Technology
SEC	Sylhet Engineering College
SPI	Sylhet Polytechnic Institute
TVET	Technical & Vocational Education & Training
TSC	Technical School & College
UNESCO	United Nations Educational, Scientific and Cultural Organization
WEB	World Wide Web

Table of Content

List of Tables

List of Figures

Executive Summary

Technology integration in education is being widely practiced throughout the whole world. TVET is not an exception in this revolution. As a developing country, Bangladesh is also running towards the global trends to incorporate technology in each and every field with a slogan of 'Digital Bangladesh'. As the population is relatively high within its small, limited lands, government is trying to convert this vast number of population into useful workforce through TVET initiative. With this view, government had taken a project in 2011 with the collaboration of ILO to reform the Technical and Vocational Education of Bangladesh. A national qualification framework has also been developed so as to get accreditation globally. ICT integration is an unavoidable area for TVET as technology is developing too fast. To keep pace with the global trends, government should take its maximum initiative to integrate ICT in TVET.

To meet the expectations described above proposed E-training app is the new door to possibilities. The broad objective or purpose of the study is to provide the insight and understanding on the elevation of E-training in Bangladesh from the perspective of world trend. However, the specific objective of the study is innovating a web based App to increase the attractiveness of TVET& enhancing the online training & creating virtual platform for jobs in TVET.

Selection of data sources for collection and analysis of data for mixed method research has been done by considering the beneficiaries and experts. Then following the principle of purposive sampling data were collected by using focus group discussion and semi structured questionnaires with the support of the 20 teachers, 25 students, 05 CSE Graduates, 02 IT Experts, 01 Industry Person & 04 DTE Experts. Data (responses to questionnaire and FGD) were available for 55 individuals.

According to the above discussions, a specialized E-training app based web with domain name EtvetBD has been developed in which online tutorials and job opportunities are integrated in a common digital platform. So anyone will get all the information to make him skilled. Also, this app has been developed for android according to the demand from the users. Moreover, online tutorials have been designed by analyzing the demand of trade courses such as electrical safety, wire size, hand tools & channel wiring.

We hope that the proposed E-Training app will play an important role in the development of the country through the development of Technical and Vocational Education system and by using E-training app nation will get skilled manpower which will help to get the vision 2021.

Finally, it can make our nation's father's dream a reality and then the Bangladesh will get place as a developed country in the world.

Chapter 1
Introduction of the Study

1.1 Introduction

Every nation through this global village must have updated means, particularly within the area of updated knowledge and skills; to compete this globalized open market competitions. As to survive with the rapidly changing socio-economic and technological demands, government and personal organizations should make sure the highest quality products and services for his or her nation. To enhance these conditions, they put emphasis on developing their manpower as per the world requirements. Most of the developing countries, therefore, consider Technical and education and Training (TVET) together of the most key agents to play the vital role for educating and training their huge unemployed population to become competitive human resources to enter into national and global market.

The necessity is to reinvent TVET for our times on a universal basis with due attention to variations globally, and to make it future-proof. A full recognition of the profundity of ongoing and future technological transformation, economic change, and occupational upheaval is vital if TVET is to be credible – and to achieve, at last, the high status that it deserves (Douse M. & Uys P., 2019). According to Alam (2007), notes that investment in education, and training produces benefit both to the individual and to society as a full. The return on investment for society will be a talented workforce which will enable global competitiveness and economic growth, while the return of the individuals are going to be an improved career path, increased earning, and an improved quality of life. According to Fagerlind and Shah (1989) the concept of 'human capital' suggests that education and training raises the productivity of workers, and increases their lifetime earning capacity. According to Alam (2007), governments perceive increase demands for skills when the labor supply shows ascent, when employment grows quickly, or when employment increases significantly. They argue that governments have called upon vocational training and training (VET) systems to assist unemployed children and older workers get jobs, reduce the burden on education, attract foreign investment ensure ascent of earnings and employment, and reduce the inequality of earnings between the riches and the poor.

Many studies reported that "development of vocational skills" and "Promotion of lifelong learning" is recognized as major national strategy in many advanced countries like Australia, Canada, Japan and us (Drage, 2009; McGrath, 2012; Coles & Leney, 2009). Additionally, other countries like Finland, Korea, Taiwan and Singapore strengthened their comparative progress and gained the competitive position in global market through adapting selected strategies during this TVET sectors (Kuruvilla, Erickson, & Hwang, 2002; Hawley & Paek, 2005). On the opposite side, most of the developing countries still couldn't finalize the particular strategies and action plan just like the developed countries.

Besides this, in Bangladesh there are a lot websites are present to flourish the E-commerce industry. From Fig.1.1 it has been seen that various sectors are using their specialized website to attract the public. Also, Bdjobs and 10 minute school are very popular type websites for searching jobs and tutorials; see in Fig.1.2 & Fig.1.3 respectively.

Fig.1.1: E-commerce websites

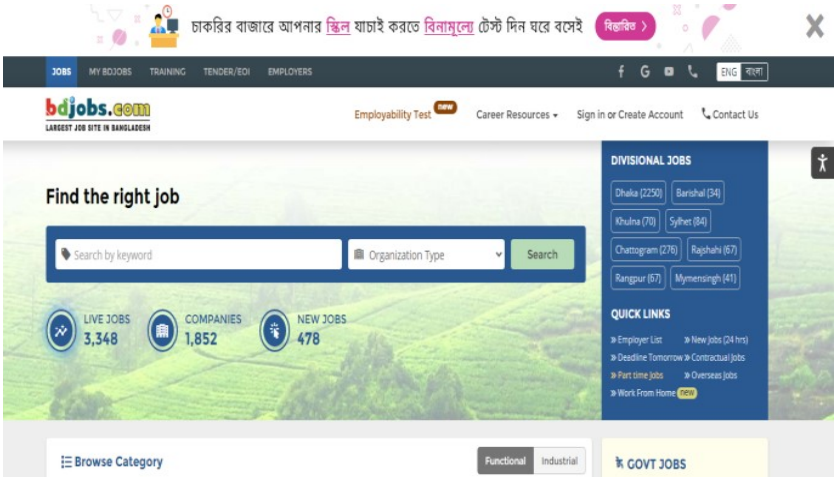


Fig.1.2: Bdjobs Website

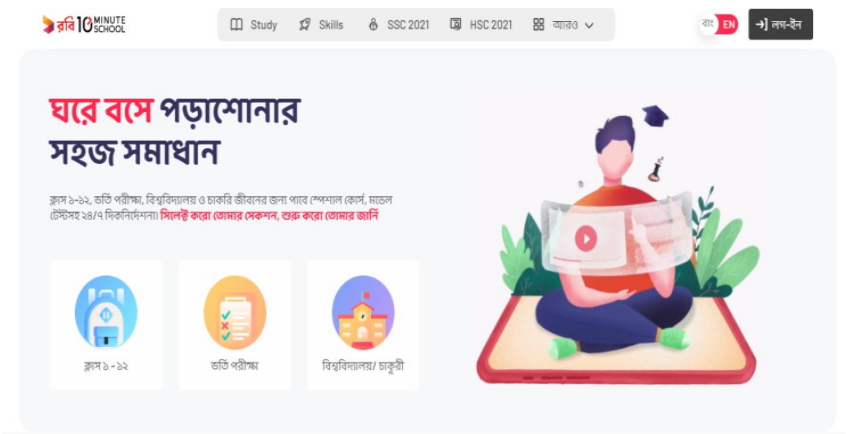


Fig.1.3:10 Minute School

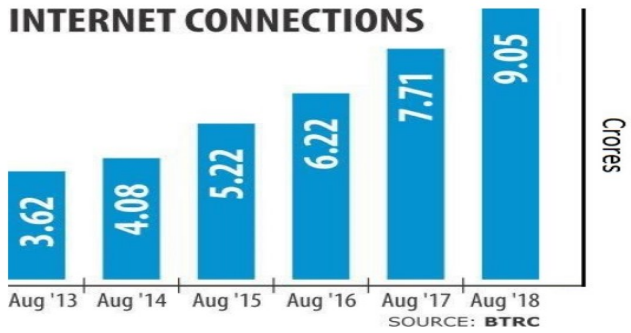


Fig.1.4: Demand of using internet in Bangladesh

From Fig.1.4 it has been seen that the demand of using internet in Bangladesh has been increasing thoroughly day by day. After realization the potential strength of TVET sectors, continual efforts are made by the Govt. of Bangladesh to enhance the current condition of TVET sectors. The Govt. is that specialize in the standard of technical and education and training (TVET) in Bangladesh in sight of a growing interest among students, the education minister has said. Nurul Islam Nahid said, in 2009, the amount of scholars within the TVETs was but one-hundredth of scholars in Bangladesh but now they comprise 13 percent. "Our target is to require it to twenty percent by 2020. Bangladesh Government in cooperation with the European Union (EU) and also the International Labour Organization (ILO) launched various projects for skill development with modernizing the country's Technical and education and Training (TVET) system, reports BSS. Recently, STEP, JICA and SAFE projects are launched by the Govt. to reform the TVET sector.

The recent approval by the government of Bangladesh of the National Skills Development Policy may be a major milestone within the country's history. We now have the framework we'd like to develop a versatile, responsive and market-oriented training system. Under this policy 18 actions are taken like Industry Skills Councils (ISCs), Gender Equality and specially, 80% of state ministries have accepted the National Technical and Vocational Qualification Framework (NTVQF) because the model for future development of qualifications.

Now, Digital Bangladesh is one of the nation's dreams, then special emphasis is given on the applying of digital technologies to comprehend Vision 2021. Digital Bangladesh implies the broad use of computers, and embodies the trendy philosophy of effective and useful use of technology in terms of implementing the guarantees in education, health, job placement and poverty reduction. The party underscored a changing attitude, positive thinking and innovative ideas for the successes of "Digital Bangladesh". The Govt. of Bangladesh implemented an oversized number of projects regarding digital technologies and variety of those are already underway. National ICT Policy-2009 was developed with a view to realize middle-income status of the state by 2021 and developed status by 2041. Improving the attractiveness of TVET education is a very important issue that must be addressed (Shahadat, Mahbub & Rabbani 2017).

According to the above discussion this paper has been proposed the E-training strategy that is digitalization of TVET. The subsequent discussions will attempt to illustrate the initiatives and challenges of E-training in TVET.

1.2 Statement of the problem

The concept of E-training derives the introduction of Information and Communication Technologies in the arena of TVET. Introduction of ICTs caused training revolution that is viewed as the major shifts in present days that has changed the traditional ways and means of training. These changes offer in one hand, new 'digital opportunities' for TVET sector to be organized and extend services close to the citizen's expectation to become more efficient, effective and responsive. On the other hand, citizens are empowered with updated training techniques and encouraged for their effective participation in TVET.

E-training is the electronic platform to train the unskilled citizens. By using specific apps, E-training of different trade courses is possible. Bangladesh government wants to be trained up the unskilled citizens but does not have enough scopes. Also this is a hard task to train the unskilled population by using some common training centers. So, by using online training apps this is easy to train up and also encouraging the unskilled and uninterested peoples.In 2002, Government of Bangladesh has adopted a National IT policy that expresses strong commitment for achieving the goal of digital Bangladesh. The policy hopes to develop country-wide IT infrastructures to ensure the access to information by every citizen to gain the SDG. According to this policy, in rural peoples of Bangladesh, likes to use digital contents. Also to increase the attractiveness of TVET system digital training approach must be launched. So, in this contrast, E-training improves the efficiency and reduces the wastage of resources, enhance planning and raise quality of services. It also proposes that all trained and skilled persons must be networked to the National Database Resource Centre in the shortest possible time.

But the problem is that there is no specialized website only for technical and vocational sector. So, it is necessary to develop a website which contains all of the important information regarding online video tutorials and job opportunities related the TVET sector. On the other side, it is better if the single website contains the online tutorials and job information. That is, anyone can train themselves by completing the videos and also searching the jobs with application facility. Moreover, it is also facilitate the industry to circulate their circulars easily according to their required and skilled person.Although from Fig. 1.5 it has been seen that a website with domain name NISE (National Intelligence for Skills, Employment and Entrepreneurship) developed by NSDA, but it is not a specialized site only for technical & vocational training under the directorate of technical education. Also, in this site there is no job information with circulation and application facility are present.

Fig.1.5: NISE (National Intelligence for Skills, Employment and Entrepreneurship) website

A critical precondition in successful E-training efforts, initially, requires a combination of a leadership with commitment and a knowledgeable and skilled human capital to design E-training segments by following the international standards to keep pace with the global market demand.

1.3 Rationale and Audiences of the Study

Education is one in every of the foremost important things that an individual must learn. Their entire future or career depends on their education and it also improves the way you interact with remainder of the people. Education or learning is incredibly beneficial to be more productive during these modern times. With such a lot of competition around the world now, education and degrees are important. Due to the advancement of the technologies, it's become easier for the people to sit down reception and educate themselves. This is often possible with the assistance of distance learning. But when there are such a lot of colleges out there, many of us think why distance learning is important. Read on to grasp more about it. Distance learning could be a system of education which is completed remotely by using transmission. The most advantage of distance learning is that it allows you to suit your learning around your work and residential life. You'll usually also set your own pace of study. It's your decision on when and where you study. It doesn't matter where you reside, you will gain a degree from anywhere within the world.

Technology can enhance existing instructional methods and in some cases introduce new ones, like networked learning, self-paced learning and online discussion (Goodyear, 2005; Roberts, 2003).Likewise the utilization of ICT can facilitate student-centered teaching, collaborative learning and also the improvement of scholar's problem solving skills. Therefore, the utilization of technology has entered into mainstream practices in tertiary education. TVET, an element of tertiary education, is additionally getting growing pressure to integrate technology in teaching and learning context (Armatas & Papadopoulos, 20013). So, considering its importance most of the developing countries are trying to introduce technology in their education sector (Kafyulilo, 2014).

The teachers & students of TVET sector are the first categorical audiences for this developed website. In line with the audiences prior learners are also a special class of beneficiaries of this website. In last, all the general peoples of Bangladesh may benefited by using this app based website by gaining the knowledge regarding TVET sector.Finally, we are able to conclude that E-training has the power to play a vital role to develop the socio-economic picture of Bangladesh by fascinating the role of TVET.

1.4 Objectives of the Study

The broad objective of the study is to provide the insight and understanding on the elevation of E-training in Bangladesh from the perspective of world trend. However, the specific objectives of the study are:

- Innovating an App to increase the attractiveness of TVET.
- Enhancing the online training & creating virtual platform for jobs in TVET.

1.5 Research Question of the Study

From the above study it has been decided that we need to design the research question as follows:

1. Why it is necessary to develop a specialized App based Web for TVET?
2. What type of website is better for TVET sector? Why?
3. What are the possibilities to exist the similar App based Web that integrates both online tutorials and Job benefits?
4. Which types of programming tools and mobile platforms are required to develop such kind of App based Web?
5. Which types of contents are required to improve the App based Web?
6. How to develop a user friendly App based Web to increase the popularity of TVET?
7. What types of video tutorials are required to implement initially?
8. What types of barriers and solutions we need to find to develop such kind of website?
9. Find out some important suggestions for the development of contents of the web based app to increase attractiveness and Usefulness?
10. Finding the opinion of beneficiaries of the E-training app based website?

Finally, we may complete the all types of findings and instructions which is necessary to develop the user friendly website with app.

1.6 Outline of the Report

The rest of this thesis is organized as follows:

- **Chapter 1:** *Introduction*. This chapter discusses the basic introduction of the study. Also, purpose of the study providing the insight and understanding on the elevation of E-training in Bangladesh from the perspective of world trend. It begins with detailed discussion about different research questions. In the meantime, it also comprises the rationality of the study behind his work.
- **Chapter 2:** *Background*. This chapter discusses the purpose of providing the insight and understanding on the elevation of E-training in Bangladesh from the perspective of world trend. It begins with detailed discussion about different literature reviews and techniques that are currently integrated in different sectors. In the meantime, it also comprises of the motivations behind his work.
- **Chapter 3:** *Proposed E-Training Platform.* . This chapter presents how to propose new online training platform for TVET, how E-Training App and algorithms work and also provides a deep knowledge about the whole proceedings.
- **Chapter 4:** *Results of the Data Analysis.* This chapter comprises of the results obtained from various instrumental analysis. Though this approach can fulfill a part of demands.
- **Chapter 5:** *Major Findings of the Study*. This chapter describes the major achievements and also provides answers to the research questions that have been asked throughout the process.
- **Chapter 6:** *Implication and Conclusion.* This chapter concludes the whole process study and shows the implications for practice and future scopes.

Chapter 2
Literature Review

This chapter introduces the deep knowledge about the purpose of the study is to provide the insight and understanding on the elevation of E-training in Bangladesh from the perspective of world trend. However, the specific objectives of the study are innovating an App to increase the attractiveness of TVET and Enhancing the online training & creating virtual platform for jobs in TVET.

2.1 Theoretical Framework

UNESCO Institute of Information and Communication Technologies (ICT) did an analytical observation in Education and it narrated a extensive review of ICT usage in different branches of TVET: ICTs for administrative motives, communication, teaching, and learning, curriculum improvement and appraisement, career education and direction, labor market information, job placement, and systems control, showing specific features of different types of ICTs generally applied in various zones of vocational education (Chinien, 2003). Teachers of TVET institutions need to update their ICT knowledge to pursue successfully on the above stated sectors.

Usage of ICT in teaching and studying is progressing day by day in each and every field of education (Oliver, 2002). A new example shift is noticeable with the switch from a full reliance of objectivist to a rising obedience to the cognitive and constructivist. For example, ICT use in distance education has evolved in a pedagogics, which is organic, collaborative and interactive (Wonacott, 2001). Teaching and learning is now being discussed in different modes: e-learning (Sun, Finger, & Liu, 2014), web based learning (B. H. Khan, 2001), distance learning (Lockwood, 2013), blended learning are the most popular. TVET teachers must gain the knowledge and abilities of teaching in the above stated educational layouts. Also, the Digital Protocol Network on National Digital Policy, launched by the world economic forum together with the 2030 Agenda for sustainable development of United Nation policies, and the National Policy On Information and Communication Technology (ICT) In School Education (2012) published in Vocational and Technical Education Journal which provide better opportunities for acquisition of valuable knowledge and skills that will match the labour market skills demand(EO Ugwoke, TO Olinya & HC Anorue, 2020). We also seen from the market that there is a lot of websites are available regarding the jobs and online tutorials. Such as BdJobs & 10 Minute School are the most renowned websites. But these websites are not specified only for TVET sector. That's why, it is essential to develop a specified website regarding TVET. It is the reason of choosing the idea to develop a single website with the jobs information and tutorials. This is very much helpful for the TVET users to find all the information from one site. Also, at present age android phone is one of the basic needs for the human being. It is critical to find a single person who have not android phone. So, it is necessary to develop an app based website which offers more user friendly environment. Now it is often concluded that, a website is required to develop with app. For this also video tutorials need to design. From Fig. 2.1 it can be seen the total theoretical framework at a glance.

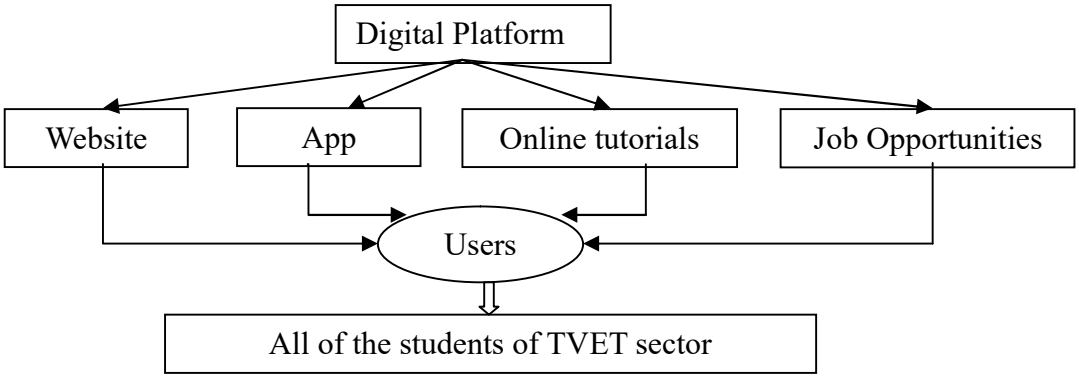


Fig.2.1: Theoretical Framework for the proposed work

E-training is one amongst the foremost contemporary concepts within the present world. By now, some nations have already got preceded much ahead with this. Other countries are well-prepared to require off or come into being. Countries like Bangladesh have just started moving. Therefore, in Bangladesh context, the proposed field remains almost a virgin one to be explored into, where substantial knowledge gap exists. So, in further discussion it'll be tried to explore the proposed model to scale back the knowledge gap in E-training concept. Also, in this section we try to discuss the different terms regarding the technical section, which is helpful to understand the insight of the theoretical framework of the proposed work.

Website: A **website** (also written as **web site**) is a collection of web pages and related content that is identified by a common domain name and published on at least one web server. Notable examples are wikipedia.org, google.com, and amazon.com. All publicly accessible websites collectively constitute the World Wide Web. There are also private websites that can only be accessed on a private network, such as a company's internal website for its employees. Websites are typically dedicated to a particular topic or purpose, such as news, education, commerce, entertainment, or social networking. Hyperlinking between web pages guides the navigation of the site, which often starts with a home page. Users can access websites on a range of devices, including desktops, laptops, tablets, and smart phones. The software application used on these devices is called a web browser.

Apps: A **mobile application**, also referred to as a **mobile app** or simply an **app**, is a computer program or software application designed to run on a mobile device such as a phone, tablet, or watch. Apps were originally intended for productivity assistance such as email, calendar, and contact databases, but the public demand for apps caused rapid expansion into other areas such as mobile games, factory automation, GPS and location-based services, order-tracking, and ticket purchases, so that there are now millions of apps available. Apps are generally downloaded from application distribution platforms which are operated by the owner of the mobile operating system, such as the App Store (iOS) or Google Play Store. Some apps are free, and others have a price, with the profit being split between the application's creator and the distribution platform. Mobile applications often stand in contrast to desktop applications which are designed to run on desktop computers, and web applications which run in mobile web browsers rather than directly on the mobile device.

In 2009, technology columnist David Pogue stated that smartphones could be nicknamed "app phones" to distinguish them from earlier less-sophisticated smartphones. The term "app", short for "software application", has since become very popular; in 2010, it was listed as "Word of the Year" by the American Dialect Society.

Programming Languages: A programming language is a formal language comprising a set of instructions that produce various kinds of output. Programming languages are used in computer programming to implement algorithms. Most programming languages consist of instructions for computers. There are programmable machines that use a set of specific instructions, rather than general programming languages. Since the early 1800s, programs have been used to direct the behavior of machines such as Jacquard looms, music boxes and player pianos.[1] The programs for these machines (such as a player piano's scrolls) did not produce different behavior in response to different inputs or conditions. Thousands of different programming languages have been created, and more are being created every year. Many programming languages are written in an imperative form (i.e., as a sequence of operations to perform) while other languages use the declarative form (i.e. the desired result is specified, not how to achieve it).The description of a programming language is usually split into the two components of syntax (form) and semantics (meaning). Some languages are defined by a specification document (for example, the C programming language is specified by an ISO Standard) while other languages (such as Perl) have a dominant implementation that is treated as a reference. Some languages have both, with the basic language defined by a standard and extensions taken from the dominant implementation being common.

Online Tutorials: Online tutoring is the process of tutoring in an online, virtual, or networked, environment, in which teachers and learners participate from separate physical locations. Aside from space, literature also states that participants can be separated by time. Online tutoring is practiced using many different approaches for distinct sets of users. The distinctions are in content and user interface, as well as in tutoring styles and tutor-training methodologies. Definitions associated with online tutoring vary widely, reflecting the ongoing evolution of the technology, the refinement and variation in online learning methodology, and the interactions of the organizations that deliver online tutoring services with the institutions, individuals, and learners that employ the services. This Internet-based service is a form of micropublishing.

2.2 Summary

From the above discussions it is seen that Digitalization policies provide better opportunities for acquisition of valuable knowledge and skills that will match the labor market skills demand. Unfortunately, underfunding, inadequate manpower with requisite skills, non-availability of modern laboratories, workshops, poor equipment and facilities among others, are some of the problems inherent in achieving full digitalization instructions in TVET programmes. Adequate funding by Government and Non-Governmental organizations, provision of adequate skilled manpower, provision of ICT modern equipment, and facilities are some of the strategies identified for effective digitalization of instructions of TVET programmes. That’s why in this report we develop a specialized web based app for TVET which cover the TVET courses and job opportunities.

Chapter 3
Methodology

This chapter introduces the deep knowledge about the process, in order that, one can understand clearly how E-training App and website algorithm works. On the other hand, in order to produce the online classes in Sylhet TSC has been done in this chapter. The aim is to propose new online training platform for TVET has been discussed in this chapter clearly.

3.1 Strategy of Inquiry

Due to acceleration of the pace of economic development and improvement of the living condition of the poor in Bangladesh, demands the need for skilled manpower in large numbers through increased access to skills training, higher participation of poor in such training for having gainful employment. It is noted that, the current system of skills training have been suffering several weaknesses. In this context, NSDA, BTEB and DTE can play critical role for promoting skills training in cooperation with other relevant organizations. The broad objective is to design an app based web which will be useful for improvement of skills training system and also enhance the attractiveness of the TVET sector. Now, the study report is divided into three sections:

- Demand analysis of the E-training app based website by collecting the data from purposive sampling.
- Designing and Technical analysis of the E-training app based web by mixed design method.
- Designing the video tutorials with the help of trainers in Sylhet TSC.

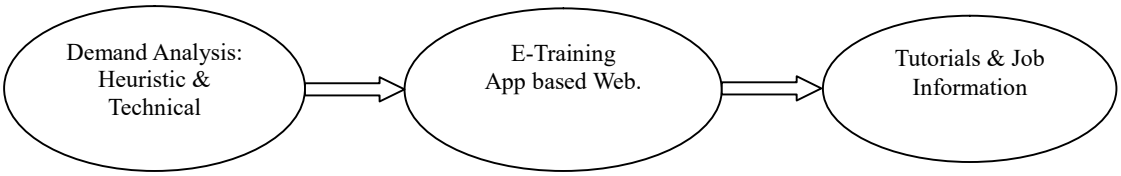


Fig.3.1: Design Stages

To attain the research objectives, the concept shown below in Fig. 3.1, has been adopted for further processing. This proposal is an exploratory one using both qualitative data and apps. It is descriptive and empirical in nature. Various methods and techniques will be followed to design E-training digital contents that is E-training apps and also for collecting data. To explore the section one we specify the following strategy of inquiry shown in table 3.1.

Table 3.1 Strategy of Inquiry

Research Question	Focus on Research questions	Types of Data	Overall Strategy of Inquiry
1	Why it is necessary to develop a specialized App based Web for TVET?	- Qualitative	Mixed Method Design
2	What type of website is better for TVET sector? Why?	- Qualitative	
3	What are the possibilities to exist the similar App based Web that integrates both online tutorials and Job benefits?	- Qualitative	
4	Which types of programming tools and mobile platforms are required to develop such kind of App based Web?	- Qualitative	
5	Which types of contents are required to improve the App based Web?	- Qualitative	
6	How to develop a user friendly App based Web to increase the popularity of TVET?	- Qualitative	
7	What types of video tutorials are required to implement initially?	- Qualitative	
8	What types of barriers and solutions we need to find to develop such kind of website?	- Qualitative	
9	Find out some important suggestions for the development of contents of the web based app to increase attractiveness and Usefulness?	- Qualitative - Quantitative	
10	Finding the opinion of beneficiaries of the E-training app based website?	- Qualitative	

3.2 Sources of Data

This study adopted a descriptive approach to achieve its objectives. Data analysis and discussions have been on some selected sources from DTE institutions and IT firms. Summary of the data sources according to the research questions has been shown in table 3.2. Also, for the more clarifications data sources are brief discussed in the following sections:

Teachers

Teachers were selected from Sylhet Engineering College, Sylhet Polytechnic Institute and Sylhet Technical School & College because the teachers of these type of institutions are directly involved with TVET sector under the directorate of technical education.

Students

Students were selected from Sylhet Engineering College, Sylhet Polytechnic Institute and Sylhet Technical School & College because the students of these type of institutions are directly involved with TVET sector under the directorate of technical education.

Table 3.2 Data Sources

Research Question	Focus on Research questions	Data sources
1	Why it is necessary to develop a specialized App based Web for TVET?	- Teacher - Student - Industry Person
2	What type of website is better for TVET sector? Why?	- Teacher - Student - CSE Graduates - IT Experts
3	What are the possibilities to exist the similar App based Web that integrates both online tutorials and Job benefits?	- Teacher - Student - CSE Graduates - IT Experts
4	Which types of programming tools and mobile platforms are required to develop such kind of App based Web?	- CSE Graduates - IT Experts
5	Which types of contents are required to improve the App based Web?	- Teacher - Student - CSE Graduates - IT Experts
6	How to develop a user friendly App based Web to increase the popularity of TVET?	- CSE Graduates - IT Experts
7	What types of video tutorials are required to implement initially?	- Teacher - Student
8	What types of barriers and solutions we need to find to develop such kind of website?	- Teacher - Student - IT Experts - Industry Person
9	Find out some important suggestions for the development of contents of the web based app to increase attractiveness and Usefulness?	- Teacher - Student - IT Experts - DTE Experts
10	Finding the opinion of beneficiaries of the E-training app based website?	- Teacher - Student - IT Experts

CSE Graduates

Students were selected from Shahjalal University of Science & Technology, Sylhet Engineering College and Sylhet Polytechnic Institute. From this source of data it is easy to survey the requirements or mindset of the students.

IT Experts

Root Soft IT and Greentech Apps were selected as IT Experts to collect the necessary directions about technical language to design and develop the E-training app based web.

Industry Persons

Manager (H.R.) from Alim Industries was selected as industrial experts to collect the necessary directions about necessity to design and develop the E-training app based web.

Experts from DTE

High ranking officials were selected from DTE to get their important feedback regarding the development of website.

3.3 Research Design

The whole research has been arranged into three phases based on research questions. According to the research focuses and using purposive sampling, every phase was used FGD among the teachers, students, CSE graduates, IT experts & industry persons and only second phase was used semi structured questionnaire among the DTE experts. After that, in third phase the final discussions was being analyzed which is shown in table 3.3.

Table 3.3 Research Design

Data Sources	RQs	Phases
Teachers	1, 2, 3, 5, 7 & 8	Phase A
	9	Phase B
	10	Phase C
Students	1, 2, 3, 5, 7 & 8	Phase A
	9	Phase B
	10	Phase C
CSE Graduates	2, 3, 4, 5 & 6	Phase A
IT Experts	2, 3, 4, 5, 6 & 8	Phase A
	9	Phase B
	10	Phase C
DTE Experts	9	Phase B
Industry Person	1 & 8	Phase A

From table 3.3 it has been shown that research questions 1 to 8 will try to be solved in phase A because these questions are mostly preliminary. Then research questions 8 & 9 will try to be solved into phase B & Phase C respectively to finalize the results.

3.4 Sample and Sampling

As the above factors had to be considered in the study in order to reflect on the variability, purposive sampling method had to be followed to allow inclusion of data sources of all categories. It needs to be noted that for the purpose of having meaningful analysis of data, a minimum number of sample units from different sources have been taken. The total number

samples taken from different categories can be seen in table 3.4. From the sampling plan it has been seen that total 151 numbers of samples were taken from different sources in three phases according to research questions.

Table 3.4 Sampling Plan

Phase A												**Total Samples**
Designation	***Teachers***			***Students***			***CSE Gradates***		***IT Expert***		***Industry Person***	
Institution	SEC	SPI	TSC	SEC	SPI	TSC	SUST	SEC	Root Soft IT	Greentech APP	Mangers	
Sample	05	09	06	08	09	08	02	03	01	01	01	**53**
Sampling	Purposive sampling											
Phase B												
Designation	***Teachers***			***Students***			***IT Expert***		***DTE Expert***			
Institution	SEC	SPI	TSC	SEC	SPI	TSC	Root Soft IT	Greentech APP	High Officials			
Sample	05	09	06	08	09	08	01	01	04			**51**
Sampling	Purposive sampling											
Phase C												
Designation	***Teachers***			***Students***			***IT Expert***					
Institution	SEC	SPI	TSC	SEC	SPI	TSC	Root Soft IT	Greentech APP				
Sample	05	09	06	08	09	08	01	01				**47**
Sampling	Purposive sampling											

3.5 Tools of Data Collection

Basically, Focus group discussion (FGD) was used in data collection. Also a semi-structured questionnaire was used to collect the data shown in table 3.5. In this study, the research question had three phases. The first phase has questions relating the necessity and preliminary requirements to develop app based web; the second phase, had the single question related the overall view and feedback about the developed website; the third phase, had the final question regarding the final evaluation of the website.

Each Focus Group Discussion (FGD) comprised of twenty teachers, twenty five students, five CSE graduates, two IT experts have taken part in it. On the other hand, semi-structured questionnaire were selected for the four DTE experts and one industry person. Besides this, to design BackEnd & FrontEnd PHP & LARAVEL & HTML, CSS & JAVASCRIPT was used as programming tools to design the app based website. In line with this, JQUERY & SQLITE was used to design the database for the job opportunities. Moreover, STUDIO and X_CODE tools were required for Android operating systems. Finally, DSLR camera was used with high configuration mouthpiece to design video tutorials with the help of SECPA.

Table 3.5 Tools of Data Collection

Data sources	Data collection instrument
- Teacher	- FGD
- Student	- FGD
- CSE Graduates	- FGD
- IT Experts	- FGD
- Industry Person	-Semi-Structured Questionnaire
- DTE Experts	-Semi-Structured Questionnaire

3.6 Research Questions – Tools Matrix

To give an insight of the entire planning of the work we designed a research questions & tools matrix which is shown in table 3.6.

Table 3.6RQ – Tools Matrix

Phase A		
RQs	**Focus on Research questions**	**Data collection instrument**
1	Why it is necessary to develop a specialized App based Web for TVET?	- FGD -Semi-Structured Questionnaire
2	What type of website is better for TVET sector? Why?	- FGD -Semi-Structured Questionnaire
3	What are the possibilities to exist the similar App based Web that integrates both online tutorials and Job benefits?	- FGD
4	Which types of programming tools and mobile platforms are required to develop such kind of App based Web?	- FGD
5	Which types of contents are required to improve the App based Web?	- FGD
6	How to develop a user friendly App based Web to increase the popularity of TVET?	- FGD
7	What types of video tutorials are required to implement initially?	- FGD
8	What types of barriers and solutions we need to find to develop such kind of website?	- FGD -Semi-Structured Questionnaire
Phase B		
9	Find out some important suggestions for the development of contents of the web based app to increase attractiveness and Usefulness?	- FGD -Semi-Structured Questionnaire
Phase C		
10	Finding the opinion of beneficiaries of the E-training app based website?	- FGD

In this research we used FGD and Semi- Structured Questionnaire to find the qualitative and quantitative data from the specific sources as teachers, students, IT experts, CSE graduates, DTE experts and Industry persons. These sources were being selected using purposive sampling and in this research we used mixed method to complete work.

3.7 Data Analysis Technique

A huge data set was generated through the study. Each and every discussion in FGD was being noted strictly and then checked & edited. Then a qualified data was prepared under the closed supervision of the team leader and statistical associate. Detailed data from the research questions under the three phases and 151 samples was analyzed and then exclude some information regarding the development purpose of the web. Besides this, after analyzing the data from the instruments and following the guidelines given by the IT experts we was started coding in JAVASCRIPT using PHP/CSSS. Lastly, we design the front end & back end environment and graphics. Finally, with the help of Root Soft IT we were registered on a domain named ***EtvetBD*** and were used YouTube channel through API key. Furthermore, video tutorials were recorded from the Sylhet TSC and editing was done several times to increase the quality of the tutorials. After the development of the website it was opened for the data sources to collect their feedback and website was updated several times according to the suggestions. So it has been concluded that data from the FGD and semi structured questionnaire was strongly analyzed and tried to be implement accordingly.

3.8 Ethical Considerations

In all steps of the research process, we need to engage in ethical practices. Practicing ethics is a complex matter that involves much more than merely following a set of static guidelines such as those from professional associations or conforming to guidelines from campus institutional review boards. Ethics has become a more pervasive idea stretching from the origins of a research study to its final completion and distribution. Ethics should be a primary consideration rather than an afterthought, and it should be at the fore-front of the researcher's agenda (Hesse-Bieber & Leavy, 2006). Of all of the steps in the research process, it does tend to relate closely to the data collection and reporting and distribution of reports than any of the other phase of research. A few of some of these issues will be mentioned here.

3.8.1 Some Ethical Issues in Data Collection

It is important to respect the site in which the research takes place. This respect should be shown by gaining permission before entering a site, by disturbing the site as little as possible during a study, and by viewing oneself as a "guest" at the place of study. Lincoln Public Schools (n.d.) in Lincoln, Nebraska, provides illustrative guidelines to follow for conducting research with minimal disruption to a school district. Their guidelines list several reasons why a project may not be approved. Disapproved projects are those that take away considerable amounts of instructional time; require large amounts of teacher, administrator, or office time. Another strategy for respecting the research site with minimal disruption is to gain access through gatekeepers (or officials). Other ethical issues arise in data collection and are associated with specific types of research designs. You need to not purposefully deprive some participants of helpful treatments, only publish positive results, or fail to disclose the purpose of the study to participants. It is helpful to involve stakeholders in assessing risk to participants, and to not pressure participants into signing consent forms.

3.8.2 Some Ethical Issues in Data Reporting

We need to show respect to audiences who read and use information from studies. Data should be reported honestly, without changing or altering the findings to satisfy certain predictions or interest groups. It may, however, be appropriate for the primary investigator to provide those at the research site with a preliminary copy of any publications. In addition, studies completed by others should not be plagiarized, and credit should be given for material quoted from other studies. As ethical educators, we need to make every effort to communicate the practical significance of our research to the community of researchers and practitioners so inquiry will be encouraged and used. Results should be published and disseminated, even though they may present findings contrary to accepted standards (S. Levy, personal communication, May 3, 2010).Now, after the collection of data by following the above methodology and tools final outcomes were discussed in the next chapter.

Chapter 4

Results of the Data Analysis

Digital Bangladesh is one of the nation's dreams, and then special emphasis is given on the applying of digital technologies to comprehend Vision 2021. Digital Bangladesh implies the broad use of computers, and embodies the trendy philosophy of effective and useful use of technology in terms of implementing the guarantees in education, health, job placement and poverty reduction. In comply with the discussions this chapter are discussed the final results from the instruments briefly.

4.1 Results from the FGD & Semi-Structured Questionnaire

Before the starting of the discussions of results we want to show the participants demographics, which are shown in Fig.4.1. From the Fig.4.1, one can gather the knowledge about the status of the participants who has been selected by purposive sampling.

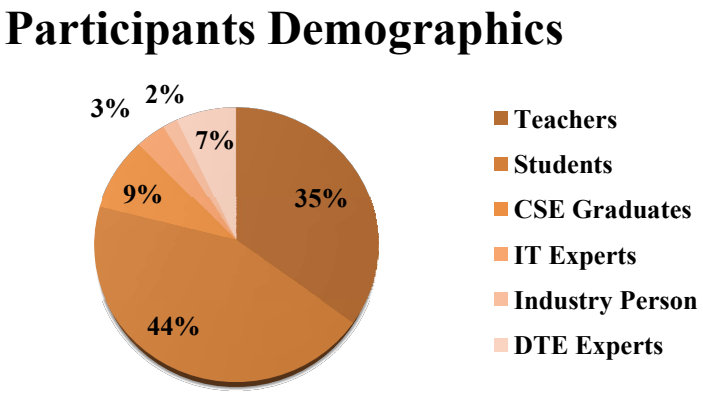


Fig.4.1: Participants Demographics

It was already being discussed that the research question was arranged into three phases. According to the research focuses and using purposive sampling, every phase was used FGD among the teachers, students, CSE graduates, IT experts & industry persons and only second phase was used semi structured questionnaire among the DTE experts. After that, the final discussions was being analyzed and summarized to find the final results. Now, the summaries of findings are given below:

4.1.1 Outcomes from Phase-A

In phase A total 08 (eight) research questions were discussed in 05 (Five) focus group. Teachers, students, CSE graduates, IT experts and industry persons were participate in this phase. Finally, after brief discussions about the necessity, types, similarity, programming tools, contents, user friendly environment and barriers regarding the website we summarized the following outcomes:

- A specialized digital platform that is Web based App is very much essential to increase the overall attractiveness for the TVET sector.
- Web based App required to integrate both video tutorials and job facilities which create a digital environment for TVET.

- The concept regarding specialized website is nearly new for TVET.
- HTML, CSS & JAVASCRIPT & PHP & LARAVEL and android based app is more familiar.
- Video Tutorials, Job Information Company, Category & Division based, Notice board, Contact, Link, Registration, Log in, Dash Board & Statistics about job available are required to implement in website.
- Required least numbers of clicks and linkages between the steps will be included with the facility of using both Bangla & English languages.
- Tutorials related house wiring with time duration 10 to 15 minutes need to design initially.
- Required motivation and publicity to attract the beneficiaries for using this website.

Now we want to discuss the each outcome briefly under the headings of individual findings as follows:

A specialized digital platform that is Web based App is very much essential to increase the overall attractiveness for the TVET sector

Focus group participants were asked to speak about the necessity of specialized website for the TVET sector. Nearly all participants are described their thoughts that the website is essential for TVET. As noted by the focus group discussion among the teachers, one of the teachers said that-**"*Digital platform regarding TVET must be needed to increase the awareness and attractiveness of this sector, which also increases the number of skilled manpower*"**.

Then, focus group discussion among students it is identified that they all are agreed for the necessity of developing the specialized web based app for TVET. And according to the semi structured interview of industry experts it is found that they also give their positive consent about the necessity of developing such a website. Moreover, they have all discussed that specialized web based app for TVET also increases the attractiveness, publicity and awareness among the people. Besides this, they believed that availability of information regarding TVET and research task will increase.

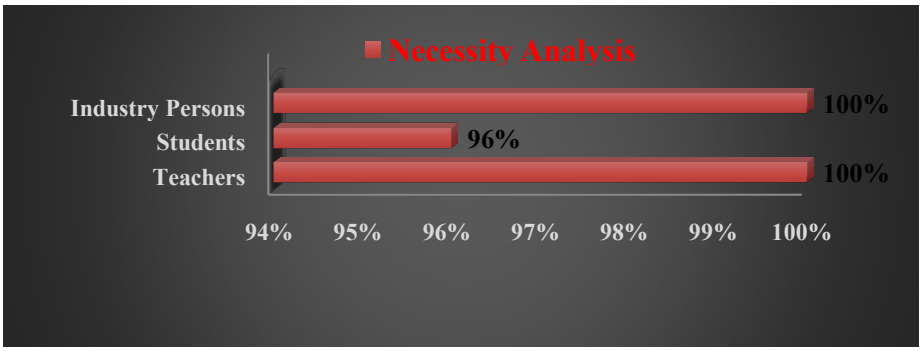


Fig.4.2: Necessity Analysis

Finally, data shows that a specialized digital platform that is Web based App is very much essential to increase the overall attractiveness for the TVET sector.

Web based App required to integrate both video tutorials and job facilities which create a digital environment for TVET

Focus group discussion among the teachers, they shared that it is very much helpful if the website is developed based on app. Because it is easier to use for the beneficiaries. On the other hand, one of the students said that- **"*Integrating the both video tutorials and job information will create a compact digital environment for TVET*".**

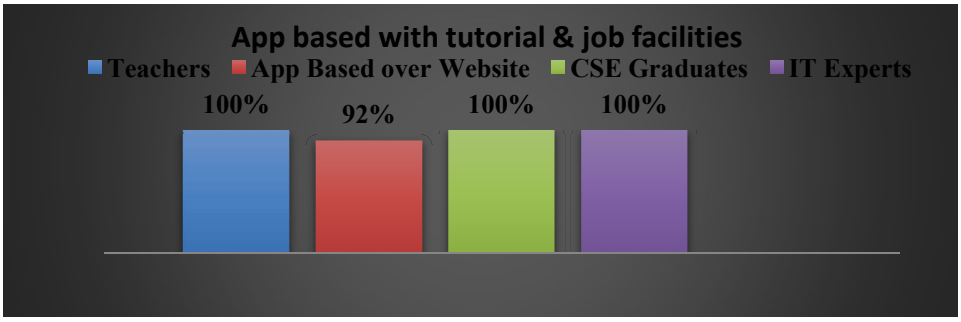


Fig. 4.3: App based with Tutorial & Job Facilities

From the focus group of IT experts & CSE graduates, it is identified that they are agreed to develop app based web. Because at present android phone and internet facilities are available, that's why it is easy to access TVET website through app. Moreover, this web must be facilitates with digital video tutorials and job information. Furthermore, job application facilities will be implemented in web. Finally, the data shows that the specialized Web based App required to integrate both video tutorials and job facilities which create a digital environment for TVET.

The concept regarding specialized website is nearly new for TVET

In focus group discussion among the teachers, students, IT experts and CSE graduates were expressed that there are various types of educational and job based webs are available. Such as 10 minute school and BD Jobs. But this type of website only integrates subjective video tutorials or Job information. So, in this view the proposed website is a new concept in TVET.

Specially, one of the IT Experts said that- "*This type of app based web facilitates with both video tutorials and job benefits are most probably new*". Finally, the data shows that this type of website does not exist anywhere in Bangladesh. So it is nearly new especially in TVET.

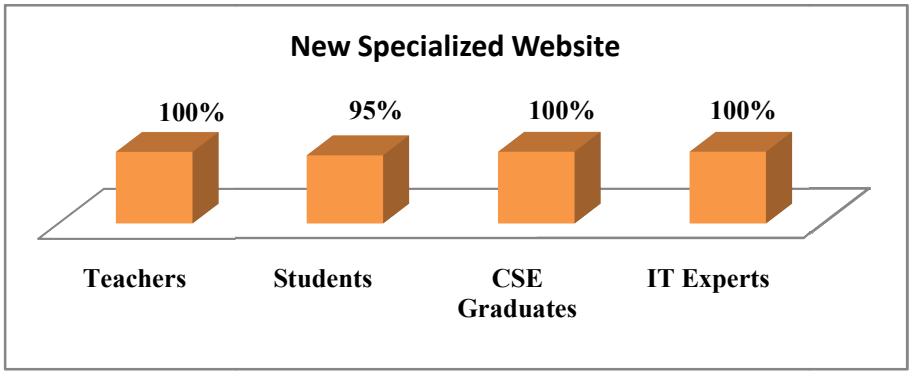


Fig.4.4: New Specialized App based Web

HTML, CSS & JAVASCRIPT & PHP & LARAVEL and android based app is more familiar

In focus group discussion among the IT experts they acknowledged that there are various types of programming languages are available in text. But it is more flexible that to use HTML, CSS & JAVASCRIPT and PHP & LARAVEL for front end and back end design respectively. Specially, one of the IT Experts said that- "*Android based app is more familiar among the general peoples*".

CSE graduates also expressed that, some tools as Domain, Hosting, Server, Play store registration, Database and API key are required to develop the website and app. Moreover, app must be implemented for android mainly but also try for IOS. Besides this, API key is very much helpful to use you tube channel and link this channel with the website. It reduces the load on server.

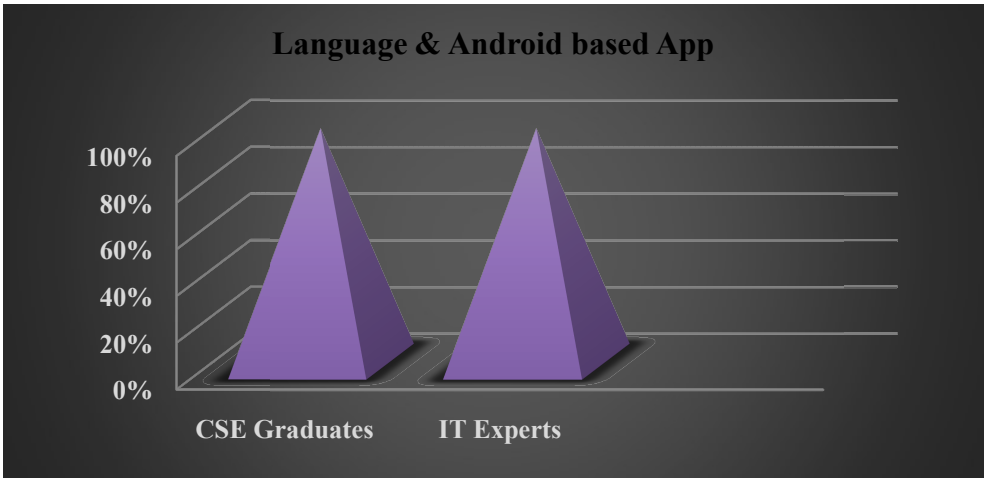


Fig.4.5: Language & Android based App

Finally, the data shows that android based app is more familiar. And need to create or buy Domain, Hosting, Server, Play store registration, Database and API key.

Video Tutorials, Job Information Company, Category & Division based, Notice board, Contact, Link, Registration, Log in, Dash Board & Statistics about job available are required to implement in website

Focus group discussion took place individually in four focus groups such as the teachers, students, CSE graduates & IT experts.

From every focus group it is commonly noted that Video Tutorials, Job Information Company, Category & Division based, Notice board, Contact, Link, Registration, Log in, Dash Board & Statistics about job available are required to implement in website. Finally, the data shows that the above contents are need to implement in website.

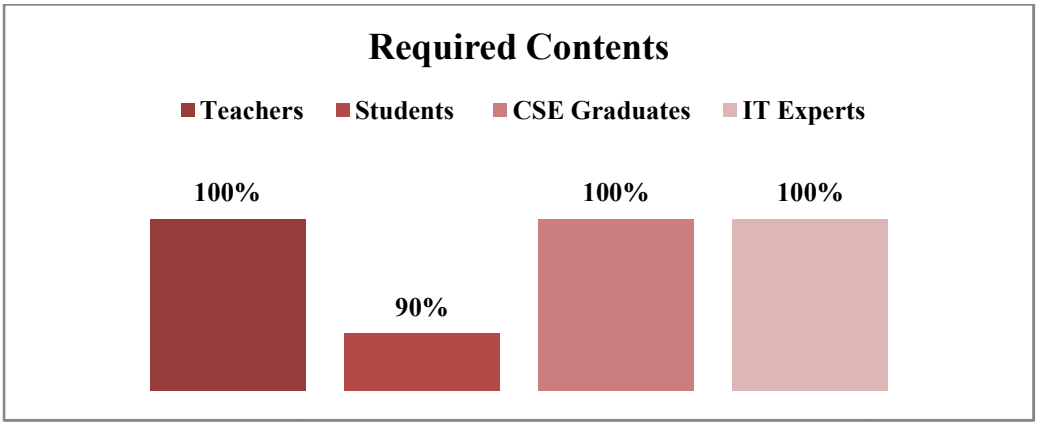


Fig.4.6: Required Contents for Website

Required least numbers of clicks and linkages between the steps will be included with the facility of using both Bangla & English languages

In focus group discussion among IT experts it is identified that to make user friendly website & app at first we need Moreover, job circulation and application process must include the verification criteria, notification criteria and online calling for interview through email. Specially, one of the IT Experts said that- "*Quality graphics increase the user friendly environment more*".

Focus group of CSE graduates acknowledged that, to make user friendly environment it also required to follow that all the information displayed in first page, step by step links, reduce the click numbers, improve graphics, and must include the Bangla & English version. Finally it is conclude that, online verification & notification criteria with job application and circulation process with least numbers of clicks and linkages between the steps will be included. Finally, website must be designed for both Bangla & English languages.

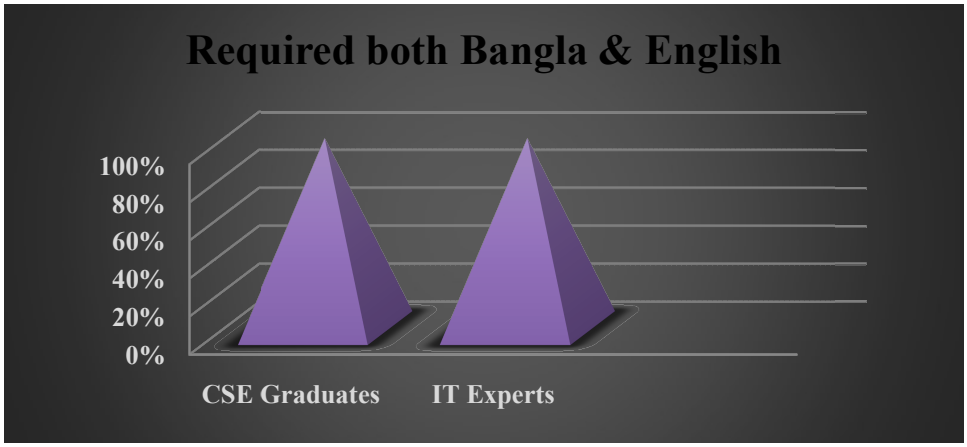


Fig. 4.7: Required both Bangla & English Languages

#Tutorials related house wiring with time duration 10 to 15 minutes need to design initially#

Numerous teachers identified that to make user friendly website & app at first we need to categorize video tutorials so that any one will easily find his required video lecture and video lectures must be in 10 to 15 minutes. Also focus group of students told that lectures must be practical oriented not only slide based. And trade courses as electrical (house wiring) and graphics is more preferable. Finally, house wiring tutorials with time duration 10 to 15 minutes need to design.

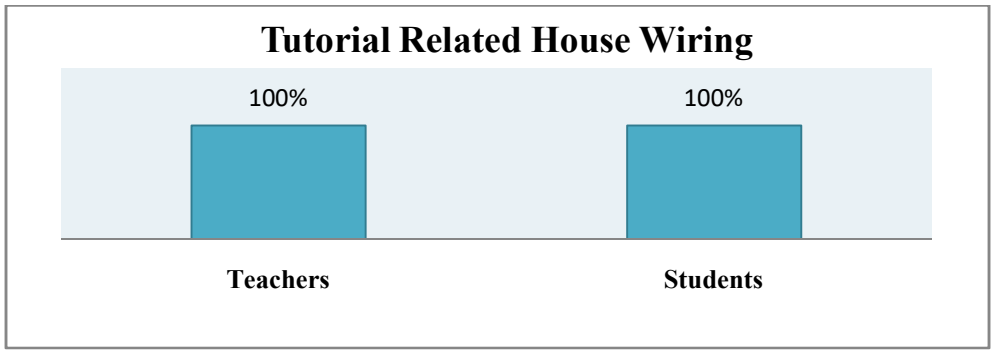


Fig.4.8: Tutorials Related House Wiring

#Required motivation and publicity to attract the beneficiaries for using this website#

Teachers said that, if we need to utilize this website effectively motivation and publicity is required to increase. Specially, one of the Teachers said that- "*Lack of technical knowledge regarding app and website is very crucial for us*".

Also, focus group of students expressed that, a lot of students have financial crisis. They have not enough funds to buy laptops or android phones and also do not afford to bear costing of internet. So, they thought that government needs to increase the funds for the students. IT experts found that there are some barriers regarding the selection of programming languages, server management. And semi structured interview from industry person, they also said that the barriers regarding the contact flexibility of between applicants and job provider. To overcome these barriers we need to use JAVASCRIPT and API key. Moreover, data collection from teachers and students is very crucial because the lack of knowledge about website implementation. To solve this we need to strong counseling the teachers and students to gather technical knowledge. Also, funds limitation is another type of barrier which required the attention of high official to solve. Finally, the data shows that we need to use JAVASCRIPT & API key and strongly motivate the teachers of TVET to gather technical knowledge. And also will try to draw attention of high officials to solve fund problem.

4.1.2 Outcomes from Phase-B

In phase B research question were discussed in 04 (Four) focus groups. Teachers, students, IT experts and DTE experts were participate in this phase. Finally, after brief discussions we summarized the following outcome:

- Graphical interfaces & other facilities are well designed and required to increase the contents in menu bar such as by adding publication bar.

From the eight research questions discussed in Phase-A, some particular topics such as necessity of building a specialized website for TVET sector, presence of job circulars and video tutorial contents, scope for job applications have been thoroughly found. Moreover, menu bar, registration bar, other links, graphics, language, API keys have also been found out from the process discussion. The website has been designed keeping all these contents accumulated. Again, for assuring the acceptance of the site against the demands that have been raised, technical discussions have been conducted with FGD and semi structured questionnaires like teachers, students, IT experts, DTE experts etc. Now we want to discuss the outcome briefly as follows:

#Graphical interfaces & other facilities are well designed and required to increase the contents in menu bar such as by adding publication bar#

In focus group discussion among the teachers they said that graphical interface, job facilities and video tutorials are nearly well. And from students it is also noted that they are satisfied after browsing this website and also feel encouragement. IT experts were said that, this website is so smooth and loading easily without any kind of error. From semi structured interview of DTE experts it is identified that graphical interface, job facilities and video tutorials are nearly well. But in links menu there is need to add website links of NTVQF and Ministry of Education. And also a publication bar will require adding in the site. Finally, data shows that it will need to add two website links of NTVQF and Ministry of Education. And other structures are very well designed.

4.1.3 Outcomes from Phase-C

This is the last and final stage of findings the comments and necessities of the proposed app based website. The final outcome we get from this phase is as follows:

- The proposed app based web is well designed and will open a new door for TVET.

From the analysis of research questions discussed in Phase - A& B, some particular topics such as necessity of building a specialized website for TVET sector, presence of job circulars and video tutorial contents, scope for job applications have been thoroughly found. Moreover, menu bar, registration bar, other links, graphics, language, API keys have also been found out from the process discussion. The website has been designed keeping all these contents accumulated. Again, for assuring the final acceptance of the site against the demands that have been raised, discussions have been conducted among the focus groups like teachers, students, IT experts. Now we want to discuss the outcome briefly as follows:

#The proposed app based web is well designed and will open a new door for TVET#

In focus group discussion among the teachers, they said that the developed app based web is well furnished and attractive. They also said that, this digital platform may create a new era for the development of TVET. From focus group of students it is identified that all the contents, graphics, video tutorials and job facilities criterions are well designed. IT experts highly appreciate the work. Specially, one of the IT Experts said that- "*This app based website will open a new door for the TVET*".

Now, it is more convenient to represent the above discussions graphically. It has been tried to find out the importance of necessity and other contents regarding the website through the analysis of graph shown in Fig. 4.9.

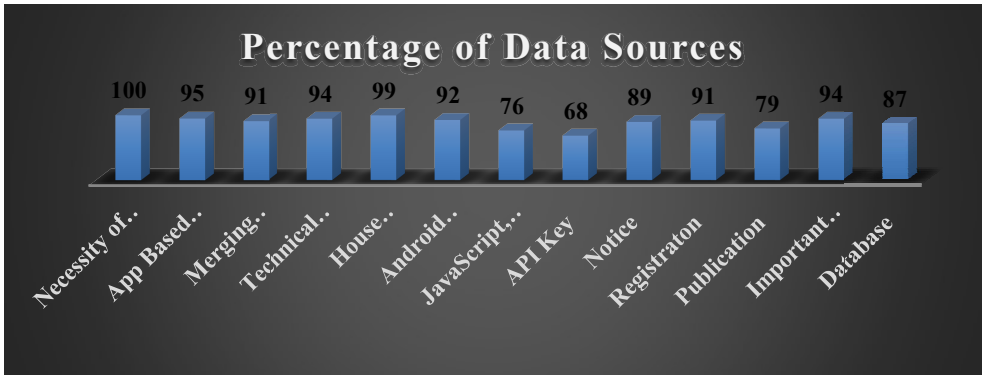


Fig.4.9: Overall & Final Scenario of Data

Finally, the implemented app based website is fully designed getting from the above discussions and according to the demand from beneficiaries.

4.2 Results from the Technical Section

According to the results from the instruments I, various methods and techniques will be followed to design E-training app based web. To attain the research objectives, the concept has been adopted for further processing is discussed below:

E-training app based web integrated various features such as different types menu bars, graphics, database for storing the job information and video tutorials. That's why, the designing procedure of this type of website is very critical and time consuming. Although, it is a specialized website for TVET which integrates both video tutorials and job opportunities. The proposed prototype E-training app based web can be broadly divided into two sections. These are given below:

- Technical Section
- User Interface Section

Now we will discuss these sections in brief in the following sections:

4.2.1 Technical Section

- Application development (Prototype): We are going to develop this app for Android & IOS operating system user and also for Desktop user.
- Web & Server Based App: The proposed app is designed for web service application method by following the information given in the Table 4.1. Note that, the proposed web portal is specifically designed by us (Admin Panel).

Table 4.1Web service application method

Designing Structure	Corresponding Languages
BackEnd	PHP & LARAVEL
FrontEnd	HTML, CSS & JAVASCRIPT

- Domain & Hosting: For E-training Apps we will make a contract with **Root Soft IT** for getting Domain and Hosting facility with security.
- Graphics: We will try to use high quality Graphics for designing Logo's for Website, Android, IOS and Desktop. This Logo's make user interface very flexible and effective.
- API key service of YouTube, by creating a channel in YouTube and linking it with our web portal.
- Database for Job opportunities: This section will be designed by using JQUERY & SQLITE programming languages. This database will be linked with our web portal and also will collect the data from users.

4.2.2 User Interface

- Activity Protocol for Industry: When any industry required circulating their job positions then they need to have registration first and Signs Up. After signing up they will see the options specified for the industry and they will upload the circulars. After the verification from the admin, the circular will be published. They will also visit the video tutorials as per requirement.

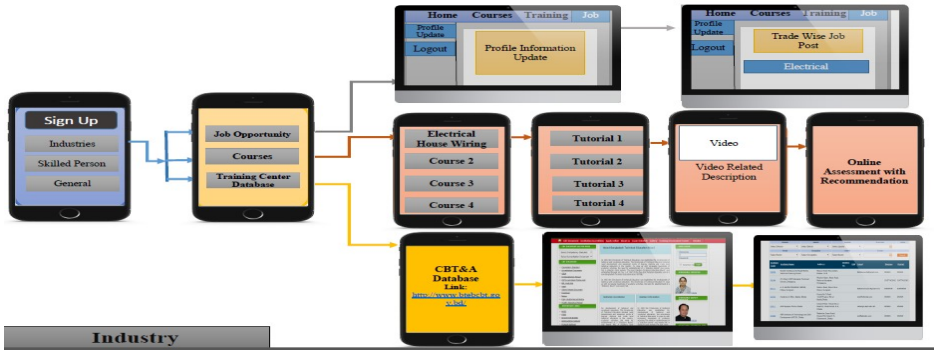


Fig.4.10: Activity Protocol for Industrial Signup

- Activity Protocol for Skilled Person: If anyone signs up as a "Skilled Person" he needs to obtain a registration number (initially it is not obligatory) from the Training Center needs to update the CV. Skilled persons can search and apply for the job according to the Job circular. They can also see the Online Trade Courses and Training Center Database. Because of these advantages skilled individuals will further enhance their skills in different trade courses.

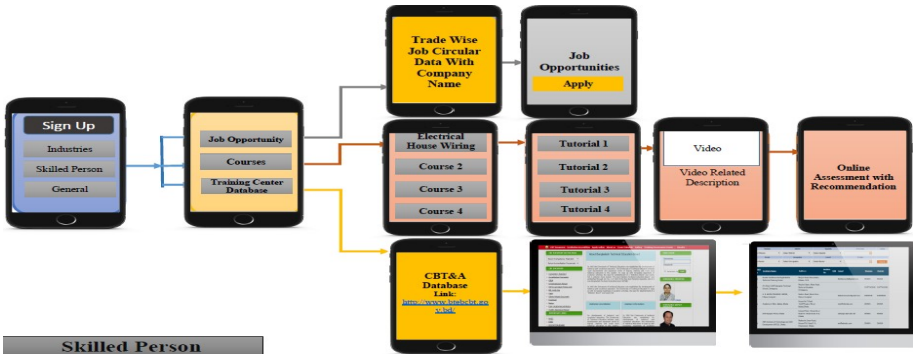


Fig.4.11: Activity Protocol for Skilled Person Signup

Finally, technology integration in education is being widely practiced throughout the whole world. TVET is not an exception in this revolution. As a developing country, Bangladesh is also running towards the global trends to incorporate technology in each and every field with a slogan of 'Digital Bangladesh'. Now, I want to present some images of web based E-training App.

E-Training App Explore
On
Technical & Vocational Education and Training (TVET)

Directorate of Technical Education(DTE)

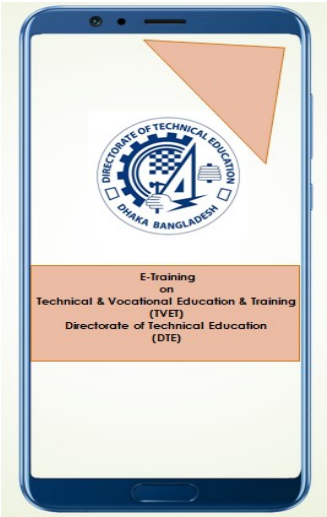


Fig.4.12: Splash Screen

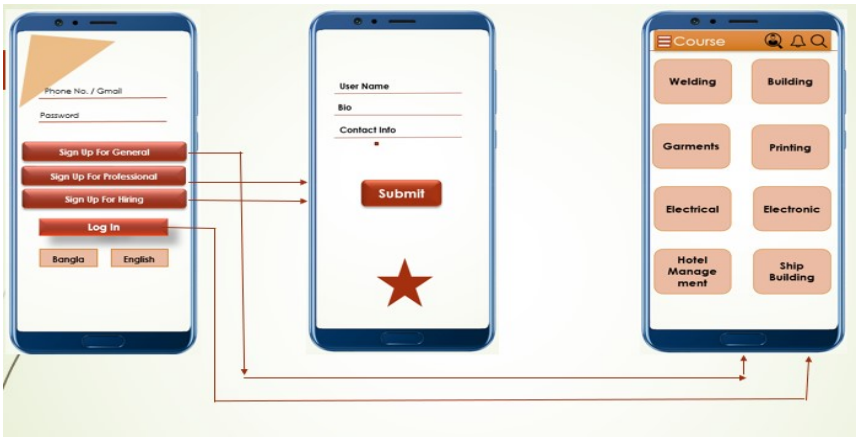


Fig.4.13: Registration and Course Activity

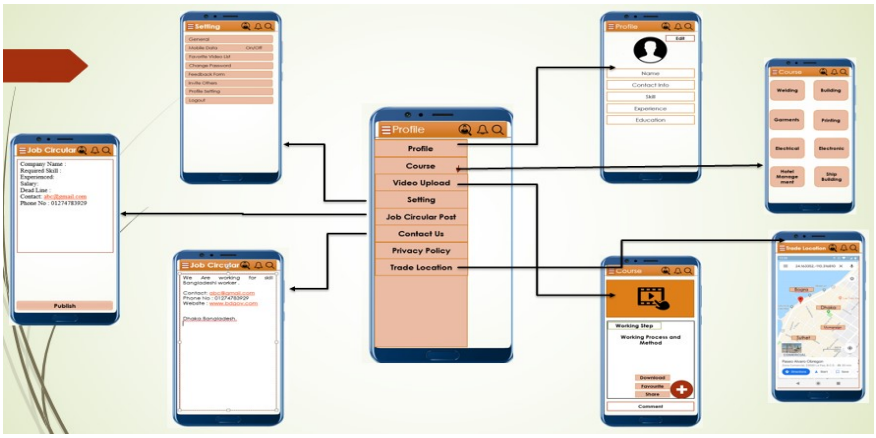


Fig. 4.14: Menu bar Options

Fig.4.15: Job Activity and Layout

4.2.3 Training Center Database

In this stage, proposed work will try to collect data to develop a database to store the information of accredited TVET training centers. To complete this hard and tough task we create a link with the website of CBT & A under NTVQF program. By using the database of CBT & A, anyone can be able to get information for a specific training center. The above discussions are shown in Fig. 3.6.

Fig.4.16: Flowchart of Training Center Database

4.3 Results from the Tutorials

In this stage video tutorials were designed according to the data from the FGD. In FGD it has been seen that maximum data sources demands tutorials regarding house wiring. So, with the association of Sylhet TSC, video was recorded and edited by SECPA.

4.3.1 Online Video Contents

In order to reflect on the variability of trade courses, initially, shown in Fig. 3.5, we choose only one basic trade course based on Electrical concept such as Electrical House Wiring.

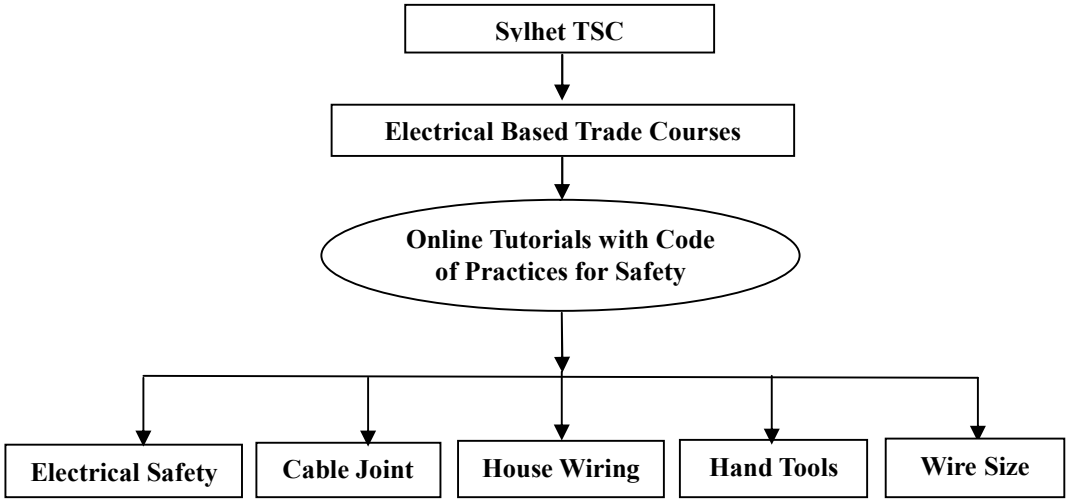


Fig.4.17: Flowchart of Video Contents

We select **Sylhet TSC** as a training center to design our specified tutorial. To make online video contents we ensure the video courses must be designed by following the code of practices for safety management, as if **unskilled persons** and **uncertified skilled persons (prior learners)** will pass the skill assessment tests by using the E-training apps. According to the demands of proposed work Five (05) online video contents has been developed, these are given below:

1. Electrical Safety 2. House Wiring 3. Cable Joint 4. Hand Tools & 5. Wire Size.

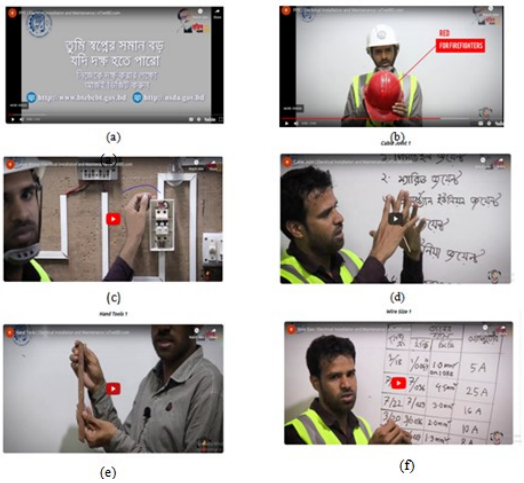


Fig.4.18: Online Video Contents of E-Training Website

4.4 Programming Portfolio

A huge data set will be generated through the study. Each and every data will be checked and edited by experts of DTE in specific technologies/trades. Since E-training apps will try to design an integrated form that this app will provide database for training centers, skilled persons and job offers from industries, so specific fields' data must be verified by the relevant

authorities. BTEB, NSDA and ISCs experts will be more relevant to analyze the authenticity of the collected data. That's why we need collaboration with the authority of these Governmental Institutions. Now, we need to buy server and play store account to upload the E-training apps. Also need registration in the Bangladesh National Web Portal for authenticity of the proposed E-training apps. The complete programming portfolio has been attached in the appendix section.

Finally, technology integration in education is being widely practiced throughout the whole world. TVET is not an exception in this revolution. As a developing country, Bangladesh is also running towards the global trends to incorporate technology in each and every field with a slogan of 'Digital Bangladesh'.

Chapter 5
Major Findings of the Study

The developed E-training App is very much applicable in practice because the Internet facility is so much more available that people want to learn everything from home through internet. Moreover, distance learning is also very important. So, the proposed E-training app is very much effective to enhance the attractiveness of TVET sector. It has been already discussed that, since the proposed work is experimental, so to clearly represent the overall procedure we arrange the full report into three sections. The sections are:

- Demand and requirement analysis by FGD & Semi structured questionnaire using purposive sampling.
- Design & Technical development of the App based website.
- Design the video tutorials.

So, in this chapter we will discuss the major findings from the above three sections into the three sub sections, which are discussed below:

5.1 Summary of findings from Section #1

To design a user friendly App based Web we develop the focuses on the research questions into three phases. First phase consisted of seven questions related with the necessity of a specialized website with app, video tutorials, job information, contents requirements in website, android based or not, language requirements & some other technical information for developing the website. In this section we arrange group discussions among the teachers, students, CSE graduates, IT experts, DTE experts & Industry persons on focusing the above questions. Second phase consisted of only one question related the overall view of the developed website based on the findings from the first phase. Then in third phase, it also consisted of single question related final evaluation of the App based website.

Finally, from the FGD among the data sources it has been found that, it is badly necessary to develop a specialized website for TVET. Also, video tutorials and job information must be included into the website so anyone will easily find the all information from the common digital platform. Also notice, registration, signs up, publication & links in menu bar must need to include. Then, majority wants to design app only for Android application. Moreover, a video tutorial about house wiring is the first choice. In line with this, Sylhet TSC was chosen to record the tutorials. From the IT experts, we was gathered the knowledge about the language, that JAVASCRIPT and LARAVEL needs to use in deigning purpose. Also, API key is very useful to use because it reduces the overall costing of managing the server facilities. Furthermore, a database was developed by using **JQUERY&SQLITE.**

Now the basic summary of the key findings are given below:

- A specialized digital platform that is Web based App is very much essential to increase the overall attractiveness for the TVET sector.
- Web based App required to integrate both video tutorials and job facilities which create a digital environment for TVET.
- The concept regarding specialized website is nearly new for TVET.

- HTML, CSS & JAVASCRIPT & PHP & LARAVEL and android based app is more familiar.
- Video Tutorials, Job Information Company, Category & Division based, Notice board, Contact, Link, Registration, Log in, Dash Board & Statistics about job available are required to implement in website.
- Required least numbers of clicks and linkages between the steps will be included with the facility of using both Bangla & English languages.
- Tutorials related house wiring with time duration 10 to 15 minutes need to design initially.
- Required motivation and publicity to attract the beneficiaries for using this website.
- Graphical interfaces & other facilities are well designed and required to increase the contents in menu bar such as by adding publication bar.
- The proposed app based web is well designed and will open a new door for TVET.

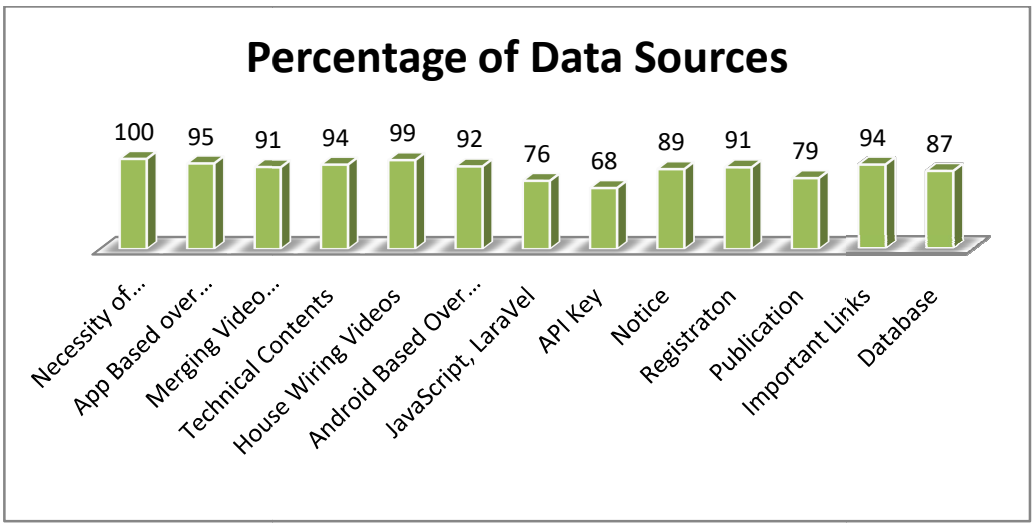


Fig.5.1: Summary of findings

Fig.5.1 shows the scenario of the complete requirement and necessity of the proposed work. It has been seen that necessity of the specialized website for TVET is 100%. That's why; this developed website is very effective to enhance the attractiveness of TVET.

Now more insight in the data analysis we want to represent the complete findings and recommendations from the focus groups in table format shown in table 5.1. From table 5.1 we can easily see the overall scenario of the analysis in various aspects.

Table 5.1 Overall scenario of the research work

Research questions	Research Finding	Recommendation
RQ.1: Why it is necessary to develop a specialized App based Web for TVET?	100% teachers, 96% students and 100% industry persons are agreed for the necessity of developing the specialized web based app for TVET. Moreover, they have all discussed that specialized web based app for TVET also increases the attractiveness, publicity and awareness among the people.	• Data shows that a specialized digital platform that is Web based App also integrate both video tutorials and job facilities, is very much essential to increase the overall attractiveness for the TVET sector and the proposed website does not exist anywhere in Bangladesh. • Android based app is more familiar. And need to create or buy Domain, Hosting, Server, Play store registration, Database and API key. • The contents such as video Tutorials (10 to 15 minutes), Job Information Company, Category & Division based, Notice board, Contact, Link, Registration, Log in, Dash Board & Statistics about job are need to implement in website. • To overcome the technical barrier we need to use JAVASCRIPT and API key. Moreover, data collection from teachers and students is very crucial because the lack of knowledge about ICT. Also government should to take necessary actions to raise funds to enrich this website and also for publicity. • The template of web based app is very well designed and ready to add in search engine.
RQ.2: What type of website is better for TVET sector? Why?	100% teachers, 92% students, 100% CSE graduates & 100% IT experts are identified that they need an app based web.	
RQ.3: What are the possibilities to exist the similar App based Web that integrates both online tutorials and Job benefits?	100% teachers, 95% students, 100% CSE graduates & 100% IT experts are agreed that only the proposed website integrates subjective video tutorials or Job information.	
RQ.4: Which types of programming tools and mobile platforms are required to develop such kind of App based Web?	100% IT experts and 100% of CSE graduates are agreed that the use of HTML, CSS & JAVASCRIPT and PHP & LARAVEL for front end and back end design respectively. Also, some tools as Domain, Hosting, Server, Play store registration, Database and API key are required to develop the website and app.	
RQ.5: Which types of contents are required to improve the App based Web?	100% teachers, 90% students, 100% CSE graduates & 100% IT experts are noted that Video Tutorials, Job Information Company, Category & Division based, Notice board, Contact, Link, Registration, Log in, Dash Board & Statistics about job available are required to implement in website.	
RQ.6: How to develop a user friendly App based Web to increase the popularity of TVET?	Moreover, job circulation and application process must include the verification criteria, notification criteria and online calling for interview through email and also need to implement the both Bangla & English languages.	
RQ.7: What types of video tutorials are required to implement initially?	100% teachers & 100% students required to categorize video tutorials and lectures must be in 10 to 15 minutes. Also, practical not only slide oriented lectures based on trade courses as electrical (house wiring).	
RQ.8: What types of barriers and solutions we need to find to develop such kind of website?	It is found that there are some barriers regarding the selection of programming languages, server management and also in publicity purpose. Also, due to the lacks of funds it is nearly tough to manage the android phone or laptops and internet bills for the students.	
RQ.9: Find out some important suggestions for the development of contents of the web based app to increase attractiveness and Usefulness?	In this phase 100% teachers, 100% students, 100% IT experts and 100% DTE experts are identified that graphical interface, job facilities and video tutorials are nearly well. But in links menu there is need to add website links of NTVQF and Ministry of Education. And 100% DTE experts are required publication bar.	
RQ.10: Find out the opinion of beneficiaries of the E-training app based website?	It is identified that all the contents, graphics, video tutorials and job facilities criterions are well designed. Specially, one of the IT Experts said that- **"*This app based website will open a new door for the TVET*".**	

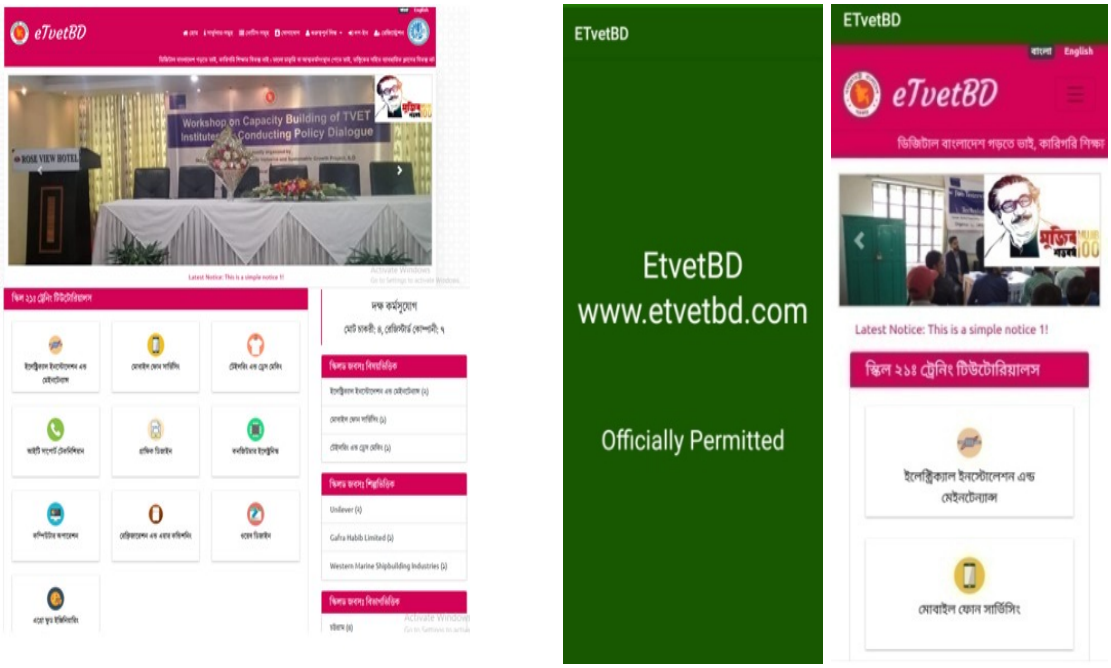
5.2 Summary of findings from Section #2

To meet the expectations described above proposed E-training app based web is the new door to possibilities. Improvement of the TVET sector is the key of economic and social development. But the people are not interested in the TVET sector in Bangladesh. Therefore, it is important to use smart technology to create interest among the peoples of Bangladesh. Now the Internet facility is so much more available that people want to learn everything from home through internet. Moreover, distance learning is also very important. So, the proposed E-training app is very much effective to enhance the attractiveness of TVET sector. As a result of the use of this E-training app, prior learners will also get recognition of their skill, which is one of the policies of national skill development. By using E-training app we will get skilled manpower which will help to get the vision 2021. The final development of the website and App is shown in Fig. 5.2.

5.3 Summary of findings from Section #3

According to the second part of the proposed work Five (05) online video contents has been developed, these are given below:

1. Electrical Safety 2. House Wiring 3. Cable Joint 4. Hand Tools & 5. Wire Size.



(a) (b)

Fig.5.2: (a) Shows the Outlook of the website & (b) Shows the Outlook of the App.

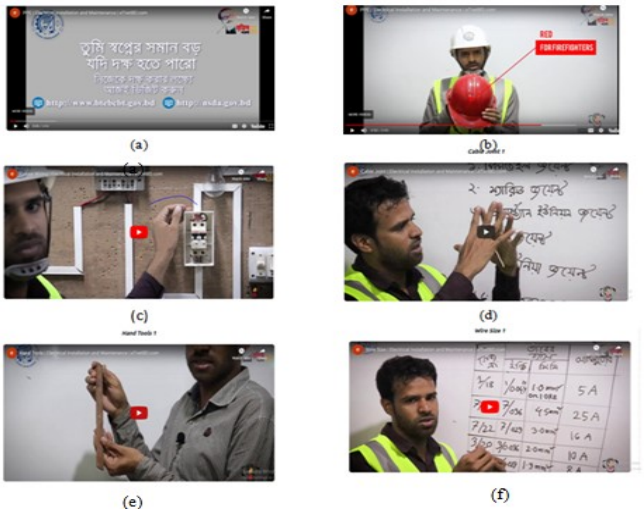


Fig.5.3: Online Video Contents of E-Training Website

It can be concluded that this research work discusses the purpose of providing the insight and understanding on the elevation of E-training in Bangladesh from the perspective of world trend. It begins with detailed discussion about different literature reviews and techniques that are currently integrated in different sectors. In the meantime, it also comprises of the motivations behind his work. This work also represents how to propose new online training platform for TVET, how E-Training App and algorithms work and also provides a deep knowledge about the whole proceedings. We hope that the proposed E-Training app will play a role in the development of the country through the development of Technical and Vocational Education system. Finally, we can make our nation's father's dream a reality and then the Bangladesh will get place as a develop country in the world.

5.4 Implications for Practice

The proposed E-training App based web is very much applicable in practice because the Internet facility is so much more available that people want to learn everything from home through internet. Moreover, distance learning is also very important. So, the proposed E-training app is very much effective to enhance the attractiveness of TVET sector.

5.4.1 Implications for Students

Students of TVET are the direct beneficiaries of this E-training app based web. Also, due to the lack of capacity of the government of Bangladesh it is not possible to give facilities everyone to make them efficient. So, the proposed model will offer the opportunity to do online courses and then finally assessed by the teachers and will be skilled. As a result of the use of this E-training app, students will also get skill certificate.

5.4.2 Implications for Trainees

Trainees under NTVQF are the direct beneficiaries of this E-training app based web. Also, due to the lack of capacity of the government of Bangladesh it is not possible to bring everyone to the training center and then make them efficient. Also a lot of people are engaged them into a lot of work but they do not have certificates so do not call them efficient. So, the proposed model will offer the opportunity to do online courses, without the extra hassle of training, and then finally assessed by the training centers and will receive skill certificates. As a result of the use of this E-training app, prior learners will also get

recognition of their skill, which is one of the policies of national skill development. Further, online based training method and facilitates to circulate available job offers for TVET trainees are most effective sites of this E-training App. Finally, we can conclude that E-training has the ability to play an important role to develop the socio-economic picture of Bangladesh by fascinating the role of TVET.

5.5 Implications for Further Research

It is an excellent effort when a research of one direction can be applied to another direction to be innovated new things. In this work, E-training website, App & Digital Contents has been developed rigorously, which ultimately leads to invent new solutions. Also, GOOGLE Map and advertisement facilities will possible to include in this website. This is helpful to increase the attractiveness of this site, shown in Fig. 5.4 and Fig. 5.5.

- Google Map: E- training App facilitates users by giving the Google Map facility. By using this Google Map anyone can locate the address of training centers.

Fig. 5.4: Image of Google Map

- Advertisement of E-training App: To inform the general people of Bangladesh about this App we propose the messaging technique. Initially, we will send SMS to the officers of DTE and other institutes such as different Polytechnics and TSC's. Also we will use Social Network Promotions such as Face book, LinkedIn & Instagram etc.

Fig. 5.5: Marketing and Promotion Section

So, to fulfill the requirements and necessities of this project we are interested to implement our own server to store the more data in future. Also, we will try to design much more effective online training videos and manage the job offers from the industries. Finally, we will propose to develop a separate E-training cell in DTE, to do this job better in future

Chapter 6
Conclusion

6.1 Conclusion

The concept of E-training derives the introduction of Information and Communication Technologies in the arena of TVET. Introduction of ICTs caused training revolution that is viewed as the major shifts in present days that has changed the traditional ways and means of training. These changes offer in one hand, new ‘digital opportunities’ for TVET sector to be organized and extend services close to the citizen’s expectation to become more efficient, effective and responsive. On the other hand, citizens are empowered with updated training techniques and encouraged for their effective participation in TVET. E-training is the electronic platform to train the unskilled citizens. That’s why a specialized E-training app based web with domain name EtvetBD has been developed in which online tutorials and job opportunities are integrated in a common digital platform. So anyone will get all the information to make him skilled. Also, this app has been developed for android according to the demand from the users. Moreover, online tutorials have been designed by analyzing the demand of trade courses such as electrical safety, wire size, hand tools & channel wiring. Selection of data sources for collection and analysis of data for mixed method research has been done by considering the beneficiaries and experts. Then following the principle of purposive sampling data were collected by using focus group discussion and semi structured questionnaires with the support of the 20 teachers, 25 students, 05 CSE Graduates, 02 IT Experts, 01 Industry Person & 04 DTE Experts. Data (responses to questionnaire and FGD) were available for 55 individuals.

By using specific apps, E-training of different trade courses is possible. Bangladesh government wants to be trained up the unskilled citizens but does not have enough scopes. Also this is a hard task to train the unskilled population by using some common training centers. So, by using online training apps this is easy to train up and also encouraging the unskilled and uninterested peoples. We hope that the developed E-Training app will play a role in the development of the country through the development of Technical and Vocational Education system. Finally, we can make our nation's father's dream a reality and then the Bangladesh will get place as a develop country in the world.

References

Alam, G.M. (2007). Private HE in Bangladesh: the impact on HE governance & legislation.

Armatas, C., & Papadopoulos, T. (2013). Approaches to work-integrated learning and engaging industry in vocational ICT courses: Evaluation of an Australian pilot program. *International Journal of Training Research*, *11*(1), 56–68.

Boutin, F., Chinien, C., Moratis, L., & van Baalen, P. (2009). *Overview: Changing economic environ-ment and workplace requirements: Implications for re-engineering TVET for prosperity. In International handbook of education for the changing world of work* (pp. 81–96). Springer.

BANBEIS. (2015). *Bangladesh Bureau of Educational Information and Statistics, Ministry of Education, Government Republic of Bangladesh*. Retrieved from http://banbeis.gov.bd/data/index.php?option=com_content&view=article&id=1217:table-81-number-of-university-teacher-and-enrolment-by-type-and-gender2012&catid=179:university-education-2014&Itemid=244

Bangladesh, P. s. R. o. (2009). *A national technical and vocational qualification framework for Bangla-desh: Short Form Proposal*. Author.

Coles, M., & Leney, T. (2009). *The regional perspective of vocational education and training. In Inter-national Handbook of Education for the Changing World of Work* (pp. 411–425). Springer.

Chinien, C. (2003). *Analytical SURVEY: The use of ICTs in technical and vocational education and training*. UNESCO Institute for Information Technologies in Education.

Drage, K. (2009). Moderization career and Technical Education Programs. *Techniques, 84(5).*

Douse M., Uys P. (2019). TVET Teaching in the Time of Digitisation. In: McGrath S., Mulder M., Papier J., Suart R. (eds) Handbook of Vocational Education and Training. Springer, Cham.

EO Ugwoke, TO Olinya&HC Anorue, (2020). Policies on Digitalization of Instructions: Implication on Teaching and Learning of TVET Programmes. Vocational and technical education journal (votej) vol 2, no. 2, 2020. ISSN: 2734-2697.

Fagerlind, I., & Saha, L.J. (1989). Education and national development: A comparative persp ective. Oxford, UK: Pergamon.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology*, *21*(1), 82–101. doi:10.14742/ajet.1344

Hawley, J. D., & Paek, J. (2005). Developing human resources for the technical workforce: A compara-tive study of Korea and Thailand. *International Journal of Training and Development*, *9*(1), 79–94. doi:10.1111/j.1360-3736.2005.00223.x

Jinnah, M. A., Abdullah-Al-Mamun, M., Khan, M. S. H., & Hasan, M. (2011). ICT in vocational teach-ing/learning and research in Southeast Asian Countries: A case of Bangladesh. *International Journal of Vocational and Technical Education*, *3*(2), 20–28.

Kuruvilla, S., Erickson, C. L., & Hwang, A. (2002). An assessment of the Singapore skills development system: Does it constitute a viable model for other developing countries? *World*

Development, *30*(8), 1461–1476. doi:10.1016/S0305-750X(02)00046-3.

Khan, B. H. (2001). A framework for web-based learning. *Web-Based Training*, 75-98.

Khan, M. S. H., Hasan, M., & Clement, C. K. (2012). Barriers to the Introduction of ICT into Education in Developing Countries: The Example of Bangladesh. *Online Submission*, *5*(2), 61–80.

Khan, S. H. (2014). A model for integrating ICT into teacher training programs in Bangladesh based on TPCK. *International Journal of Education and Development using ICT, 10*(3).

Khan, S. H. (2015). Emerging conceptions of ICT-enhanced teaching: Australian TAFE context. *In-structional Science, 43*(6), 683-708. doi:10.1007/s11251-015-9356-7.

Khan, S. H., Hasan, M., & Clement, C. K. (2012). Barriers to the introduction of ICT into education in developing countries: the example of Bangladesh. *International Journal of Instruction, 5*(2), 61-80.

Kafyulilo, A. (2014). Access, use and perceptions of teachers and students towards mobile phones as a tool for teaching and learning in Tanzania. *Education and Information Technologies*, *19*(1), 115–127. doi:10.1007/s10639-012-9207-y

Lockwood, F. (2013). *Open and distance learning today*. Routledge.

McGrath, S. (2012). Vocational education and training for development: A policy in need of a theory? *International Journal of Education Development, 32(5), 623-631. Doi: 10.1016/j.ijedudev.2011.12.00.*

Ministry of Education (2011). National skills development policy.

Oliver, R. (2002). *The role of ICT in higher education for the 21st century: ICT as a change agent foreducation*.

Roberts, G. (2003). Teaching using the Web: Conceptions and approaches from a phenomenographic perspective. *Instructional Science*, *31*(1), 127–150. doi:10.1023/A:1022547619474

Shahadat Khan, Mahbub Hasan & G. Rabbani (2017). Current Trends and Issues in TVET of Bangladesh. Chapter January 2017, Journal on Research Gate, DOI: 10.4018/978-1-5225-1811-2.ch007.

Sharma, R. C. (2003). *Barriers in using technology for education in developing countries.* Paper pre-sented at the Information Technology: Research and Education.

Sun, P. C., Finger, G., & Liu, Z. L. (2014). Mapping the Evolution of eLearning from 1977–2005 to Inform Understandings of eLearning Historical Trends. *Education Sciences*, *4*(1), 155–171. doi:10.3390/ educsci4010155

Shamim, M. R. H., Aktaruzzaman, M., & Clement, C. K. (2011). Factors influencing use of ICT in Tech-nical& Vocational Education to make teaching-learning effective & efficient: Case study of Polytechnic institutions in Bangladesh. *International Journal of Basic & Applied Sciences*, *11*(3).

Wonacott, M. E. (2001). *Keeping Vocational/Career-Technical Educators Current*. Trends and Issues Alert No. 23.

Appendix I

Programming Portfolio

```
//
//  RootFileUtil
//
//
classFileUtil: GTAFileManager {

publicvardirUrls = [URL]()
init(_ dirs: [Dir]) {
super.init()
dirs.forEach{dir in
if let rootDirUrl = self.rootDirUrls[dir.root] {
dirUrls.append(rootDirUrl.appendingPathComponent(dir.name))


        } else {
warning("Wait what?, `\(dir.root)` not listed in `\(self.rootDirUrls)`")
        }
      }

CreateDirsIfNotExists(dirUrls: dirUrls)
   }
//=================================================================
========
   //                /* public */

//=================================================================
========
public static func doUpdateStuffFor08() {
logs("funcdoUpdateStuff<FileUtil>")
specialMoveForVersionUpdate(Dir("__dev",       .DocDir),       Dir(Constant.DirName.DEV,
.GTAFDir))
specialMoveForVersionUpdate(Dir("Base_Databases",                                .DocDir),
Dir(Constant.DirName.BaseDB, .GTAFDir))
specialMoveForVersionUpdate(Dir("gapless-db",                                .DocDir),
Dir(Constant.DirName.GaplessDB, .GTAFDir))
specialMoveForVersionUpdate(Dir("Lists",       .DocDir),       Dir(Constant.DirName.Lists,
.GTAFDir))
specialMoveForVersionUpdate(Dir("Translation_Databases",                         .DocDir),
Dir(Constant.DirName.Trans, .GTAFDir))
   }
private static funcspecialMoveForVersionUpdate(_ old: Dir, _ new: Dir) {
letgtafile = GTAFileManager()
letoldDirUrl = FileUtil([old]).dirUrls.first!
letnewDirUrl = FileUtil([new]).dirUrls.first!
forfileName in gtafile.GetAllContents(of: oldDirUrl) {
```

```
letoldFileUrl = oldDirUrl.appendingPathComponent(fileName)
gtafile.MoveItem(from: oldFileUrl, to: newDirUrl.appendingPathComponent(fileName))
        }
gtafile.DeleteItem(oldDirUrl)
    }
}
classGTAFileManager {
publicvarappSupportDirURL: URL
publicvarfileManager: FileManager
  /// - $ApplicationDir/Library/Application Support/GTAF
publicvargtafDirURL: URL
publicvardocDirUrl: URL
publicvartempDirUrl: URL
publicvarrootDirUrls = [GTAFileManager.RootDir:URL]()
init() {
self.appSupportDirURL=  URL(fileURLWithPath:

NSSearchPathForDirectoriesInDomains(.applicationSupportDirectory,
                                                                .userDomainMask, true).first!
        )
self.gtafDirURL         = self.appSupportDirURL.appendingPathComponent("GTAF")
self.docDirUrl=                                                         URL(fileURLWithPath:
NSSearchPathForDirectoriesInDomains(.documentDirectory, .userDomainMask, true).first!)
self.tempDirUrl         = self.gtafDirURL.appendingPathComponent("TEMP")

self.fileManager        = FileManager.default

        /// CREATE `GTAF` dir if doesn't exists
self.CreateDirsIfNotExists(dirUrls: [gtafDirURL, tempDirUrl])

rootDirUrls[.GTAFDir]   = gtafDirURL
rootDirUrls[.DocDir]    = docDirUrl
    }

publicfuncgetFirstFile(in dirURL: URL) -> String? {
do {
return try fileManager.contentsOfDirectory(atPath: dirURL.path).first
        } catch let error {
logs("Error, funcgetFirstFile<GTAFileManager>", error.localizedDescription)
        }
return nil
    }
    /// - Returns: names of contents in a dir
    /// - it can be both file or directory
publicfuncGetAllContents(of dirURL: URL) -> [String] {
do {
return try fileManager.contentsOfDirectory(atPath: dirURL.path)
        } catch let error {
logs("Error, funcGetFiles<GTAFileManager>", error.localizedDescription)
        }
```

```
return []
    }

    /// - Returns: content urls in a dir
    /// - it can be both file or directory
publicfuncGetAllContentUrls(of dirURL: URL) -> [URL] {
returnGetAllContents(of: dirURL).map { dirURL.appendingPathComponent($0) }
    }
publicfuncDeleteAllContents(from dirURL: URL) {
forfileUrl in GetAllContentUrls(of: dirURL) {
DeleteItem(fileUrl)
        }
    }

publicfuncCopyItem(from: URL, to: URL) {

do {
tryfileManager.copyItem(at: from, to: to)
        } catch let error {
logs("Error, funcCopyItem<GTAFileManager>, from = \(from), to = \(to)",
error.localizedDescription)
        }
    }
publicfuncMoveItem(from: URL, to: URL) {
do {
if !fileManager.fileExists(atPath: to.path) {
tryfileManager.moveItem(at: from, to: to)
            }
        } catch let error {
logs("Error, funcMoveItem<GTAFileManager>, from = \(from), to = \(to)",
error.localizedDescription)
        }
    }
publicfuncMoveFolderItems(from prevDirUrl: URL, to newDirUrl: URL) {
for item in GetAllContents(of: prevDirUrl) {
MoveItem(from: prevDirUrl.appendingPathComponent(item), to:
newDirUrl.appendingPathComponent(item))
        }
    }
publicfuncDeleteItem(_ itemUrl: URL) {
do {
tryfileManager.removeItem(at: itemUrl)
        } catch let error {
logs("Error, funcDeleteItem<GTAFileManager>, itemUrl = \(itemUrl)",
error.localizedDescription)
        }
    }
publicfuncCreateDirIfNotExists(dirUrl: URL) {
if !fileManager.fileExists(atPath: dirUrl.path) {
do {
```

```
tryfileManager.createDirectory(at: dirUrl, withIntermediateDirectories: true, attributes: nil)

}  catch let error {
logs("Error, funcCreateDirIfNotExists<GTAFileManager>", error.localizedDescription)
        }
    }
  }
publicfuncCreateDirsIfNotExists(dirUrls: [URL?]) {
fordirUrlOptional in dirUrls {


if let dirUrl = dirUrlOptional {
self.CreateDirIfNotExists(dirUrl: dirUrl)
        }

    }
  }
publicfuncRemoveIfCorrupted(fileUrl: URL) {
iffileManager.fileExists(atPath: fileUrl.path),
letfileAttrs = try? self.fileManager.attributesOfItem(atPath: fileUrl.path),
letfileSize = fileAttrs[.size] as? UInt32, fileSize<= 1024 { // if equal/lower than 10KB
do {
tryfileManager.removeItem(at: fileUrl)
}  catch let error {
logs("Error, funcRemoveIfCorrupted<GTAFileManager>", error.localizedDescription)
        }
logs("funcRemoveCorruptedFile<GTAFileManager>, fileSize: \(fileSize), url: \(fileUrl)")
    }
  }

  /// - Returns: in byte
publicfuncGetFileSize(_ fileUrl: URL) -> UInt32 {
iffileManager.fileExists(atPath: fileUrl.path),
letfileAttrs = try? self.fileManager.attributesOfItem(atPath: fileUrl.path),
letfileSize = fileAttrs[.size] as? UInt32 {
returnfileSize
    }
return 0
  }

  /// - Returns: in byte
publicfuncGetFolderSize(_ folderUrl: URL) -> UInt32 {
var size: UInt32 = 0
GetAllContentUrls(of: folderUrl).forEach {
size += GetFileSize($0)
    }
return size
  }
publicfuncisDirectory(_ contentURL: URL) -> Bool {
varisDir: ObjCBool = false
```

```
iffileManager.fileExists(atPath: contentURL.path, isDirectory: &isDir), isDir.boolValue {
return true
        }
return false

    }

}
extensionGTAFileManager {



struct Dir: Hashable {

let name: String
let root: GTAFileManager.RootDir

init(_ name: String, _ root: GTAFileManager.RootDir) {
            self.name = name
    }

}
```

Appendix II

Research Questions for Focus Group Discussions

Research Question	Focus on Research questions
1	Why it is necessary to develop a specialized App based Web for TVET?
2	What type of website is better for TVET sector? Why?
3	What are the possibilities to exist the similar App based Web that integrates both online tutorials and Job benefits?
4	Which types of programming tools and mobile platforms are required to develop such kind of App based Web?
5	Which types of contents are required to improve the App based Web?
6	How to develop a user friendly App based Web to increase the popularity of TVET?
7	What types of video tutorials are required to implement initially?
8	What types of barriers and solutions we need to find to develop such kind of website?
9	Find out some important suggestions for the development of contents of the web based app to increase attractiveness and Usefulness?
10	Finding the opinion of beneficiaries of the E-training app based website?

Appendix III

Semi-Structured Questionnaire for DTE Experts

Directorate of Technical Education
Research & Knowledge Management Cell
Agargaon, Dhaka

General Information:
A project is going on to increase the attractiveness of TVET sector by developing an App based website named ETVETBD and link (https://etvetbd.com). This site is specified only for the TVET and have the facilities to learn online and to find jobs. There is no other websites are present in Bangladesh which give both facilities.

N, B.: This information will be used only for the research work to enhance the attractiveness of TVET.

Information Collection from the Experts of DTE

General Information:

1.	Name	
2.	Designation	
3.	Organization	

Questions:

1.	Is it required to implement publication menu in menu bar?
Ans.	a) Yes b) No
2.	Is it required to implement link menu in menu bar?
Ans.	a) Yes b) No
3.	Please mention some important links which is required to integrate in our website.
Ans.	
4.	Is it required to implement Contact menu in menu bar?
Ans.	a) Yes b) No
5.	Is it required to implement Notice menu in menu bar?
Ans.	a) Yes b) No
6.	Is it required to create fields to upload online video tutorials?
Ans.	a) Yes b) No

7.	Please give tick mark (✓) besides the trade courses considering demand which are required to show in website.
Ans.	1) AIDT 2) Aircraft Maintenance (Avionics) 3) Aircraft Maintenance (Aerospace)4) Architecture 5) Automobile 6) Ceramic 7) Chemical 8) Civil 9) Civil (wood) 10) Computer 11) Computer Science 12) Construction 13) Data Telecommunication 14) Electrical 15) Electromedical 16) Electronic 17) Environmental 18) Food 19) Footwear 20) Glass 21) Graphic Design 22) IPCT 23) Mechanical 24) Mechatronics 25) Marine26) Mining & Mine Survey 27) Power 28) Printing 29) RAC 30) Ship Building 31) Surveying 32) Telecommunication 33) Tourism& Hospitality.
8.	Is it required to create fields to upload the Job Circulars?
Ans.	a) Yes b) No
9.	Is it required to create fields for Job application?
Ans.	a) Yes b) No
10.	Is it required to create fields for online calling for interviews?
Ans.	a) Yes b) No
11.	Please mention some recommendation according to your personal view for making the website more user friendly.
Ans.	

With Cordial Thanks

Acknowledgment of compassionate information provider		Acknowledgment of information Collector	
Name		Name	
Post		Post	
Organization		Organization	
The information given is very true & authentic. I fill up this form willingly & consciously.		I have collected the information willingly & consciously.	
Signature with Date		Signature with Date	

Semi-Structured Questionnaire for Industry Persons

Directorate of Technical Education
Research & Knowledge Management Cell
Agargaon, Dhaka

General Information:
A project is going on to increase the attractiveness of TVET sector by developing an App based website named ETVETBD and link (https://etvetbd.com). This site is specified only for the TVET and have the facilities to learn online and to find jobs. There is no other websites are present in Bangladesh which give both facilities.

N, B.: This information will be used only for the research work to enhance the attractiveness of TVET.

Information Collection from the Industry Persons

General Information:

1.	Name	
2.	Designation	
3.	Organization	

Questions:

1.	What do you think about the necessity of developing a specialized App based Web for TVET?
Ans.	
2.	What types of facilities you want to integrate in website?
Ans.	
3.	Also mention some barrier of developing this website according to your personal view.
Ans.	

With Cordial Thanks

Acknowledgment of compassionate information provider		Acknowledgment of information Collector	
Name		Name	
Post		Post	
Organization		Organization	
The information given is very true & authentic. I fill up this form willingly & consciously.		I have collected the information willingly & consciously.	
Signature with Date		Signature with Date	